PEANUT DIVERSITY MANAGEMENT BY THE KAIABI (TUPI GUARANI) INDIGENOUS PEOPLE, BRAZILIAN AMAZON.

By

GERALDO MOSIMANN DA SILVA

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2009

To Adriano and Flora.

ACKNOWLEDGMENTS

This dissertation would not have been possible without the support of my family. My children Adriano and Flora were my main source of inspiration. I thank my mother, Ita, and my father, José for always being there. My brothers and sisters made me feel I would finish my research at moments when I did not believe I could. Thanks to Goreti, Paulo, José Luiz, Francisco José, Rogério, and Rita de Cássia.

I am very thankful to the Kaiabi people for sharing with me their time and knowledge. Specially, I thank Tuiarajup, Arupajup, Wisi'o, Morekatu, Jare'i, Sirawan, and Kwariajup.

At the University of Florida, my dissertation committee members have been by my side every step along the way. I thank Dr Nigel Smith for his continued faith in my work, and for sharing coffee and gossips about the Amazon. Dr Hugh Popenoe guided me through many subjects I never had thought about. Dr Augusto Oyuela-Caycedo provided me confidence in the final steps. Besides giving lots of academic input Dr Marianne Schmink showed me a way of life in which blessing happens. Thank you all.

I am also thankful to other faculty that gave me support through friendship and academic contribution: Dr Ignacio Porzecanski, Dr Bob Buschbacher, Dr Michael Heckenberger, Dr Emilio Bruna, and John Dain. Dr Russell Bernard and Dr Suzan Weller provided kind support for my quantitative analysis. Hannah Covert, Patricia Sampaio, Desiree Price, and Ronda Black made my life easier in Gainesville for their diligence to deal with administrative issues.

In Brazil I counted on the logistical support of Instituto Socioambiental, mainly the people working in the Xingu Program: André Villas Boas, Paulo Junqueira, Marcus Tope Schmidt, Kátia Ono, and Paula Mendonça. I am also indebted to the Associação Terra Indígena Xingu (ATIX). Without the support of Mairawy Kaiabi, Alupa Kaiabi, Makupa Kaiabi, and all the staff with ATIX it would be impossible to make this research. Many persons from the Distrito

Sanitário Especial Indígena do Xingu (DSEIX) help me to understand the relationships between agriculture and health, specially Dr Douglas Rodrigues, Dr Sofia Mendonça, and Dr Marcos Schrape. Thank you all.

During this long journey many friends shared doubts and confidence, providing support and encouragement. Dr Vava Gomes, thank you for always sharing perceptions about life and academy. I also want to thank Wendy-Lyn Bartels, Amy Duchelle, Nick Kawa, Dr Ludmila Ribeiro, Dr Doriam Borges, Matt Palumbo, Dr Richard Wallace, and Renata Godoy for your patience in reading and providing input and comments on my research. Many other friends exchanged ideas and gave me support. I will never forget all my extended Brazilian family in Gainesville: Abib and Karla, Amintas, Ana and Pedro Parente, Ane, Ana Eleuterio, Bubuzinha, Eric, Morena, and Nono, Evandro, Juliana Azoubel, Lucas e Paula, Luciana Borges, Lucimar, Leo Pacheco, Marina, Nazare, Paulinha Pinheiro, Ricardo and Denyse, Simone, Raissa, Rossaninha, Vivian, Werlayne Urso Nunes and Molly. Love you all, valeu galera! Last but not least, I need to mention my cumpadre Cristiano Pettersen Neto, Alfredo Rios, Alicia Peon, Daniel Carillo, Daniela, Omaira Bolanos, Rafael Rojas, and Tita, Pablo, and Simon.

Finally, funding for this dissertation came from various sources and I want to acknowledge them. Field work was funded by the Center for Latin American Studies at the University of Florida through a Charles Wagley Fellowship and a Tropical Conservation and Development Program (TCD) research grant. TCD also funded my first and last years in Gainesville. CAPES, the Brazilian Coordenadoria de Apoio ao Pessoal do Ensino Superior provided a fellowship for most of my time as a graduate student.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

PEANUT DIVERSITY MANAGEMENT BY THE KAIABI (TUPI-GUARANI)
INDIGENOUS PEOPLE, BRAZILIAN AMAZON

By

Geraldo Mosimann da Silva

August 2009

Chair: Nigel Smith
Major: Geography

This dissertation examines how indigenous peoples in the Amazon use, create, manage, and recover crop diversity using peanut management among the Kaiabi Indians as a case study. Beyond biological and economic explanations, historical, social and cultural values affect the use and conservation of crop resources. Sacred lessons from spiritual domains inform agricultural practices and influence agrodiversity management, including selection of new varieties. Shamans may exhort ordinary people to uphold such lessons. At the same time, cross-cultural interactions and changes internal to indigenous societies push transformations in knowledge about crop diversity and in the repertoire of varieties cultivated in the fields. Responses to these forces of permanence and change are local-, and culture-specific, and may incorporate the promotion of historical events related to cultural revival, including the recovery of crop diversity.

This research applied both quantitative and qualitative methods to explore these issues. Results show that currently Kaiabi elders and female individuals hold greater knowledge about the names for peanut varieties and crop diversity, but some female youth also showed similar levels of knowledge. Agrodiversity management is performed through the interaction of expanded and nuclear families. Therefore, not all nuclear families cultivate peanut, and knowledge varies within families. Among those cultivating peanut, few families held the most

crop diversity while the majority of farmers kept only a small number of varieties. The findings of this research also suggest that individuals who still select new peanut varieties based on spiritual lessons were able to maintain knowledge about agrodiversity. Moreover, their families cultivate more diversified fields. A village where the shaman guides the initiative to recover crop diversity presented a greater number of newly created peanut varieties. This village was the most important source of seeds of both traditional and new varieties to other families and places, too.

Ideally, crop diversity should be maintained at different places, because of the risk involved in concentrating most varieties in a few fields. Therefore, an external backup system is needed to more efficiently protect crop varieties. However, essential components of the indigenous seed management system such as spiritual values, social organization, and the knowledge associated with managing crop diversity cannot be captured by *ex situ* approaches. Hence, a combination of *in situ* and *ex situ* approaches would be most suitable to promote the conservation of agrodiversity. However, due to their historical exploitation by non-indigenous interests and current issues about germplasm ownership, indigenous peoples raise resistance to the collection of their crop varieties. To conserve crop diversity and maintain a productive physical environment for indigenous peoples, it is essential to promote appropriate policies. Such policies should enhance the chances of upholding indigenous socio-cultural settings and the landscape in which agrodiversity is generated, managed, and evolves through time. Also, it is necessary to include fair mechanisms for sharing the benefits arising from the use of indigenous crop diversity and the associated knowledge in modern agriculture. This way, native peoples can better balance their tradition with influences coming from a globalized world.

CHAPTER 1
INTRODUCTION

This study addresses local management of indigenous[1] agrodiversity. It concerns the relationships among social dynamics, culture, and crop diversity. The focus is on swidden cultivation systems in the Brazilian Amazonian and their connections to a globalized world.

The main objective of this study was to analyze the role of historical and socio-cultural forces involved in the creation, use and management of crop resources among indigenous peoples in the Amazon. The study was a collaborative effort involving the researcher, a local indigenous association, *Associação Terra Indígena Xingu* (ATIX), and a Brazilian NGO, *Instituto Socioambiental* (ISA). However, I am solely responsible for all activities associated with the research.

I studied agrodiversity management among the Kaiabi people who live in the Xingu Indigenous Park, in the southern part of the Brazilian Amazon. The Kaiabi are a Tupi speaking group with weak connections to agricultural markets. Peanut was used as a case study due to its great cultural importance for the Kaiabi. Data on manioc diversity, for which there is a great deal of information about indigenous management in the Amazon, were used to contextualize the findings.

As occurred with many indigenous peoples due to their history of contact, migration and contemporary cross-cultural interaction with external agents, the Kaiabi faced changes in their crop diversity repertoire and associated knowledge. In such settings, the distribution of specialized knowledge of crops, varieties and production technology among members of a society, and the systems of intergenerational knowledge transmission may be transformed.

[1] For the sake of clarification, hereafter I use the expression "indigenous peoples" to identify groups of Amerindians who were living in the place before the arrival of European conquers.

Accordingly, seed circulation systems for the exchange of crop varieties might have been reshaped. In this context, cultural recovery initiatives play a specific role in the practice of agriculture, opening opportunities for cooperation between farmers and scientists.

Agrodiversity management refers to the processes and practices involved in decisions farmers make concerning seed selection and the quantity and nature of specific crop varieties that they maintain (Brush, 2004). The term agrodiversity, or agrobiodiversity, although also used in a broad sense to include all life forms directly or indirectly linked to agricultural production (Brookfield, 2001), here refers to those components of biodiversity related to crops and the diversity within each crop, the varieties. In this research I chose to use the term local variety, or simply variety, because within crop diversity may encompass other types of genetic materials besides landraces (Zeven, 1998)[2]. The Kaiabi refer to crop varieties as '*ko pypiara pytuna*', translated literally as crop types, or '*tipos de plantas da roça'* in Portuguese.

Studying manioc diversity management in the Amazon, Laure Emperaire and collaborators (1998) emphasized that the notion of variety encompasses different meanings according to each cultural group approaching a specific plant (indigenous peoples, scientists, urban consumers, politicians). For indigenous farmers, variety is a collection of individuals with similar phenotypic characteristics that allows for the identification of groups of plants as a unit, and to differentiate nominations to such groups (Emperaire et al, 2003; Brush, 2004). This notion is based on cognitive criteria, along with uses and other cultural attributes. Boster (1986) suggested that perceptual differences for above ground morphological traits are employed by farmers to recognize and name manioc varieties[3]. Although varieties similar in these traits are more prone

---

[2] For a detailed discussion about the concept of local varieties, see Brush (2004).

[3] However, Yudja Indians and Amazonian *caboclos* also classify manioc according to below ground characteristics, e.g. color of the tuber or tuber skin.

to be confused, the model[4] stresses farmers' ability to recognize subtle differences, which allows for incorporating mutations and or recombinant seed-derived plants into their gene pool (Chernela, 1986; Salick et al 1997). However, Salick et al (1997) identified inconsistency in the names for manioc varieties among the Peruvian Amuesha Indians, characterized as "strong tradition with little consensus". Furthermore, studies on manioc taxonomy based on cognitive, morphological-based criteria, found no correlation between varietal names and their genetic makeup (Salick et al 1997; Emperaire, 1998; Elias, 2001a; Emperaire et al, 2003; Sambatti et al, 2001). Consequently, varietal names for the crop can either under or over estimate genotypic variability. Accordingly, studies for other crops showed that names for local varieties are not necessarily overlapped by a botanical definition (Cleveland et al, 1994; Zimmerer, 1996; Sadiki et al, 2007). Therefore, to better understand the meaning of indigenous management of crop diversity it is crucial to pay attention to how farmers recognize and name varieties (Emperaire, 2005; Sadiki et al, 2007).

Approaches to the Study of Agrodiversity

Brush (2004) presented the study of agrodiversity as belonging to three complementary areas of knowledge: ethnobotany, economic botany, and human ecology. Brush considered ethnobotany as more concerned with classification systems, devoted to elucidate the names for local varieties and the associated farmers' knowledge. Recently, another approach derived from ethnobiology has emerged: biocultural diversity aims to demonstrate the linkages between cultural and biological diversity (Maffi, 2001; Carson and Maffi, 2005). Current research activities on agrodiversity on these grounds are more related to linguistics. For example, Perales

[4] The model requires independent answers from the informants. From my experience with the Kaiabi I can assert that information spread at incredible speed within and between villages. Hence, the full application of the *Model for Perceptual Selection* is problematic in such conditions. Nevertheless, this fact does not invalidate Boster's (1986) approach to morphological traits, variety naming and farmers' management.

et al (2005) demonstrated that socially acquired knowledge and practice about maize diversity in Mexico is strongly bounded to linguistic and ethnic affiliation. In this context, local varieties are favored because of the lower social cost of information to deal with crop diversity. Brush (2004) linked economic botany to descriptions of the use, ecology and economic status of cultivated plants; human ecology, in turn, is related to the understanding of crop diversity in a dynamic context of environmental and social changes. Such studies include cultural, social, economic and technological determinants affecting agronomic performance, markets and cultural values of distinct types of crops. Operationally, it involves demographic changes, farm size, availability of labor and agricultural inputs, consumption demands and prices, and credit policies. However, the lines dividing these disciplines are unclear (Zimmerer, 2001). Zimmerer explained how ethnobiology blended with approaches from geography, incorporating elements directly linked to the formulation of public policies about natural resources use and management, pointing to 'ethnolandscape ecology' as a perspective that "refers to the analysis of cultural environmental knowledge in relation to humanized landscapes that are often highly politicized" (Zimmerer, 2001, p. 726). Akin to 'cultural ecology' such conceptualization implies the existence of biophysical-cultural creations, including crop varieties (Brush, 2004).

I applied a research design compatible with Karl Zimmerer's (1996, 2003) *environmental geography approach*, which perceives agrodiversity as a product of ecologic-economic forces, culture, and geography. As such, historical determinants (including migration) and environmental knowledge also influence agrodiversity status. This model of agrodiversity management states that, besides environmental and agronomic rationales, non-ecological objectives motivate farmers. Among them, culture plays a key role, including the attitudes of farmers and their symbolic expressions and cuisine[5]. In addition, household and extended families are regarded as crucial social analytic units for agrodiversity research (Zimmerer, 1996, 2004; Netting, 2003).

Indigenous Knowledge: Concepts, Variation, and Processes

Social systems may be divided into knowledge, values, organization, and technology sub-systems, each of which co-evolves with the others and with environmental systems, whether by chance or design (Norgaard, 1994). Although SW is not synominous to social systems, both western science (WS) and indigenous knowledge (IK) fit into this framework, sharing similarities and particularities, and presenting a broad range of interactions that allows for a "genuine synthesis" (Agrawal, 1995). However, within indigenous cultures, unclear lines separate rational from non-rational, and technical from non-technical elements (Scoones and Thompson, 1994). Indeed, Viveiros de Castro (2008) reminded us that, while the synthesis is welcomed, ecological indigenous knowledge differs from western science not by its content but essentially for its structure, derived from indigenous perspectives on relations between nature and culture (Viveiros de Castro, 1996a).

Actual and potential uses of IK imply the recognition of its value in the original socio-cultural setting, and potential applications elsewhere (Berkes, 1999; Sillitoe et al, 2002). This brings to the forefront the issues of indigenous self-determination and political empowerment, resources ownership, and human rights, demanding protection for IK (Posey and Dutfield, 1996; Posey, 1999).

Based on heterogeneity, complexity and uncertainty involved in human-nature relationships, Holling et al (2002) drew on an integrative theory of adaptive change to work on

[5] Cuisine refers to "cultural rules, representations, beliefs and practices that govern cooking and eating in different societies and influence people's behaviors and identities" (Fischler, 1995, quoted by Camacho, 2006).

these processes. The authors identified two targets: integrate the dynamics of change across scales and over time, and integrate disciplines to better understand ecological, economic and institutional processes. Hence, the combination of indigenous knowledge (with deep diachronic memory) and western science (presumably with deep synchronic understanding) “may enhance the adaptive capacity for coping with disturbance and building social-ecological resilience” (Berkes and Folke, 2002, p. 146).

Stanford Zent (2009) reviewed studies on Indigenous Knowledge (IK) carried out during the last half century and distinguished several developmental phases, based on research foci, methods and objectives. He characterized the last chronological phase as ‘processual studies of indigenous knowledge’. Scientists aware of the rapid erosion of IK began to put efforts into its dynamic aspects, emphasizing the mechanisms by which IK is created, transmitted, transformed, conserved and lost. As a domain within IK, agrodiversity has been continuously adapted by societies in which it is embedded to respond to at least partially unpredictable and uncontrolled internal and external stimuli in different time / space arrangements. For this reason, an adaptive approach was proposed as a suitable tool for dealing with plant genetic resources knowledge and management[6] (De Boef et al, 2000). Moreover, such processes require a contextualized approach emphasizing local particularities (Heckler and Zent, 2008).

To identify cultural indicators for modeling causal and conditioning factors for IK loss and persistence, and to assess the effectiveness of policies to protect IK, Zent and Maffi (2007) reviewed a set of drivers related to variation and change. Acknowledging that the direction and strength of effects on knowledge may be site- and domain-specific, Zent and Maffi provided an

[6] De Boef et al (2000, p. 343) refer to adaptive management of plant genetic resources as “a management style that uses these resources without reducing the options as to their future availability, access and use”.

extensive list of potential explanatory variables[7]. Within a similar framework, a work-in-progress initiative addressing specifically the development of cultural indicators for indigenous peoples' food and agroecological systems is under wayunder the auspices of the United Nations' Food and Agriculture Organization (FAO) and the International Indian Treaty Council (IITC). However, such indicators were designed for macro-level analysis (Woodley, 2006); therefore, they are not compatible with the level of details required in this study's research design.

Based on Zent and Maffi's (2007) discussion of case studies within a broad ethnoecological scope, here I comment on selected variables, providing further considerations later in this text when dealing with indigenous crop diversity. Age, gender roles, occupation focus and income refer to the disaggregation of knowledge among individuals and groups within a society (Sillitoe, 2002). Age is the most common indicator of change, and is directly employed in synchronic, and in diachronic studies as a proxy variable to gauge the evolution of knowledge over time (Hewlett and Cavalli-Sforza, 1986; Zent, 1999, 2009; Lizarralde, 2001; Heckler, 2002). Thus, change is assumed to be the difference between knowledge of adults and children (Voeks and Leony, 2004). However, using age alone may be misleading, because it interacts with several other variables. Moreover, most knowledge about non specialized subsistence skills is acquired at late adolescence or early adulthood (Zent and Maffi, 2007), therefore the normal learning curve from youngsters to elders is time- and age-dependent (Godoy et al, 2006). Consequently, it is questionable whether differences in knowledge between adults and children are due to a trend in IK shift or part of the normal

[7] Zent and Maffi (2007) discussed variation and change in IK according to the following variables, which were analyzed within the framework of IK properties proposed by Ellen and Harris (2000): age, gender roles, formal education, parental schooling, language shift, bilingualism, market involvement, imported technology, occupational focus, wealth, land availability, public economic assistance, sedentism, habitat degradation, useful species extinction, distance to forest or town, migration, travel, inter-ethnic contact, availability of western medicines or health clinics, religious belief, and values change.

learning curve. Furthermore, for indigenous peoples variation in knowledge may be more sensitive to age categories (incorporating both age and gender) rather than age or gender itself.

In the case of the Kaiabi living in the Xingu area, while most of the youngsters were born in place, many elder individuals migrated from other areas occupied by the group in the past and currently. Although people migrating from distinct areas may exhibit variation in knowledge, in the case of the Kaiabi migration is mainly an age-dependent variable, which may bias their answers. The use of native language and bilinguism are fairly homogenous in the study area, where there is a marginal presence of agricultural markets (exclusively for specific products such as manioc flour, and inputs like tools).

In some occasions age, gender roles, and occupation focus correlate well with the intensity of travel of individuals and, therefore, the level of inter-ethnic contact. However, cross cultural interactions not always depend on travels, as in the case of the Xingu Park where 15 distinct ethnic groups currently live.

Land availability and habitat degradation are environmental and economic factors related to population density, settlement patterns and sedentism (spatially defined factors), and may favor or hamper the use of agricultural sites (Brookfield, 2001). Finally, beliefs are at the core of indigenous knowledge, but variation may occur across individuals within small societies. In other words, as knowledge is unevenly distributed among members of a given society, individuals do not necessarily present the same competence about myths, cosmology and other symbolic expressions of their own culture, which may be represented in cuisine and crop diversity (Elias, 2000).

Formal education is associated with the quantity and nature of information individuals received through schooling, which may affect the time available to subsistence activities such as agriculture (Zimmerer, 1996; Salick et al, 1997). In a similar way, engagement in paid job, and to a lesser extent, political leadership, can also potentially diminish opportunities for individuals to keep in contact with crops.

The passage from a focus on variation of knowledge within a society to processes leading to changes in knowledge requires a look at causation and/or correlation of variables in relation to persistence or loss of indigenous knowledge (Zent and Maffi, 2007). In addition to explanatory variables, the study of mechanisms for knowledge transmission, intimately related to social organization in specific cultural contexts, is crucial for understanding processes transforming IK. From an early mechanicist approach (Hewlett and Cavali-Sforza, 1986), other socio-cultural and economic elements were added as part of knowledge transmission processes including spiritual, moral and affective dimensions (Atran, 1999, 2001; Nazarea, 2005; Athayde et al, 2009).

Indigenous Management of Crop Diversity in Perspective

Several determinants influence farmers' choice of which varieties to maintain, discard or replace; and how factors associated to the environment, crop ecology, and agricultural practices weight farmers' selection practices. Such drivers are interwoven in the fabric of indigenous life, and are expressed in the relationships between culture and agrodiversity management.

For centuries, farmers have been the custodians of crop gene pools in their plots and in storage facilities (Harlan, 1975; Plucknett and Smith, 1984). Indigenous strategies for crop diversity management might be as diverse as the societies in which they are embedded, with some farmers maintaining dozens of crops, and up to hundreds of crop varieties. Taking the example of manioc, Boster (1984) mentions that Aguaruna people in Peru used more than 700 varieties names (with many synonymous). Emperaire et al (2003) compiled information on 60 case studies[8] on Amazonian indigenous peoples showing areas with striking diversity: Salick et

[8] These figures also reflect the knowledge about the most studied places and peoples. The number of varieties seems to be proportionally linked to the overall population of the group under investigation, and their respective number of

al (1997) presents 204 manioc varieties names for the Amuesha in Peru. Chernela (1986) reported 137 varieties in four Tukano villages in Brazil. Tukano people in Colombia (Uaupés River) had more than 100 varieties (Dufour, 1993) as well as the Huambisa of the Santiago River, Peru (Boster, 1983). Apart from these five reports, all other studies identified between one and 100 varieties. This finding demonstrates that the crop may have distinct importance according to farmers' cultural context. Moreover, while some members of a specific contemporary society act as keepers of crop diversity, in general most households cultivate only a small proportion of the full repertoire of varieties available (Brush, 2004).

Determinants of Indigenous Agrodiversity Management

Farmers choose crop varieties based on evaluation of their qualities. Such qualities are established by personal and social criteria (Bellon, 1996). Bellon proposed that farmers evaluate varieties through a set of concerns as follows: environmental heterogeneity; incidence of pests and pathogens; risk management; culture and rituals; and dietary requirements. Brush (2004) summarized these concerns as three main factors determining the outcome in terms of local varieties: environmental and agronomic factors; risks, associated with fluctuation in yield instability and farmers' ability to cope with this instability; and uses (food, fodder, fuel) and markets, including the storage capacity to withstand the period between harvests.

Studies carried in various parts of the Amazon and elsewhere, however, suggest a broad array of explanations for local agrodiversity management, including the combination of internal and external factors. Such determinants link environment and crop ecology, economy, policies, social organization, and culture to each other (Zimmerer, 1996; Thrupp, 1998; Emperaire et al, 2001; Howard, 2003; Brush, 2004). The following elements playing a role are: demography,

---

places of residence. However, as the methods of research were not homogeneous, it is not possible to make a comparative appraisal about variety diversity.

settlement patterns and land availability; markets and policies affecting agriculture; elements associated with management of crop fields and seeds (ecological zones, cropping timing and agricultural cycles suitable for specific crops and their variation); seed sources and exchanges; processes applied to recognize local varieties; varietal choice; selection processes, and storage devices and methods); social organization (the framework for agricultural work; kinship and within- and extra-community ties); uses and food security; and farmers' world vision and spiritual values related to cuisine and agriculture.

Markets often favor varieties that may not match farmers' valued qualities (Brush, 1992; Meng et al, 1998; Bellon, 1996); therefore, non commercial farmers rely mostly on their own saved seeds and on informal seeds sources such as kinship relations and neighbors, and only marginally interact with formal markets for seeds supply (Cromwell, 1990; Tripp, 1996).

Modifications in demographic forces, the presence or lack of markets for inputs and products, economic and policy incentives and constraints for the use of natural resources, opportunities for off-farm jobs, and incentives for technological changes including modifications in the seeds system, all contribute to the transformation of crop diversity (Zimmerer, 1996; Brookfield, 2001; Brush, 2004). However, cultural changes in indigenous systems are selective and partial, a consequence of pursuing improved livelihood conditions (Zimmerer, 1996). The results can bring either positive or negative consequences for the maintenance of local varieties (in at least part of farmers' fields), sharing space with modern ones at varying degree. Therefore, market integration does not necessarily mean decreasing crop diversity (Brush et al, 1992; Tripp, 1996; Zimmerer, 1996; Brookfield, 2001; Valdez et al, 2004).

Crop diversity often results from micro-environmental niches, and is considered to be a key factor for optimizing social work organization and to cope with current and future uncertainties (Zimmerer, 1996; Brookfield, 2001; Brush, 2004). Relevant environmental features include patterns of rainfall distribution; cultivation in separated plots exploring different positions in the catena (soil moisture and fertility) or specific temporal arrays. In addition, agronomic risks (pests and diseases) pose threats to harvests, which farmers seek to minimize by taking advantage of a crop's eco-physiologic characteristics (period to maturation, photoperiod), and plant architecture (light, shade and soil protection) (Qualset et al, 1997). Indigenous farmers may give up some crop diversity when soil fertility declines below an easily remedied point (Zimmerer, 1996).

Farmers value the whole collection of varieties of a given crop available to them, which constitute their management unit, rather than individual varieties or even more subtle variations under the name for a local variety (Emperaire, 1998; Elias et al, 2000). Diversity of crop varieties responds better to changes in these multiple environmental, economic, social and cultural criteria over time. Therefore, turnover of varieties, a quite common phenomenon, is linked to unsatisfactory answers to these criteria (Bellon and Brush, 1994; Bellon, 1996; Emperaire, 1998; Elias et al, 2000; Brush, 2004).

Maintenance of crop varieties by farmers reflects the dynamic balance of losses and additions and the nature of the local or external varieties involved (Zeven, 1999). For example, the choice of manioc varieties by indigenous farmers in the Amazon follows production strategies linked to food security, and some drivers seem to have more importance: agronomic (mainly yield); utility features of varieties (Emperaire, 1998; Elias et al, 2000); and social networks for varieties exchanges (Boster, 1986; Emperaire, 1998; Heckler and Zent, 2008). Yet, in many cases the use for most varieties overlaps, which has been called 'functional redundancy' (Elias et al, 2000, p. 252). Indeed, due to its material value for food security and as a symbol of cultural identity associated with supra-material domains and culinary traditions, at least sectors of a particular indigenous population may maintain local crop diversity despite cultural and economic transformations (such as formal education and engagement in cash economy, among others) present in the Amazon (Perreault, 2005) and elsewhere (Zimmerer, 1991, 1996; Steinberg, 1999). Other internal factors influencing crop diversity are related to sorcery (Carneiro, 1983), extensive travel, accidents such as uncontrolled burnings, sickness in the family (Emperaire, 1998; Elias et al, 2000), and bad luck (Salick et al, 1997). Diversity in the fields is also linked to the aesthetic and moral ideal of living well (Howard, 2003; Heckler and Zent, 2008), and varieties in a particular garden are associated with personal and collective memories (Boster, 1986; Elias et al, 2000; Nazarea, 2005; Heckler and Zent, 2008).

Within a particular society, agrodiversity management and maintenance is also associated with the distribution of knowledge among its members. In some societies the knowledge associated with crop diversity is fairly dispersed among their members (Iskandar and Ellen, 1999). However, such a pattern for the distribution of knowledge is not universal. For example, Makushi informants had no accurate or exhaustive knowledge about manioc diversity in their villages (Elias et al, 2000). Age and gender groups and specialized social actors may account for such differences in knowledge and practice. In general females have been considered the custodians of crop varieties and their main processors in many societies around the world (FAO, 2002a,b; Howard, 2003). However, such generalization might be misleading because gender relations influence local agrodiversity status through agricultural divisions of responsibilities in decision making, seed management roles, and knowledge (Zimmerer 1996; Oakley and Momsen, 2005; Pfeiffer and Butz, 2005), and may be informed by cosmology and behavioral norms (Descola, 1994; Howard, 2003). Gender can mark different approaches to the same crop occupying discrete spatial (fields) or temporal (phases during a cropping season) units (Howard, 2003; Pfeiffer and Butz, 2005). In other instances, most agricultural activities are performed by just one gender; women in the case of manioc cultivation by some Amazonian groups (Descola, 1994; Salick et al, 1997; Elias et al, 2000; Heckler and Zent, 2008). In cases in which males engage in off farm jobs, the work load of the household may influence female's decisions about crop diversity (Perreault, 2005; Pfeiffer and Butz, 2005; Heckler and Zent, 2008). Women are also regarded as educators, and would deliver more knowledge than men about crop diversity to children (Salick, et al 1997; Howard, 2003). Given their more direct linkages with agrodiversity in the fields and cuisine, in some occasions women would suffer most of the impact of technological changes, markets, contact outsiders, and development programs (Howard, 2003).

In other cases there are specialized social actors such as shamans that have specific ritual or cultural roles for managing and crop resources and associated knowledge (Jarvis et al, 2000; Brush, 2004). However, while studies demonstrated the central importance of the symbolic dimension of agriculture in the context of indigenous social organization (Descola, 1994; Rival, 2001; Santos, 2006), the only study directly reporting the role of a shaman dealing with crop diversity management was carried out by Salick et al (1997) among the Amuesha in the Peruvian Amazon. Even in this case, a paradox emerges: the authors did not explain why and how manioc - a crop managed mainly by women - has a male shaman as the keeper of its diversity. Furthermore, Elias et al (2000) noted that Salick and collaborators did not comment on the risks of losing varieties associated with such centralized management of crop diversity, which may include disincentives for others to maintain diversity because it could be accessed through exchange networks (Brush, 2004).

In close association to knowledge, given the remarkable social character of varieties exchanges, it is necessary to consider the nature of crop varieties and knowledge flow, and its geographical extent. A broad array of cultural and social values and norms guides varieties exchanges, which operate through kinship ties and social networks at varying spatial scales. While some features are commonly found in different societies, others are local-specific. Main mechanisms include trade of seed by seed; seed by labor; gifts; theft; sales in local markets; acquisition in seed fairs. Timing for repaying the provider also varies widely. Commonly, providers enjoy a remarkable social status (Emperaire, 1998; Elias et al, 2000; Howard, 2003; Zimmerer, 2003; Emperaire and Peroni, 2007; Heckler and Zent, 2008). Along with practical, economic and symbolic determinants, affective value was recognized as an important factor that permeates social relationships (Heckler and Zent, 2008). Furthermore, some exchange mechanisms are gender specific, but it is not always the case (Bellon and Brush, 1994; Emperaire, 1998; Elias et al, 2000; Howard, 2003; Pfeiffer and Butz, 2005; Heckler and Zent, 2008). While the extension of networks for varieties exchanges is sensitive to site and ethnic affiliation (Elias et al, 2000), Boster (1986) showed that the names for Aguaruna manioc varieties tend to be more homogeneous when exchanges occur within the same family.

Notwithstanding the importance of affective ties and memories and the socially vibrant varieties exchanges they engender, several indigenous societies are facing modifications in the dynamics of inter-generational knowledge transmission systems that impact the retention of both crop varieties and the associated knowledge. In general the loss of perception of diversity has been associated with globalization processes that tend to homogenize societies, turning traditional[9] management of agroecosystems vulnerable (Zimmerer, 1996; Salick et al, 1997;

[9] I employ the term *traditional* troughtout this dissertation as an adjective for expressing time depth as opposed to the term *new*, which characterizes something that happened recently.

Steinberg, 1999; Peroni and Hanazaki, 2002; Howard, 2003). Moreover, formal schooling may also impact traditional knowledge transmission by subtracting time for the children to directly experience daily farming activities and to interact with elders (Zimmerer, 1996; Salick et al, 1997). As a consequence of economic and cultural changes, young generations are losing the symbolic meaning of local varieties, and their cultivation had been relegated mainly to the elders (Steinberg, 1999), who keep social memory about agrodiversity alive (Van Etten, 2006).

Seed Selection and Management

Previously I explained the determinants that play a role to better understand farmers' choices regarding crop diversity and the meaning of their practices. Understanding farmers' selection is essential for unveiling how agrodiversity management is carried out, which involves a combination of elements related to the environment, crop ecology, and agricultural practices influencing the selection of crop varieties.

Crops are subject to natural evolutionary forces that cause changes to their genetic identity through mutation, gene recombination, migration or genetic drift (fluctuation in gene frequencies in a population). In addition to these forces, artificial selection through human interference under agro-environmental pressures directs the characteristics of a population over time, and therefore the maintenance of genetic diversity on farm (Brush, 2004). Artificial seed selection 'refers to the choice that farmers make about which seeds to plant, and management refers to the process of seed selection and decisions about the quantity of specific crop types that are maintained' (Brush, 2004, p. 38).

In general, local varieties are kept as metapopulations[10], showing relevant genetic and phenotypic diversity under the same name (Emperaire, 1998; Louette, 1999; Brush, 2004).

[10] Metapopulation is "a 'population' of unstable local populations, inhabiting discrete habitat patches" (Hanski, 1998, cited by Brush, 2004, p. 187).

Accordingly, the level of internal consistency in naming and distinguishing local varieties may vary. In such context, measuring diversity by counting farmer-named varieties may be misleading as a proxy for genetic diversity (Sadiki et al., 2007). Moreover, for selecting a specific variety, farmers may value characteristics (traits) distinct from those used for name it, such as agronomic traits (yield, drought resistance), use (organoleptic quality), and aesthetic features (color, shape, etc). Moreover, farmers' conscious selection criteria may unconsciously interfere with the selection of other not so evident traits that may contribute to build a variety (Brush, 2004).

The biological basis for farmers' seed selection is associated with the mating system (or breeding system) of plants. The basic differences refer to whether a crop is cross- or self-pollinated, and whether the crop is propagated by seeds or vegetative structures. However, self pollinated plants present a small but significant rate of out crossing (Frankel et al, 1995). In addition to the mating system of the crop, farmers may mix clones or seeds of distinct genetic origin to compose a local variety (Brush, 2004). Therefore, although sharing general principles, farmers' selection practices are distinct according to each crop and cultural context (e.g. maize, a cross pollinated crop, Soleri and Smith, 1999; Louette and Smale, 2000; rice, Richards, 1985; Bellon et al, 1997; and barley, Allard, 1988, typical self pollinated plants). Yet, manioc, a cross pollinated crop normally reproduced by cuttings, is biologically apt for shedding seeds which may originate plants managed by farmers[11] (Chernela, 1986; Salick et al, 1997; Elias et al, 2001b; Pinton and Emperaire, 2001).

[11] Indigenous farmers are aware of the cassava's reproductive biology, and take advantages from it to generate diversity. Manioc diversity coming from seeds is a true plant breeding process in which recombinant plants are recruited from seedlings. The process depends on ecological requirements to go further as well as on the farmers' behavior. It evolves from an initial natural selection (in which seeds develop into mature plants) to the conscious selection and evaluation of the new material according to its usefulness. Later this material is assigned a name, either a new label or an already known variety name, originating varieties composed by one or more clones

Timing for selection (pre-, during, or post-harvest) enables farmers to perform selection based on different traits. Most commonly, farmers perform post-harvest selection, in general in bulk, applying selected morphological criteria. Moreover, specific social actors may perform the tasks that are needed (Brush, 2004). Sampled from a population, the quantity of seeds set aside for sowing in the next season has the practical meaning of excluding genotypes, mainly when farmers' selection is directed to eliminate off types (either previous to the harvest or after it, due to morphological dissimilarities of traits in relation to the conceptualized variety). In this case, Zeven (1999) argued that farmers modify genetic diversity through seed replacement instead of seed selection. Furthermore, when seed flow (the migration of seeds to other places, through social exchanges for example) is operationalized, it either interacts genetically with the former population as an addition (mix), or by substitution of seeds (Ellstrand and Elam, 1993). Seed flow is particularly important for open-pollinated plants (Louette, 1999), but the amount of out crossing in self pollinated crops may also originate relevant modification in the genetic structure of varieties (Allard, 1988; Bellon et al, 1997). In addition, a seed population transported to other places may increase inter-populational diversity for the trend in isolated populations of a variety (mainly for self-pollinated plants) to suffer genetic differentiation, causing a high site specific adaptability (Allard, 1988). Therefore, when farmers report they still cultivate seeds received from their parents, it actually means that they are growing varieties (under the same name) with seeds renewed from other sources (Rice et al, 1998).

Agronomic elements of seed selection include the size, and distribution of plots in the fields, how specific varieties are assigned to each plot; and temporal arrays for planting different varieties. Also, the part of the plant used for reproduction (all the seeds or parts of the cob,

---

(Emperaire, 1998; Elias et al, 2000, 2001a; Mckey et al, 2001; Peroni and Martins, 2001; Sambatti et al, 2001; Pujol et al, 2002).

panicle or pod; cuttings; tubers); and agronomic practices of cultivation (density, elimination of off types or reproductive structures) contribute to the outcomes of selection (Brush, 2004). Storage devices and methods, which vary according to cultural affiliation and interaction with outsiders, may also play a role as a selecting force upon the seeds (Lewis and Mulvany, 1997; Jarvis et al, 2000).

Culture and Agrodiversity Management

Despite the wealth of studies dealing with economic, environmental, and crop ecology issues privileging a materialistic approach, mainstream agrodiversity research still shows cultural aspects of crop diversity as residual explanations that have not been elucidated by rational decisions made by individual farmers (Soleri and Cleveland, 1993; Gonzales, 1999; Brush, 2004; Nazarea, 2005). Beyond their biological dimension represented by genes, and the economic and environmental context of farming, from an indigenous perspective crop varieties are cultural artifacts that play an essential role in ethnic identity (Zimmerer, 1991, 1996; Emperaire, 1998; Brookfield, 2001; Howard, 2003; Brush, 2004). Although indigenous cultures are not static, agrodiversity is embedded by its sacred origins (Sullivan, 1988; Hiemstra and Haverkort, 1999), and it is permeated by farmers' ritual expressions (Conklin, 1957; Rappaport, 1971; Descola, 1994; Iskandar and Ellen, 1999; Santos, 2006), and history and memories (Dove, 1999; Nazarea, 2005). Agrodiversity management is also expressed in aesthetics preferences (through both plants and products), consumption patterns and local cuisine, and other attitudes of farmers (Howard, 2003; Bellon, 2004; Nazarea, 2005; Perreault, 2005; Camacho, 2006).

It is remarkable that indigenous farmers' perceptions and management of crop diversity may be informed by cultural elements completely out of the sight of most scientists. For example, manioc growing in old fallow sites is viewed as gift of the ancestors by Piaroa Indians (Heckler and Zent, 2008), and new or unusual forms of rice found by Mende cultivators are seen as a blessing from the ancestors and deities (Richards, 1985). This issue is addressed more directly by Ishizawa (1999) when explaining Andean farmers' vision of agrodiversity with the following words:

"No one (not even a community) would claim to be the inventor of a new strain or race. A new variety is the result of the conversation of humans with deities and nature and it appears by itself. It is greeted as such with joy. It is not an experimental construction" Ishizawa (1999, quoted by Bystrom, 2004, p. 4).

Particularly relevant for the Amazon, Viveiros de Castro (1996a, 1998) demonstrated that, for the Amerindians, the relationships between nature and culture are socially determined. He also exposed how recent approaches to ethnological studies have put in evidence a blend of disciplines and a 'transcendence of antinomies' between theoretical views of nature and society, including research on natural resources management (Viveiros de Castro, 1996b). More specifically, in Amazonia some indigenous groups perform rituals associated with agricultural production, deeply interweaving their social organization, cosmology and mythology (Descola, 1994; Rival, 2001, Santos, 2006). In the case of the Achuar, Descola (1994) explained the symbolic basis for agriculture (mainly manioc), which does not bear a direct functional character in the technological sense. For this reason, the author denied that crop diversity is maintained because of gastronomic and techno-agronomic imperatives.

While calling attention to the social and cultural context of crop diversity management (Jarvis et al, 2000; Jarvis and Hodgkin, 2008; Brush, 2004), mainstream research and development initiatives seemed to show a rather more incomplete grasp of indigenous' perspectives about their agriculture. Emphasizing human cognitive and emotive predispositions, Virginia Nazarea (1998, 2005) made the case that cultural determinants are as important as economic and political factors toward a better understanding of farmers' management of crop diversity. Accordingly, she suggested directing the attention to cultural elements of crop diversity management through qualitative methods. Nazarea did not deny the use of quantitative methods but called for the inclusion of qualitative approaches that allow for fine tuning research design[12]. The studies of Rival (2001) and Elias et al (2000) about manioc among the Makushi Indians also suggest that the two focus on crop diversity management and on the symbolic dimensions of agriculture, do not preclude each other. Moreover, they demonstrate how collaboration between plant scientists and social scientists can be fruitful for understanding farmers' thoughts and practices about agrodiversity.

Agrodiversity Conservation, Development, and Indigenous Peoples

Farmers' management of crop diversity may lead to modifications in the quantity and quality of varieties kept under cultivation in their fields. Distinct groups of social actors perceive how agrodiversity is managed, lost and conserved, according to their world views and assumed objectives for sustainable development and conservation. Proposition of strategies to cope with crop diversity is based on this conceptualization, including distinct arrays associated with local and external conservation approaches, which also express schemes for benefit sharing.

Agrodiversity Loss and Conservation

Crop genetic erosion can be understood as the loss of crops as well as of variation within the same crop species (Thrupp, 1998), which has been recognized as a worldwide concern (FAO, 1996; Brookfield, 2001; OECD, 2001). It is difficult to make generalizations about current dimensions of genetic erosion because changes in farmers' varieties repertoires are context sensitive and may be bi-directional (Brush, 1989, 2004; Zimmerer, 1996). Historically, however, it is remarkable that about 90-95 % of the native population of the Amazon was decimated

[12] Studying determinants for the Venezuelan Piaroa farmers keeping high manioc diversity, Heckler and Zent (2008) also called for the deployment of qualitative methods to unveil socio-cultural factors guiding farmers' decisions about agrodiversity management. These authors defended a contextualized place for quantitative methods in ethnobotany, too.

through epidemics and slavery within a few centuries after contact (Denevan, 2003). Nevertheless, after the Conquest, regional indigenous agricultural systems were differentially impacted. Although some agricultural systems endured minor damages, many suffered greatly and a large number of crops, their varieties, and the associated knowledge on agrodiversity management were lost (Clement, 1999). Clement estimated that 138 crops were cultivated or managed by indigenous peoples in the Amazon at the time of the contact (1492), of which 32 % were annual plants. The genetic erosion of infra-specific diversity was probably most serious, the intensity of loss depending upon local preferences and the genetic variability available to each indigenous people. Probably annual plants disappeared more rapidly than perennial ones, depending on their degree of domestication; those fully domesticated would have disappeared in 1-3 years.

Genetic erosion concerns led to worldwide germplasm collecting and storage in gene banks, mainly during the 1950-70s, a strategy known as the *ex situ* approach (Pistorius, 1997). More recently, however, the recognition of farmers' role in selecting and maintaining diversity led to a growing scientific interest in local and indigenous crop diversity management (Harlan, 1975). Agrodiversity conservation was included within the framework of international negotiations about conservation and development, and their implementation pushed the theme to mainstream research efforts (Brush, 2004; Jarvis et al, 2007, 2008; Tansey and Rajotte, 2007).

Definitions proposed for the local management of cultivated species, also known as *on-farm* or *in-situ* approach, share the focus on maintaining genetic resources of crops and their wild relatives in their natural or farming environments, thereby allowing evolution processes to continue (Jarvis et al, 2000). Maxted et al (1997, p. 25) defined on farm conservation as "the sustainable management of genetic diversity of locally developed traditional crop varieties, with associated wild and weedy species or forms, by farmers within traditional agricultural, horticultural or agri-silvicultural cultivation systems."

Within a region or ethnic domain, common and rare varieties of a crop can be found, with either widespread or local occurrence, and showing more or less homogeneous genetic structure. Once a farmer loses a specific common variety in a particular year, it can be recovered later through exchange networks. However, if such variety is rare, it may be difficult to bring it back, and the variety may be lost forever (Jarvis et al, 2000; Brush, 2004). This dynamic of losses and additions of varieties implies interferences on the genetic structure of crop varieties populations over time. For this reason, some scientists advocated that farmers *manage* rather than *conserve* agrobiodiversity. Accordingly, it would be more important to maintain operative the co-evolutionary mechanisms that generate variability in farmers' fields rather than demand that they conserve specific varieties (Altieri and Merrick, 1987; Oldfield and Alcorn, 1987; Collins and Hawtin, 1999; Cromwell and Oosterhoult, 1999; Louette, 1999). If the aim is to conserve specific genes or alleles, it would be better to conserve specific varieties in institutional genebanks (Louette, 1999). In this context, backing up local germplasm ex situ was recognized as an important strategy for local management and conservation. Due to advantages and limitations of both *in-situ* and *ex-situ* approaches the systems were regarded as complementary (Zimmerer, 1996; Qualset et al, 1997; Brush, 1999).

Threats to agrodiversity and associated knowledge opened opportunities for supporting *in situ* conservation of local genetic resources (Brush, 1999, 2004; Almenkinders and de Boef, 2000). In situ conservation requires associating farmers' management of crop resources and support to their livelihood systems. The challenge is to design programs and activities that promote the effectiveness of farmers' management while keeping their access to crop diversity.

In this regard, a new balance is needed for accommodating learning, by integrating economic, cultural and ecologic aspects at local and global scales. This dynamic conceptualization does not reject innovation (new technologies and crop varieties), and thus old varieties that farmers are not interested in anymore would be the best candidates for ex situ conservation (Almenkinders and de Boef, 2000).

Despite divergent perspectives among stakeholders, in recent decades there were converging agendas with favorable prospects for cooperation. The issues at stake are related to the uses of agrodiversity, directly through cultivation by farmers and its documentation as an empowerment tool; and indirectly as future uses for plant breeding and devolution of germplasm to the respective communities of origins (Visser and Engels, 2000). Therefore, there are two broad categories of activities for supporting in situ conservation and development: a) those related to activities targeting the availability of plant genetic resources to farmers (seed banks, seed fairs, promotion of germplasm exchanges; and reintroduction of traditional varieties through participatory selection or breeding); and b) activities aiming to enable a favorable environment, such as policies in the form of socio-economic conditionings and institutional frameworks (Almenkinders and de Boef, 2000). However, for conservation and development to happen, the formal research sector needs to improve its awareness about traditional agrodiversity knowledge systems, and the achievements reached so far by initiatives carried out under the learning approach, promoting institutional change (Bystrom, 2004).

Initial discussion of the importance of in situ conservation exposed an apparent dichotomy opposing pragmatic (utilitarian, economist) and idealist (humanistic, biocentric) arguments for *in situ* conservation (Soleri and Smith, 1999; Rhoades and Nazarea, 1999; Nazarea 2005). The first group included scientists primarily concerned with biological conservation (Brush, 1991; Qualset et al, 1997; Maxted et al, 2002); and the second group included researchers committed to local development issues (Nabhan, 1985; Altieri and Merrick, 1987; Oldfield and Alcorn, 1987; Cleveland et al, 1994; Thrupp, 1998; Emperaire et al, 2001).

Nevertheless, development is not necessarily detrimental to agrodiversity maintenance as previously believed, ensuing a so called second generation of thinkers that tried to put the two apparently opposing sides (conservation and development) together (Brush, 1989; Zimmerer, 1996; Almenkinders and de Boef, 2000). As such, current mainstream research justifications for the advantages of in situ conservation are as follow: 1. important elements of crop genetic resources cannot be captured and stored off-site; in situ is dynamic, allowing for losses and additions of elements of the agroecosystems; 2. genebanks fail to capture diversity generated after the collection has occurred; 3. all forms of conservation are vulnerable to biological, economic, social, and political factors; and 4. service and political reasons bolster in situ conservation; the strategy is considered an important factor for achieving development related to food security and income to farmers in areas bypassed by conventional technological improvement schemes such as the green revolution (Brush, 2004). At the international level, there is now a mandate for *in situ* conservation from the *Convention of Biological Biodiversity* (CBD), the *International Treaty on Plant Genetic Resources for Food and Agriculture*[13] (ITPGRFA), and the *Global Environment Facility* (GEF) (Brush, 2004; Tansey and Rajotte, 2007). These policy instruments have been used to promote participatory schemes for germplasm enhancement along with farmers. Currently a series of exploratory research projects addressing

[13] The Treaty created a Multilateral System of access and benefit sharing covering a list of 35 food crop species and 29 forage species (Annex I to the Treaty). Although there are provisions safeguarding the rights of plant breeders, farmers' rights (article 9) received scarce attention in the text (Tansey and Rajotte, 2007). However, it is important to note that peanut was not included in Annex I, and therefore is not covered by the Treaty's Multilateral System.

in situ conservation are under way under the auspices of *Biodiversity International*[14] (Jarvis et al, 2007, 2008). In addition, GEF provided funds for supporting livelihood systems across the world through a United Nations University's *Project on People Land Management and Ecosystem Conservation* - PLEC (Brookfield et al, 2003). Another alternative approach within the FAO system is represented by the *Globally Important Ingenious Agricultural Heritage Systems* (GIAHS), which proposes to conserve peoples and agroecosystems, agrodiversity included (Altieri and Koohafkan, 2002; and Ramakrishnan, 2002). Finally, it is noteworthy that, although with a much more modest structure, a number of projects with an ample range of scope, time frame, and funding sources have been conducted by farmers' organizations, NGOs and other partners (de Boef et al, 1993; Gaifami and Cordeiro, 1994; GRAIN, 2002). A fraction of all these programs and projects included indigenous peoples' *strictu sensu*[15].

While these initiatives run in parallel, earlier debate between utilitarian and humanistic approaches still demand us to question whose perspectives' are expressed in research design and development initiatives aiming to support in situ conservation, which is related to world visions of sustainability and development. Mainstream research until recently has been criticized for not fully balancing farmers' and scientists' perspectives (Nazarea, 2005). Trying to close the gap between pragmatic and idealistic extremes, Nazarea advocated more flexible frameworks and approaches to deal with the complexity of biodiversity conservation. The main issue here is not whether cooperation between farmers and scientists is desirable or productive. The most sensitive aspects refer to making clear statements of objectives by all actors involved in any initiative; how such collaboration is translated into practice; and how every part accrues benefits

[14] The FAO's *International Plant Genetic Resources Institute* (IPGRI) was renamed to *Biodiversity International* in 2006.

[15] Indigenous peoples, in this sense, are those who descend directly from the Amerindians who were living in the place at the time the European conquers arrived in the continent.

(Hawtin and Hodgkin, 1997; Cleveland and Soleri, 2007a; Jarvis et al, 2008). Threats of privatization and diminishing farmers' access to germplasm, and property rights still remain open issues (Visser and Engels, 2000). I argue that a third generation of thinkers devoted to in situ conservation of crop diversity has the mission of clarifying these unresolved issues.

Indigenous Rights and Crop Diversity

Concerns about indigenous intellectual property rights can stymie efforts to collect and conserve crop genetic resources (Carneiro da Cunha and Almeida, 2000; Brush, 2005). Indigenous peoples have been claiming within the United Nations system for the protection of human rights and reaffirming their fundamental values and spiritual beliefs regarding biological resources and knowledge[16]. Among other instruments, it refers to the regulation of article 8(j) of the *Convention of Biological Biodiversity* (CBD), which deals with access and benefit sharing over genetic resources and the associated knowledge (Bragdon et al, 2008). Due to its particularities, agrodiversity was subjected to the *International Treaty on Plant Genetic Resources for Food and Agriculture* (ITPGRFA). Both CBD and ITPRGFA put emphasis on state members' sovereignty, and point to the development of national regulations on the matter (Halewood and Nnadozie, 2008). In this context, collaboration between farmers and scientists for dealing with agrodiversity may be controversial (Cleveland and Soleri, 2007a). MacGuire et al (2003) found that

[16] The United Nations Declaration on the Rights of Indigenous Peoples, signed in 2007, asserts the right of indigenous people "to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions" and obliges states to take action to compensate indigenous people for "cultural, intellectual, religious and spiritual property taken without their free, prior and informed consent or in violation of their laws, traditions and customs". However, there is a lack of political will for the involvement of indigenous peoples in national and international fora discussing their rights, which were not addressed to their satisfaction in the negotiations to date (Baumuller and Tansey, 2008). In the same vein, the World Intellectual Property Organization's (WIPO) Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC) held on October 2008 did not reach an agreement in the negotiations about international protection of traditional knowledge (Mara, 2008a). Moreover, indigenous peoples vigorously complained about their under recognized legitimacy as self-determined peoples, and about their exclusion from some crucial discussions at the forum (Mara, 2008b).

Issues around intellectual property rights (IPR) need to be clarified, to establish where access and control over germplasm and information is vested, and who has rights to benefits. Current frameworks say nothing of material developed jointly between researchers and farmers' groups, or on collective systems of ownership (MacGuire et al, 2003, p. xiv).

Although often with a limited understanding about specific policy instruments and their debate at international fora, triggered by concerns over ownership and benefit sharing, some Brazilian tribes are striving for their rights to limit access to their genetic patrimony (Lima and Bensusan, 2003). Recently a Kaiabi village in the Xingu Park engaged in a research project that included peanut germplasm collection. However, the debate within the indigenous organization over the authorization for the research was controversial, and the final decision was not endorsed by all political leaders. Kwaryja village, the main site of this research, holds a great repertoire of crop varieties among the Kaiabi villages. Its leaders were among those who did not agree with germplasm collection. Instead, the villagers' choice was to manage agrodiversity in their fields, keeping complete control over their varieties. Consequently, upon their request, this research did not include the collection of crop varieties and their genetic characterization.

Sustainable Development and Indigenous Agrodiversity

A popular, widely accepted concept of sustainability was introduced to international policy and academic circles by the Brundtland Report (WCED, 1987). It states that

Sustainable development (…) seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future. (…) What is required is (…) a type of development that integrates production with resource conservation and enhancement, and that links both the provision for all of an adequate livelihood base and equitable access to resources (p. 40).

The Brundtland Report highlighted three main components to sustainable development: environmental protection, economic growth, and social equity. This conceptualization was used to compose the Agenda 21, aiming to establish how sustainable development should be achieved from local to global scales, which was adopted by the members of the UNCED Conference (Eco

92). However, the outcomes of the conference were criticized for delegating authority to states over indigenous agency and for being politically biased toward promoting modernization. Nevertheless, CBD-derived incentives for international initiatives promoting in-situ conservation were also acknowledged (Nazarea, 2005).

Particularly concerning agricultural diversity, as a reaction to the perceived conceptual insufficiency of the Brundtland approach, sustainability has been expressed as the outcome of collective decision-making built by the interaction of stakeholders with distinct socio-economic positions. As such, they show who has different motivations and objectives, and operate their own perspectives for resources management (Visser and Engels, 2000; Cleveland and Soleri, 2007b). A compatible, more encompassing conceptualization of sustainability states that

Sustainability is the capacity to create, test, and maintain adaptive capability. Development is the process of creating, testing, and maintaining opportunity. The phrase that combines the two, sustainable development (…) represents a logical partnership (Holling et al, 2002, p. 76).

For indigenous peoples, the influence of particular historical trajectories (Whitehead, 2003) and of the western habits acquired through post-contact inter-ethnic interactions pose challenges to accommodate new visions and needs within old internal value systems (Chase Smith, 1996). Cultural continuity and material life has been re-shaped, and in some occasions and for specific purposes, the body of indigenous knowledge might not be enough to deal with processes derived from internal and external forces of change, whatever their specific nature. If indigenous societies were not isolated in the past nor constrained by mono-causal determinants, today they still exhibit connectivity among themselves and with outsiders, also expressed in their conceptualization of human-nature relations (Viveiros de Castro, 1996a). The inextricable linkage between land ownership, biophysical environment conservation, socio-cultural imperatives, and symbolic and spiritual dimensions for indigenous survival is well documented

(Posey, 1999; Colchester, 2000; Schwartzman et al, 2000). It enables a coalition of common interests to be orchestrated by indigenous leaders and external advisors, including natural resources management (Posey, 1984; 1996; Moran, 1995; Schwartzman et al, 2000; Maffi, 2001; Viveiros de Castro, 2008). This predisposition allowed opportunities to launch initiatives for supporting *in situ* conservation of local crop diversity resources (Chernela, 1986; Emperaire et al, 1998, 2004; Elias et al, 2001a; GRAIN, 2001; Peroni and Hanazaki, 2002; Pujol et al, 2002). Furthermore, the logic of external influences (such as community-based projects) can be captured by the locals and re-appropriated with meanings intrinsic to their own cultural context (Sahlins, 1997). In this sense, the implementation of culturally relevant education initiatives could help to sustain local knowledge and practices (Zimmerer, 1996; Zarger, 2002).

Prior to the UNCED Conference, the movement for a sustainable approach to development in Brazil was catalyzed by environmental concerns manifested by those alarmed by the destruction of natural resources, and by social movements with a focal point mainly in Amazonia (Sponsel, 1995; Chase Smith, 1996; Posey, 1996; Hall, 2000; Albert, 2000). Brazilian indigenous peoples have played a vital role in political grassroots movements since the 1970s, fighting against their exposure to harmful relationships with the national society, and the idea of their '*progressive assimilation'* expressed in the Brazilian law of 1973[17] (Ramos, 1988). They established alliances with other forest dwellers and outsiders (international human rights and environmental activists[18]), which enabled them to actively pursue their rights and influence

[17] The law 6.001 / 1973, better known as the Indian Statute, stated that the Indians living in Brazil were 'relatively unable' and, therefore, should be under the tutee of the State until their assimilation into the national society. This legal approach was in effect until the promulgation of the new Brazilian constitution, in 1988, which expressed the rights for indigenous peoples to maintain their own culture and social organizations (ISA, 2008).

[18] It is not to say that the alliance between indigenous peoples and environmentalists is free of potential pitfalls, such as the misperception of indigenous as a "noble savage" (Redford, 1991; Conklin and Graham, 1997, Carneiro da Cunha and Almeida, 2000). Also, the worldview of indigenous peoples and their conceptualizations of nature do not

significantly the Brazilian Constitution of 1988 (Conklin and Graham, 1997; Ramos, 1998), and at some extent, the outcomes of the UNCED Conference (Albert, 2000)[19].

Although the Agenda 21 itself was never implemented in the Brazilian Amazon, the region benefited directly from the environmental debate through the implementation of the *Pilot Program for Protection of the Brazilian Rainforest* (PPG7), in 1990. PPG7 brought a more optimistic perspective for development and conservation in Amazonia (Hall, 2000), including the demarcation of several indigenous lands[20] (MMA/PPG7/WB, 2002). Specifically aiming to promote sustainable indigenous development, in 1996 a branch of the PPG7, the *Indigenous peoples demonstrative projects* (PD-PI) was launched. The PD-PI project was designed to provide support for strengthening indigenous identity, build up formal organizations, capacity building, and resource management.

Agriculture is an important economic and cultural activity for the Kaiabi people. When the Kaiabi migrated to Xingu, despite the disruption in environmental knowledge that they faced, the group was able to maintain their diversified agricultural system. Negotiating additions and losses in various aspects of their lives, continuity was possible, but at a different, reorganized level (Senra et al, 2004).

---

necessarily match with western ways of conceptualizing and "appropriating nature". According to their holistic views (as diverse as they might be), indigenous do not pursue conservation as a goal by itself. However, it does not mean that the issues of conservation and development do not make sense for them (Conklin and Graham, 1997; Schwartzman et al, 2000).

[19] The Constitution provided the legal basis for the indigenous peoples to organize themselves as civil society organizations. In this context, the 1992 Earth Summit's debate provided opportunities for accessing international funds to support the implementation of Agenda 21 through the multiplication of local projects for sustainable development in the Amazon (Albert, 2000). However, Conklin and Graham (1997) warned that the process of supporting indigenous peoples initiatives through international funds creates increased dependency, and a reason for the state to relegate its own responsibilities

[20] However, it is also noteworthy that the Brazilian Government failed to accomplish a constitutional provision requiring that all the indigenous lands should be officially assigned to the rightful owners after five years from the promulgation date, 1988 (ISA, 2005).

Schwartzman and Zimmerman (2005) described a long political process taking place in the upper Xingu river basin. It includes the Kayapó, the Kaiabi and other Indians from the lower Xingu Park, and non-indigenous people as the main stakeholders. This political process was linked to the endurance of indigenous identity, their ever changing cultural and social organization, the building of economic alternatives, natural resource management and land protection. Schwartzman and Zimmerman regarded the capacity of change and adaptation as inherent to indigenous peoples as a response to challenges posed by battles over their socio-cultural, economic and environmental sustainability. In this context, their strategies appear to be based upon a high degree of resilience. While strengthening their ethnic identity, the Kaiabi mobilized to launch the '*Munuwi Project*: *recovery of the Kaiabi people crops*', which eventually was funded by PD-PI. Peanut diversity management is at the core of this project.

Peanut

Taxonomy, Origins and Dispersion

Peanut is a legume that belongs to the Fabaceae family. Its genus, *Arachis*, has 80 described species (Krapovickas and Gregory, 1994; Valls and Simpson, 2005). Based on morphological criteria – mainly the presence or absence of flowers on the main axis, the cultivated peanut, *A. hypogea* L., is classified in two subspecies, *hypogea* and *fastigiata*. These subspecies encompass six botanical varieties which are believed to have originated in different locations (Krapovickas and Gregory 1994), as seen in Table 1-1. For example, the Virginia type may have been developed in Amazonia, the Peruvian variety is the common type found in some archaeological sites in Peru, and the development of the Valencia type would be associated with Tupi-Guarani peoples of the Paraguay-Paraná basin. However, there are local varieties (landraces) of doubtful taxonomic affiliation, including those cultivated by the Kaiabi (Freitas and Valls, 2001; Freitas et al, 2007). Most of the landraces are site-specific, but there are few exceptions, including the *Guaicuru*[21] peanut, which receives different names within a broad area despite being genetically uniform (Krapovickas, 1995 apud Valls, 2005). On the other hand, due to their mixed genetic pedigree, it is also difficult to classify many modern cultivars as belonging unequivocally to one of the above mentioned botanical categories (Valls, 2005).

There is ethnographic, historical and genetic evidence that the peanut originated in South America. Gabriel Soares de Souza (1938) wrote that in 1587, the peanut was only known in Brazil (however, he did not travel outside Brazil). Hammonds (1994) summarized accounts of post-Columbian travelers, showing that peanut was unknown outside the Americas until 1500. Although the first register for the crop appeared in the 16th century (Hammonds, 1994), the first research to correctly describe the plant and explain its fruit development was carried out by Poiteau in 1797, who published his findings in 1802 and 1806 (Krapovickas and Gregory, 1994).

Given its reproductive characteristics, with underground fruits, the biological and fluvial dispersion of peanut is limited, which points to the strong dependence on human action (Krapovickas, 1973; Krapovickas and Gregory, 1994). Combining cartographic information about centers of origin for subspecies and botanical varieties of the cultivated peanut with ethnic and linguistic distribution, Krapovickas (1969, 1973) found correlation between a genecenter with a concentration of Tupi-Guarani groups, a second with Jê speaking groups, and another composed by a mosaic of several ethnic groups. He also identified eight Tupi-Guarani cognates for the name *manduwi,* and reported that Tupi names appear interspersed with Arawak names from southern Bolivia to close to the Chaco area. The author raised the hypothesis that predecessors of these Arawak groups contributed to the domestication and dispersion of peanut

[21] The type specimen was collected by Hoehne in Pimenta Bueno, Rondônia, and probably belongs to the subspecies *hypogea* var. *hypogea* (Krapovickas, 1969).

from the east of the Andes to the west of these mountains and to the Caribbean (Krapovickas, 1969, 2004).

Integrated analysis of morphologic, cytogenetic and bio-geographic data suggests that *Arachis* species at higher elevations in the Central Brazilian Shield are the most primitive (Krapovickas and Gregory, 1994; Valls, 2005). However, the exact place of origin of the cultivated peanut is still subject to debates (Krapovickas and Gregory, 1994; Kochert et al, 1996; Raina and Mukai, 1999), and the possibility of more than one event in distinct places is tenable (Simpson et al, 2001). The area of origin likely includes the regions of eastern Bolivia, Paraguay, northwestern Argentina, Uruguay and western Mato Grosso in Brazil, possibly including eastern Peru. Despite the controversy over where peanut was domesticated, currently this entire area is rich in landraces, and the diversity of their names and uses provide further evidence for the antiquity of cultivation in the region (Krapovickas, 1969, 1973; Hammonds, 1994). Given the antiquity of peanut cultivation in South America, Valls (1996) proposed that archaeological records could be used to better assess the contribution of peanut and other *Arachis* species to paleo-Indians diet, especially to their protein intake. However, preservation of biological remains is problematic under hot and wet conditions.

Krapovickas and Gregory (1994) praised the South American indigenous peoples' great knowledge of wild *Arachis* species[22] and their management ability to domesticate peanut. Archaeological data suggests that peanut (the variety *hirsuta*, subspecies *hypogaea*) was adopted some 3400-3900 yr Before Present as an irrigated crop in Ancón, on the desert coast of northern Peru, where traders or mobile horticulturalists brought it after its domestication somewhere

[22] Besides *A. hypogea*, Valls (1996) mentioned other *Arachis* species that possibly were used as human food in the past, including *Arachis villosulicarpa* Hoehne that was never found in the wild. This peanut relative was known to be cultivated by only three indigenous groups in the Juruena and Diamantino area of western Mato Grosso State (Krapovickas, 1969), very close to the place where the Kaiabi lived before relocating to the Xingu Park. Recently, Freitas and Valls (2001) reported this species in cultivation by the Yawalapiti Indians of the southern Xingu Park.

southeast of the area (Cohen, 1977, mentioned by Hammonds, 1994). Recently, while agreeing on the adoption of the crop domesticated elsewhere, Dillehay et al (2007) proposed a much earlier date for the cultivation of a morphologically wild peanut in Zaña Valley, another site in northern Peru, pushing the record to 8000 yr BP. Thus, peanut domestication would have happened before this period.

Historical records show that soon after 1492, peanut was taken to Europe and Africa, and slowly spread to other regions (Hammons, 1994). In addition, based on Dubard (1906), Krapovickas (1998) hypothesized that through a sea trading route linking Acapulco (Mexico) to Manila (Philippines) from the late 1700s until 1815, the variety *hirsuta*, subspecies *hypogaea* could have reached the Old World, traveling across Peru, Central America, and Mexico, reaching China, Indonesia and Madagascar. The precise date and mechanism by which peanut was introduced to the United States are unknown (Hammonds, 1994). A plausible hypothesis is that African slaves transported the crop and launched its cultivation in the southeastern U.S. in the eighteenth century (Smith, 2002).

Peanut uses and production

Peanut seeds contain high quality edible oil (42- 50%), easily digestible protein with high biological value (12-36%, commonly around 25%) and carbohydrates (10-19%), although quantities vary between subspecies and botanical varieties. These figures may be altered according to plant maturity and by the type of processing. Peanuts also contain calcium, iron, thiamine and riboflavin, and are a good source of vitamins of group B complex and vitamin E (Savage and Keenan, 1994).

Currently, the main use of peanuts is for edible oil production, but peanuts are eaten in many different ways, such as raw, roasted, boiled, or in the form of a beverage (*chicha* in Spanish, *mingau* in Portuguese), along with inclusion in many dishes and candy preparation.

Peanut oil has fuel properties and can be used as source of energy. By-products and peanut hay are used to feed livestock (Savage and Keenan, 1994).

Because of its inherent characteristics and flexible uses today, peanut is planted in nearly 100 countries; the major producers in the world are China, India, Nigeria, USA, Indonesia and Sudan. The crop is the world's fourth most important source of edible oil and the third most important source of vegetable protein. As of 2004, peanut was grown on 26.4 million ha worldwide, with a total production of about 35 million metric tons and an average productivity of 1.55 tons/ha (ICRISAT, 2008). Currently, Brazil accounts for a modest share of the global production, with most of its peanut crop supplying internal markets. Brazilian national statistics for 2008 show a planted area of 112.634 ha, a harvest of 272.000 t (in husk), and a productivity around 2,4t/ha. In 2006, Mato Grosso State held an area of 5107 ha planted in peanut, with a total production (in husk) of 3.814 t, corresponding to a productivity of 746 t/ha (FIBGE, 2008).

Genetics

For better understanding local management of peanut diversity, a brief overview of the genetics for the crop is in order. The cultivated peanut species is an allotetraploid with 2n =4x =40 chromosomes, meaning that the plant has two sets of chromosomes from two different species. No wild forms of *Arachis hypogea* L. are known. There is evidence that its progenitors are *A. ipaënsis* Krapov. and W.C. Greg. and *A. duranensis* Krapov. and W.C. Greg. (Fávero et al, 2006), however other species may be involved as well (Freitas et al, 2007; Raina and Mukai, 1999).

Gene flow within the genus *Arachis* is very limited and circumscribed to small populations of the plant, adapted to specific soil types, mainly sandy (Krapovickas and Gregory 1994). However, although peanut is self-pollinated, the plant presents a small but important rate of cross-pollination, ranging from 0.25-6.0% (Norden, 1980). Native bees are the principal pollinators of peanut flowers (Hammons, 1963; Hammons and Leuck, 1966; Leuck and Hammons, 1969)[23]. Population insulation through physical distance and genetic incompatibility within the genus *Arachis* (Krapovickas and Gregory, 1994), along with cross pollination, provides the basis for genetic diversity of the crop (Norden et al, 1982). Cross pollination is a concern for plant breeders pursuing varietal purity (Culp et al, 1968; Norden et al, 1982) and is also an issue for seed multiplication for genebank storage (Williams, 2006). However, indigenous farmers may have taken advantage of the outputs of the process of genetic drift to manage peanut diversity. As will be seen later, at least a portion of them continues to perform peanut selection based on this process.

Molecular marker techniques have shown that the expression of peanut morphological traits seems to be controlled by several pairs of genes, which grants a broader genetic base for the crop than originally thought (Moretzsohn and Valls, 2001). Besides being important for the study of crop evolution and for commercial plant breeding, this fact is also relevant because the distinction of peanut varieties by indigenous people may be based on morphological characters.

Recent research using microsatellite markers has shown significant variability among Brazilian accessions of peanut from different botanical varieties (Borges et al, 2007). Of particular importance to this research, analysis of germplasm accessions collected in two Kaiabi villages (Ilha Grande and Kwaryja) showed that morphological traits, especially in pods, exceeded previously described variation (Freitas and Valls, 2001; Freitas et al, 2007). Furthermore, Freitas et al (2007) found a large dissimilarity among germplasm accessions representing botanical varieties previously included in the same subspecies *fastigiata*. Besides one peanut described as belonging to the variety *hypogea*, they identified four other types,

[23] In a recent study Blanche et al (2006) found no treatment effect in an experiment testing tripping of peanut flowers by large bees, concluding that the tested commercial peanut varieties are no longer attractive to bees.

namely Nambikwara, Xingu, an intermediate type Xingu/Nambikwara, and a White Kayabi type. The authors concluded that the material collected in Kaiabi villages

> Expanded the known genetic variability of the cultivated peanut (and that) peanut samples maintained by the two villages are genetically differentiated, suggesting that exchange of samples between these two villages has been rare and that they have grown different types of peanut (Freitas et al, 2007, p. 682).

The explanation for this disjunction would be the geographical distance between villages prior to the transfer to the Xingu area, and their "political isolation".

Overall, genetic diversity of peanut in South America (and elsewhere) has attracted the attention of botanists, plant breeders and other scientists for a long time, due to scientific interest and the potential of incorporating gene pool diversity into commercial agriculture. The pressure for collecting germplasm increases as urban centers grow and more land is converted to agriculture and cattle ranching, replacing the vegetation of places where wild relatives occur. Additionally, local peanut varieties (or landraces) from indigenous and peasant agriculture are put at risk because of socio-economic and cultural transformations. Nevertheless, studies dealing with peanut diversity management by indigenous groups living for centuries in the region of its origin are scarce[24].

Indigenous Peanut Management Systems

David Williams (1991, 1996) reported an ancient, specialized farming system performed by Tacana Indians in the region of Beni river, northern Bolivia. The Indians cultivate up to six

---

[24] My perception on this issue was confirmed through personal communication with Dr Karl Zimmerer, Stephen Brush and Oliver Coomes during the AAG Annual Meeting, held in Boston on April 2008. In addition, Dr S.N. Nigam, the Principal Groundnut Breeder at ICRISAT headquarters in India, informed over an e-mail message that "*peanut is an introduced crop in Asia and Africa. Except for local landraces, most of the old varieties were developed through mass selection either in local materials or in introductions. The newer varieties are the results of hybridization followed by selection. Peanut is a cash crop in both continents. Where farmers are resource poor, it is low input cultivation. As such, I am not aware of traditional methods of cultivation of peanut in Asia* (May, 13th 2008). In a follow-up message on the same date, Dr B. Ntare, his ICRISAT colleague based in Africa, confirmed a similar situation for the continent.

peanut varieties in a single village, employing a double cropping system, alternating gardening in riverine sandbars (*playas*) and the subsequent upland slash and burn agriculture. The main cultivation takes place in *playas*, where traditionally seeds of two varieties were sown in the same hole, promoting gene flow among the varieties. Women were in charge of the harvest, when they exerted a meticulous, intensive fruit-by-fruit selection. After the main harvest, the product is carried to the village and carefully sun dried before being traded, consumed or stored. Before the next planting season, peanut seeds pass through a new selection for size, shape and healthiness. The researcher considered storage to be fragile, undertaken in woven baskets or bags suspended from the houses rafters, and exposed to damage by insects and fungi, predation by rodents and subject to mischievous children and hungry adults in periods of food scarcity. Thus, smaller peanut plots on upland gardens primarily function as a backup for the seeds, which are maintained freshly available for the next sandbar cropping season. Selection is performed again prior to sowing, totaling four selection events a year. Williams argued that the intense interaction between human agency and germplasm carried out for a long time allowed for a process of crop evolution, and proposed the area as a center of domestication for Valencia peanut types.

At the end of the 1980s the Ecuadorian Achuar were cultivating seven peanut varieties in floodplain areas, two of which were also present in upland fields (Descola, 1994). In his brief mention of peanuts, the author stated that the crop was peripheral for the Indians’ agricultural system, and the product was regarded as being a snack rather than food.

Recently in the central Peruvian Amazonia, the traditional slash and burn agriculture and associated genetic diversity has been threatened by deforestation, oil drilling, migration and colonization, “ethnic acculturation”, and commercial agriculture (Collado-Panduro et al, 2006a). Thus, a consortium of public and NGO research, education, conservation and policy initiatives led by the *Consórcio para el Desarollo Sustenible de Ucayali* (CODESU)[25] and *Instituto Nacional de Investigación y Extensión Agraria* (INIEA-Pucallpa), supported by *Biodiversity International* developed a project to study local agrodiversity management (Chávez-Servia and Sevilla-Panizo, 2006; Jarvis, et al, 2004). The main goal was to strengthen the scientific base and institutional and political relations to support farmers in their use and conservation of cultivated genetic diversity in the Pucallpa area. From 2001 through 2006, the consortium investigated 56 communities of Shipibo and Ashaninka Indians, riverine mestizos' *(riberiños)* and colonists' agrodiversity management including peanut, manioc, maize, cotton, beans and peppers, in the region of Pucallpa, Ucayali (CODESU, 2008; Collado-Panduro et al, 2006a). More than 70 % of the families in the area cultivate peanut in small areas averaging less than 0.25 ha (Soto Fernandéz et al, 2004). Despite being a secondary crop, peanut is an important item in farmers' diet (Collado-Panduro et al, 2005a).

The area was split in sub-regions, and samples included both upland and floodplain areas (Collado-Panduro et al, 2006a). A Rapid Rural Appraisal identified social, cultural, economic and environmental issues influencing crop diversity management. The research also included local varieties collection and the respective ethnobotany information associated with their characterization, use and management. For this, nuclear families were interviewed.

The main findings indicate that the factors influencing agrodiversity management the most include ethnic affiliation, environmental differences and market accessibility. The economic status of interviewed families showed no significant difference regarding cultivated diversity. The study found that a remote group of Ashaninka Indians displayed more diversified gardens, despite performing agriculture on less suitable upland soils, while Shipibo Indians enjoyed better

[25] Details about the consortium's local management and monitoring of Amazonian crop varieties can be found at http://www.codesu.org.pe.

floodplain soils, their less diversified gardens were found closer to the market. Mestizos and colonists had less diversified gardens than indigenous people (Collado-Panduro et al, 2004a).

This same study also found that seed conservation is family-based instead of a community concern. Farmers are involved in an informal seed system in which there are keepers that maintain most diversity. Although some Ashaninka families use peanut seeds for up to 19 years, most of them (60%) [Shipibo, 70%; mestizos, 90%] use seeds continuously from one to four years. Other Indian families of both ethnic groups (27-29%) keep their seeds for 5-14 years.

The main causes of seed loss are climate-related problems, including drought, inundation or soil loss due to river erosion. As seed exchanges among communities are restricted by geographical distance and difficulties in transportation, 80% of the families search for seeds within their own place, relying on relatives and neighbors. However, visits to family in other locations can be used to obtain needed seeds. To maintain peanut seed supply, seeds are saved, loaned, given as gifts or purchased. The first two mechanisms are the most important for the Ashaninka, with seed loan as the main one; following, with similar proportions of both the mestizos and Shipibo respondents mentioned saved and purchased seeds as their most relevant strategies. A small proportion of the Shipibo obtain seeds through gifts.

In addition to carefully drying the seeds in the sun before storing them, and many re-exposing the seeds to sun periodically, most families do not perform any seed treatment. Although some indigenous families still use traditional recipients made with local materials, seeds are primarily stored in plastic containers. Usually, each container receives just one variety, which is kept inside the house. When peanuts are not shelled, polyethylene bags are used for storage in the kitchen, where the seeds are exposed to smoke. All the observed procedures for storage keep the seeds viable until the next cropping season. Farmers reported a very small peanut seed loss due insect predation. More than 80% of all interviewed families select seeds during harvest time. However, 9-15% of the indigenous families and 20% of the mestizos, employ all seeds available without selection. In general, women and youngsters, who usually also sow the crop; perform selection looking for large fruits containing well formed, healthy seeds. The researchers also reported that knowledge about practices and criteria for seed selection is passed through generations, but they did not provide details about the transmission mechanisms involved (Collado-Panduro et al, 2005a).

The research team collected 58 accessions of peanut (6% out of 957 total varieties sampled for the five studied crops) belonging to the sub-species *fastigiata* (most common), *peruviana* and *hypogea*[26]. *S*ome were unknown to the market and under risk of loss (Collado-Panduro et al, 2005b). Occasionally, the names of varieties proved to be confusing, with some samples receiving just the name *maní* (peanut); in other cases synonyms were found for the same variety, and the same name was applied to different materials. Names were also used as a proxy to identify the origins of the varieties, those in native language revealed varieties that came from ancestors, and Spanish names represented recent materials (Collado-Panduro et al, 2004a). Twenty-eight varieties were cultivated in an experimental station for agro-morphological characterization based on standard descriptors (Williams, 2006) and agronomic evaluation (Collado-Panduro et al, 2005b). Evaluation was also performed in farmers' fields. Seeds of four studied varieties were tested against those of the farmers in community fields, and although showing a similar productivity in preliminary essays, they were multiplied in plots of 30-50m^2 and distributed to the farmers (Collado-Panduro et al, 2005c). This was accompanied by training on seed selection and production, including a manual in accessible language (Collado-Panduro et

[26] An online catalogue for these varieties, including location and passport data, is available at http://www.codesu.org.pe./catalogo/index.swf.

al, 2005a, 2005c). The reports for this research did not address directly the issues involved in ownership of the genetic materials collected and studied, and let it be implied that benefit sharing was reached through these training events and the respective manuals, along with seed re-distribution to farmers.

For contemporary indigenous peoples in Brazil, the records about peanut are scarce. One exception is represented by the Tapirapé Indians, a Tupi-Guarani group of Brazil Central. Herbert Baldus (1970) refers to peanut (*monoví*) cultivation and use practices in the context of his anthropological research from 1935 to the late 1940s, while Charles Wagley (1977) provided other important but limited information about peanuts for the same tribe. According to an ancient Tapirapé legend, crops, peanut included, were brought by their cultural hero Apuwemonu when he came down from the sky. Birds initially helped the Tapirapé cultivate their gardens (Wagley, 1977). These Indians used to open large gardens in the forest, which were planted with a variety of crops that provided them with abundant food, along with game meat and other forest resources. Contrasting with other indigenous groups, Tapirapé men used to sow (using a planting stick) and harvest most of the crops, while women participated in these activities just for peanut, maize and cotton. Indeed, beans were mentioned to be less important to them than peanuts (Baldus, 1970). Accordingly, Wagley (1977, p.58) stated that “the crops planted by women seem to have had greater value”, adding that the Tapirapé usually traded almost twice the amount of salt or molasses for peanuts than for any other food. Although he did not provide information about varieties, Baldus (1970) described peanut saying that

> O monoví Tapirapé distingue-se do amendoim comum já pelo tamanho, muito maior, alcançando os seus legumes sete centímetros de comprimento e suas sementes dois a três centimetros[27] (p. 194-195).

[27] “The Tapirapé distinguish common peanut by its much larger size, its fruits achieving 6 cm in length and its seeds 2-3 cm.”

The Tapirapé used peanut to prepare several dishes including an especially appreciated non-alcoholic fermented beverage, the *monoví-kauí*. Besides its importance in the diet, peanut was used in medicine and took part of cultural manifestations, such as that of food served in a ritual ceremony called *tata upaua*. Yet, a food taboo prevented parents of newborn children from eating any form of the legume for up two years (Baldus, 1970).

However, due to the invasion of their lands and more intense contact with nationals, Baldus (1970) called the attention to changes faced by the Tapirapé between 1935 and 1947. At the later date, he noticed considerable losses in food resources in the village, and reported that the fruits of peanuts had decreased to almost half of their original size, probably due to loss of land suitable for agriculture[28]. I interviewed a Tapirapé woman in the Xingu Park in 2006, who is married to a Kaiabi. She told me that the Tapirapé had many peanut types but they did not give them different names as the Kaiabi do. *Now everything is already lost there, as they will lose all peanut [varieties] here after their elders pass away*, she added.

Structure of the Dissertation

This dissertation was organized as a book in which each subsequent chapter adds new information, and complements the previous one. Besides the introduction, there are four chapters and a general conclusion. Chapter two, entitled 'A warrior people: an overview of the Kaiabi history and selected cultural features', presents the main historical, social and cultural issues that might help to understand current crop diversity management practices. The chapter has two parts. In the first part I briefly summarize the Kaiabi history since the early accounts until today, highlighting the main issues involved in the expansion of the economic frontier in order to

[28] Although less fertile soils may provide shorter peanut fruits, it is not clear whether this information refers to the same peanut varieties the author saw in his previous visit to the Tapirapé.

understand why the Kaiabi gradually gave up their territory[29] at the middle Teles Pires river and moved to the Kururuzinho and Xingu area between the 1950s to the early 1970s. I present early information on Kaiabi agriculture and the transition to metallic tools; comment on their encounter with the Villas Boas brothers and the movement to the Xingu Park; report on the Kaiabi depopulation and recovery through their recent history; deal with cross cultural interactions, migration and ethnic identity; and make an assessment of the Kaiabi's politics and identity in the context of the Xingu Park. Finally, I comment on the current situation of the Kaiabi lands. In the second part of this chapter I introduce selected cultural features including comments on the settlement pattern adopted by the Kaiabi, followed by the composition and functioning of the domestic groups mainly regarding food production and consumption. At the end I present also some main elements of their cosmology.

Chapter three presents the specificities of the Kaiabi among the universality of the shifting cultivators. Following, I explain some key social aspects of their agricultural system and recent changes the Indians have been facing. The third section of the chapter presents the environmental zones as perceived by the Kaiabi, contrasting the Xingu area and their old territory. *Terra Preta* soils (*Black Earths* or *Amazonian Dark Earths*) receive special attention due to their importance to their agricultural systems diversified Kaiabi. The fourth part of the chapter is dedicated to an agronomic analysis of their agroecosystems, focusing on agricultural sites and fields; seasons and crop cycles; and timing and agronomic features of their fields. Next, I discuss components and variations of agrodiversity, followed by a discussion of cropping patterns. Finally, I present a quantitative appraisal of Kaiabi crop diversity, when I approach manioc production and management as a case study.

[29] As we will see later in this text, a small third Kaiabi group remained in the Tatuy river.

Chapter four, comprised of three parts, addresses how indigenous peanut diversity is generated and managed, dealing specifically with Kaiabi peanut diversity. The first part opens analyzing the Kaiabi as peanut cultivators, followed by a discussion on how the Kaiabi distinguish peanut varieties and on how varieties are created or lost in light of their spiritual perspective. Then, I first present traditional peanut varieties managed by the people, when I briefly touch on the issue of naming varieties, which is further explored later in this same chapter. Next, I deal with peanut uses and general consumption restrictions related to the product by the Kaiabi, pointing to specific varieties. The following sections address agronomic and social practices related to peanut cultivation, the seed management systems operated by the Kaiabi, and the strategies applied for peanut varieties selection, including its rationale and variations. Finally, to synthesize several elements discussed in the first part of the chapter, I present the geography of peanut seed management systems currently performed in Kaiabi villages in Xingu Park.

The second part of the chapter four deals with a historic initiative for peanut diversity management designed and implemented in the context of the general Kaiabi cultural revival, partially in the form a community based project. It opens presenting historical data about Jepepyri Kaiabi, a deceased shaman and political leader who founded Kwaryja village. I then outline the main features of his sons, and the duties their father left to them. Having set up the historical context for the initiative, I analyze the revival of peanut diversity in Kwaryja village, and its interactions with other Kaiabi villages. I start with the relationships between shamanism, the renewed interpretation of the myth of origin of crops, and crop seed management, as conceptualized by Tuiarajup. His approach includes the creation of new peanut varieties, a practice not uncommon for other Kaiabi farmers. However, the process of naming peanut varieties applied by the shaman has specificities in relation to the practices applied by other

Kaiabi farmers, which are the subject of the next of section of this chapter. I then present and discuss the establishment of multiplication plots for peanut varieties, including observations about old and new modes of social work organization. Then, I present data about the current Kaiabi seed circulation system, highlighting the dimensions of the phenomenon and the mechanisms employed for seed exchange among families and villages. Moreover, I discuss the strategies designed to disseminate the spiritual foundations and agricultural practices associated with peanut diversity management. I also comment on the impact of this initiative in the plans advanced by other Kaiabi villages to carry out similar work. Finally, I briefly point to issues about the evaluation of the Kwaryja experience from a Kaiabi leaders' perspective.

Chapter five presents and discusses data about the distribution of knowledge about peanut varieties and their names exhibited by individuals and sub-groups of individuals within the Kaiabi society. I also investigate old and new practices related to knowledge transmission processes for crop varieties names. Finally, I present data about the actual existence of peanut varieties in fields cultivated in the 2006-07 cropping season in all Kaiabi villages in Xingu Park. In a closing section, I address the findings of this chapter along with current Kaiabi peanut diversity management strategies revealed in previous chapters, and discuss their implications for indigenous crop diversity management and conservation.

The Author and the Kaiabi

I worked with *Instituto Socioambiental*, a Brazilian NGO, in Xingu Park from 1996 through 2003, when my duties were concentrated in the north region of the indigenous land. During this time I spent most the year living in the Diauarum Post, and travelled frequently to Kaiabi and Yudja villages, and to a lesser extent, to Ikpeng and Kĩsêdjê villages. My first contact with the Kaiabi people occurred in September 1996, when I took part in a team that surveyed their agricultural system in Capivara village.

Although my main responsibilities were related to the development of economic alternatives, I also helped support the *Associação Terra Indígena Xingu* (ATIX), an indigenous organization[30] devoted to advancing their rights as guaranteed in the Brazilian Constitution of 1988. I helped to set up and execute training events for the association's board of directors, and participated in the formulation and execution of a modular course on Economy, Ecology and Culture for village teachers, which later gave birth to a program to train youths for natural resources management. In this context, I started to visit crop fields. In 1997, I received a request from Kwaryja village residents to help them to set up a strategy to deal with agrodiversity. At that time Jepepyri, an old shaman and leader was in well advanced age, and his sons were already in charge of the crop diversity management. They were concerned that many Kaiabi were abandoning several crop varieties, what could mean losing them forever. I started to work with them on this theme in 1998, and a first village level workshop was carried out in 2001. Since then, I devoted a significant part of my time to survey and understand crop diversity management by both Yudja and Kaiabi people. In 2002 I helped Kwaryja residents to formulate and submit for funding a community based project to deal specifically with the recovery of peanut diversity, linking agricultural practices with the cosmological domain. The *Munuwi Project* started in 2003. Later in this same year I left my job to start my graduate program. Although absent from the villages for most of the time, I spent the summer of 2004 and 2005 in Xingu Park, directing my attention to peanut management mainly in the Kwaryja village. During this time, I also contributed to administrative tasks related to planning and accounting, and to the execution of activities of the *Munuwi Project*. Later, I spent most of 2006 in the field, when I resided in Kwaryja for several months while visiting other villages.

[30] Although of ATIX is inter-ethnic in scope, most components of its board of directors and staff are Kaiabi.

Since I was deeply involved with the *Munuwi Project*, I am not in a position to elaborate a neutral appraisal of the experience, as I personally influenced its development to some degree. Nevertheless, despite sharing skills with them and helping build local capacity, I am aware of the limited and circumscribed dimension of my direct influence. Thus, I feel comfortable about commenting on some certain aspects of the initiative. The Kaiabi kindly allowed me to engage in collaborative research from which we both benefited, while they were able to maintain control of the situation. Kwaryja residents perceived the project itself as tool for achieving their goals, most of which were established long before I met Jepepyri's family. From my part, before starting any research activities, I clearly explained my plans to both Kwaryja residents and ATIX. Thus, they always had the opportunity to consult each other and suggest adaptations in the research design before granting permission for my study. Furthermore, although I visited them for only two months per year in 2004 and 2005, and spent several months in the Xingu Park in 2006, key people in the village frequently asked my opinion on issues related to the development of the initiative or agrodiversity management in general. Also, I was regularly invited to participate in planning and administrative tasks. That said, I did not take any part in the process of decision-making or in the execution of actions regarding the most important elements of the initiative: the connections between mythology and the spiritual world and agricultural practices, social labor organization, and the delivery of seeds to other families and places. I believe that I occupied a place between Oakdale's progressive and degenerative views, incentivizing cultural practices while representing an agent of change by my very presence in the village. Metaphorically, I would say that I played the role of a metallic axe: a foreign tool that helps to perform the required work while bringing cultural changes.

To study Kaiabi agrodiversity management I developed a process of consultation with leaders and villagers aiming to provide information about my research and to obtain their informed consent (Appendix A). For this I performed a series of meetings with the board of directors of ATIX and with the association's Political Council. I also held formal and informal meetings in Kwaryja village.

Note About the Spelling of Kaiabi Words and Expressions.

Records for the group present variations for its name including Cajahis, Cajabis, Kajabi, Caiabis, Cayabi, and Kayabi (Grünberg, 2004). The spelling Kaiabi was adopted in 2001when village teachers collectively agreed upon the orthography of their language. Following their decision, I used the term Kaiabi throughout this research. The same applies to all words and expressions I mention. Most of them were reviewed by Sirawan, teacher of the Ka'i School in Kwaryja village, and double checked with teacher Jowosipep, from Tuiarare village.

Research Questions, Objectives and Hypotheses

This research was designed to contribute to deepening the understanding of the mechanisms for agrodiversity management and maintenance by indigenous peoples in the Amazon. Its main objective is to identify and explain historical and socio-cultural forces involved in the creation, use and maintenance of indigenous crop resources. Specifically, it addresses peanut diversity management among the Kaiabi people in the Xingu Indigenous Park. The research questions guiding this study are:

1. What are the historical and socio-cultural driving forces involved in the creation, use and maintenance of crop diversity among indigenous peoples in the Amazonian region?
2. How is indigenous crop diversity generated and managed, especially for the Kaiabi's peanuts?
3. How is crop diversity knowledge distributed within indigenous societies, especially for the Kaiabi's peanuts?

4. How do changes in knowledge transmission systems impact the use and maintenance of indigenous agrodiversity?

5. What are the patterns and factors influencing crop variety movements among families and villages, and how are varietal movements influenced by external actors?

6. While facing threats of loss of diversity, how can crop diversity be recovered under historic events represented by cultural revival projects?

7. What are the implications of indigenous agrodiversity management practices for conservation and development?

The specific objectives are:

1. Identify and characterize peanut varieties grown by Kaiabi farmers.

2. Identify the distribution of peanut varieties in family fields.

3. Identify distribution of knowledge about names for peanut varieties among subgroups of individuals.

4. Identify and analyze mechanisms for agricultural knowledge transmission.

5. Identify patterns and reasons for peanut varieties movements among families and villages that shape the seed circulation system.

6. Identify and characterize practices and knowledge about peanut varieties multiplication and delivery in the context of the historical event for cultural revival.

The working hypotheses for this research are:

H1: Peanut diversity knowledge is unevenly distributed within the Kaiabi society. I hypothesize that although elders, particularly women, hold greater knowledge about crop diversity, shamans also exhibit great knowledge of peanut diversity, use and management.

H2: There are differences in variety repertoire among Kaiabi families and villages. I hypothesize that the history of each specific variety (whether traditional or newly-created) is differently appropriated by individuals and families from different villages.

H3: After migration and intensification of inter-ethnic interactions, cultural revival efforts can reshape seed circulation systems. I hypothesize that old mechanisms were partially replaced by new ways of exchanging seed among Kaiabi families and villages.

H4: According to their history of contact and inter-cultural interactions, indigenous peoples may face changes in their processes for agricultural knowledge transmission. I hypothesized that currently, organic knowledge transmission mechanisms have been partially replaced by institutionalized educational initiatives.

Research Methods

The research design for this study is compatible with Karl Zimmerer's (1996, 2003) *environmental geography approach*, which sees crop diversity as artifacts originated from the interaction of ecologic-economic forces, culture, and geography. Although there is no standard approach for studies about local management of agrodiversity, previous studies emphasize the establishment of benchmark sites for in depth, long-term studies; the key role of local farmers as part of the research design; and the central importance of household-level analysis (Netting, 1993; Brush, 2004; Zimmerer, 2004). To complement this geographical approach and consider the complex nature of indigenous agrodiversity management, my study incorporated inputs from agronomy and crop ecology, anthropology, ethnobotany, human ecology, and economic botany.

Building upon these insights, this research involves three integrated approaches, with differentiated dimensions: (1) the study of the socio-cultural determinants for the use, creation, management, and maintenance of these varieties; (2) an in depth examination of an initiative for the recovery of crop diversity; and (3) an inquiry about crop diversity including knowledge tests, a survey of the repertoire of varieties actually cultivated in farmers' fields, and a study on mechanisms for knowledge transmission regarding crop diversity. To address my research questions, the data were organized in four main themes, which are presented in separate chapters: (1) Kaiabi history and culture; (2) environment, agricultural systems and agrodiversity; (3) peanut diversity management and recovery; and (4) the distribution of knowledge about peanut diversity, the repertoire of varieties in the fields, and mechanisms for knowledge transmission.

Only adult, married individuals were included in the research. Based on data from the Health Service (Distrito Sanitário Especial Indígena do Xingu, 2007), I estimated the total number of Kaiabi nuclear families (NF) currently living in Xingu Park to be around 156 (couples accounting for about 315 persons), of which 143 NF (92%) were included in this research as active farmers (287 individuals). Among those considered to be non-active farmers were four very old couples that no longer practiced agriculture, and four middle aged women (two separated from their former husbands and two widows) who were sharing agricultural fields with other members of their expanded family. In addition, four NF were absent from Xingu Park during my fieldwork due to health problems, and a young family characterized by inter-ethnic marriage did not take part in the research.

For 25 nuclear families only one person was interviewed. This figure includes eight inter-ethnic marriages; six men working outside their villages during the time of the research; four persons facing health problems; and one non-married man. A young couple in couvade did not take part in the knowledge tests but their fields were surveyed. Finally, six potential informants chose to not take part in the research. In addition to these families and individuals, I did not count elder widows. The number of informants interviewed about each broad topic of this research was not uniform (Table 1-2). Kaiabi informants asked me to use their true name instead of pseudonyms. However, whenever sensitive issues were at stake, I provided anonymous information.

Research methods for each topic are as follow:

Kaiabi History and Culture

Although early data on Kaiabi agriculture are scarce, I present an overview of the Kaiabi history and culture focusing as much as possible on agricultural issues. For this, I relied on oral narratives, interviews with key informants, and research on secondary data. Among the secondary data, the most important source was the ethnographic study by Georg Grünberg derived from his doctoral dissertation carried out in the 1960s. I also engaged in conversations with many Kaiabi, some of them were particularly relevant as informants. From them I sought to understand historical and cultural features associated with life before migration to Xingu and clarify several general aspects of their social organization, agriculture, and economy in the new area. Among them, from Kwaryja village Arupajup, son of Jepepyri, was surely my main informant for historical data concerning the time when he was an adolescent and his family lived in the Teles Pires area, until around 1950. His brother Tuiarajup taught me almost everything I know about the relationships between agriculture and the spiritual domains. Also, he explained in detail how his father managed crop diversity after arriving in Xingu, and commented extensively on contemporary crop management issues in general, and on peanuts specifically. I had numerous long conversations with both brothers, either alone or we three together.

Wisi'o, Tuiarajup's oldest wife, and her sister in law Moreajup also were patient enough to talk to me for a long time, on several opportunities, providing a female input on various issues about agriculture and the Kaiabi way of life. Their daughter Kwariajup competently complemented her mother's information while providing a fresh view of Kaiabi agriculture. Finally, Sirawan, the village teacher who was enrolled in college, help me to understand several points his father Arupajup and his uncle Tuiarajup told me, through constant explanations.

From other villages, I had the opportunity to maintain dialogues with Kupeap and Kupeiani (both son of the late Captain Temeoni), his grandson Yefuka, and the elders Tewit and Jawari, from Capivara. From the same village, though to a lesser extent, Rea and Jemoete provided a female perspective on my issues of interest. I also had conversations or heard narratives from Mairawy (Diauarum); Rejupit and her husband Amaypo (who lived in Diauarum and now are in Caiçara village); Kawitaii (from Ipore, former Kururu village); Jowosipep and his father Xupé (from Tuiarare); Sirawe (from Sobradinho); Jerua (the widow of Jurumuk, now in Maraka Novo village); Makupa (Diauarum); and Mairata (Muitara).

In addition to villagers, my close conviviality with the board of directors and staff of ATIX and of the Health Service, along with participation in several political meeting within the Xingu Park, contributed to a better understanding of the political context in which the Kaiabi operate. Regarding other Kaiabi lands, I had the opportunity to visit the Tatuy river area in 1998, when I talked to several leaders of this place, some of whom I later met again in Xingu. I benefited from talking to some leaders from Kururuzinho visiting the Xingu Park, too.

In addition to informal communication, I did participant observation in most Kaiabi villages in Xingu with more intensity in Kwaryja, and benefited from direct involvement with agricultural activities including sowing, performing agronomic practices, seed selection, and harvesting fields. I also measured several fields and surveyed their varietal composition. Furthermore, I conducted unstructured interviews with 14 key-informants, including six village leaders (Appendix B). They included one woman, four village teachers, two members of the board of directors of ATIX, one director of the health service, and one individual serving as county house representative in the municipality of São José do Xingu. Also, my long term experience in the area allowed me to carry out participant observation in most villages of Xingu Park. In addition, during the time I lived in Xingu, I carried out various village level workshops about crop diversity management, and was able to share ideas and receive inputs from broader audiences of people of different ages and gender. In one of these workshops in Kwaryja village, I stimulated the participants to develop a map showing the route for the migration from the Teles

Pires to the Xingu area, which also highlighted the pathway crop varieties took until they arrived at the current site for the village.

Environment, Agricultural Systems and Agrodiversity

I gathered most of the information about environment, agricultural systems and agrodiversity during the time I lived in Xingu Park, previously to starting my graduate program. During that time, I frequently visited agricultural sites and spent many hours talking about these themes with men and women, youngsters and elders. While carrying out my fieldwork, I was able to review and clarify several points about the subject. I explored in depth environmental differences between the Xingu area and the old territory, and examined the main features of the Kaiabi agricultural system, including land use strategies, measuring fields, assessing soil fertility, observing agronomic and social practices related to agriculture, and the overall performance of crops. I also studied the structure and composition of poli-cropping arrays, and discussed issues related to agrodiversity management. In this context, I worked out a list of the Kaiabi crops and their respective varieties (*ko pypiara pytuna*) through elders' free listing and group discussions performed mainly in Capivara, Kururu (now Ipore) and Kwaryja villages from 1996 through 1998, which was reviewed in 2006.

Based on this list, during the 1999-2000 crop season I carried out a survey of varietal diversity for most crops present in the fields of the families from all Kaiabi villages within Xingu Park, (Silva, 2002). The survey included 61 nuclear families, belonging to twenty four expanded families, in addition to other six expanded families (EF) that preferred to answer the survey as a group[31]. Although I used physical samples (seeds) of some varieties as visual stimulus, each

---

[31] In 2000 there were 13 Kaiabi settlements in Xingu Park, including villages, administrative posts, and border inforcement posts. The difference to the total 38 Kaiabi EF found in 2006 is explained as follow: one EF was not living in Xingu Park at that time; two EF were not included in the 2000 survey; former Kururu, now called Ipore

couple interviewed declared what varieties they had in their fields based on the list. While the list provided reflected my best knowledge at that time, couples were invited to add any variety they knew that had not been included yet. This survey presents three relevant characteristics: first, it was conceptualized as a tool for the Kaiabi to discuss strategies for agrodiversity management, instead of as academic research. Therefore, it focused on Kaiabi farmers' interests at the moment, which included a selection of crops rather than an exhaustive survey of all crops[32]. Second, due to inconsistencies in naming varieties, the use of farmers' declaration without checking the fields could not reflect the actual collection of crop varieties existent in their fields. As the original purpose of the survey was to present the results for the Kaiabi to discuss, I assumed that social control had a role in inhibiting intentionally wrong answers, allowing for the varieties names to be used as a proxy for a preliminary assessment of the status of their crop diversity. Third, residents of some small villages opted for answering the survey for the whole expanded families instead of doing it by nuclear families.

For carrying out a quantitative appraisal of current Kaiabi agrodiversity[33], I calculated the proportion of farmers that were cultivating each variety. Based on these proportions, I established a tentative number of rare, *vulnerable varieties* per crop, which were conceptualized as those varieties cultivated by less than 20% of the nuclear families (Silva, 2002). However, it should be noted that the data for the 1999/2000 survey included a mix of nuclear and extended families; hence the proportion of farmers cultivating each variety may be overestimated.

---

village, opted for answering the survey as a unit encompassing four EF that now live in other villages; two EF from Capivara village were interviewed together; and the three EF from Kwaryja village were also interviewed as a unit.

[32] However, it is important to note that the number of named varieties says nothing about the genetic makeup of crops (Cleveland et al, 1994; Sadiki et al, 2007).

[33] According to the interest the Kaiabi had expreesed at that time, some minor crops (rice, squash, arrow root, arrow cane, papaya, pineapple, and sugarcane) and perennial fruit trees were not included in the 2000 survey.

Rodrigues (1993) called special attention to manioc, questioning why the Kaiabi exhibited such low diversity for a staple crop which occupies most of the agricultural acreage. He also discussed the implications of the incipient but steady market for manioc flour to agrodiversity management and conservation. Given the abundant literature concerning manioc diversity management in the Amazon, I devoted a section to discuss the subject in order to gain better understanding of Kaiabi general strategies for agrodiversity management. I also added information about the origins of each manioc variety, pointing to whether they were either traditional or came to Kaiabi fields from external sources.

Operationally, my research was carried out mainly as a synchronic study. However, based on data from the 2000 varietal survey, which was repeated in 2006, I present an exploratory longitudinal approach. Here I addressed the cultivation of manioc and peanut (the culturally most important crop for the Kaiabi, and the main subject of this study, upon which I will below). For manioc, the survey was performed based on questions. To avoid mistakes and misinterpretation, a knowledgeable Kaiabi expert accompanied the interviews and in case of doubt, he discussed the identification of the variety at stake. In some cases, we visited fields or homegardens to be sure of the variety identity. However, it was not possible to interview all nuclear families at the two periods (mainly in the first one), because of the Kaiabi settlement dynamics in which families either moved in or out the villages, bringing significant population changes in the later period. Nevertheless, exploratory results were organized according to the number of varieties cultivated by families, and according to age status. Finally, I discussed the relationships between diversity management for manioc and other crops, and the implications of my findings for conservation and development.

Peanut Diversity, Management and Recovery

For studying peanut diversity, management and recovery, I first reviewed the list of peanut varieties I obtained in 1996 from elders and Tuiarajup through group discussions, including inputs from Tuiarajup and his brother Arupajup. I ended up with a list of peanut varieties that are considered to be traditional by the Kaiabi, along with their accepted synonymous names. I identified local criteria for identifying peanut varieties applied by the Kaiabi, which were complemented by a partial morphological description of peanut pods and seeds (adapted from IBPGR/ICRISAT, 1992) for available varieties, through village level workshops. I also measured peanut fields.

I examined culturally relevant aspects of cultivation, uses and consumption restrictions for peanuts through conversations with elders; unstructured interviews with villagers and key-informants; and participant observation in villages and while visiting peanut fields (Martin (1995). I also ran a group discussion with women in Kwaryja village in 2006. The origins of old and new varieties, and strategies for peanut diversity management were elucidated using the same set of methods.

Based on these methods I identified seed management systems predominant within expanded families and villages. For this I took into account three major features: ownership of peanut fields (mainly whether fields belonged to nuclear families or were shared by components of expanded families); the composition of the work force for performing agricultural work from the preparation of the fields through harvesting and storage; and the individual who was in charge for management the fields, including decision making regarding cultivating peanut varieties. Also, I examined past and current involvement with seed selection practices through open interviews with farmers in selected villages (Appendix B). Altogether, these data allowed me to sketch a geographic distribution of peanut management systems.

The revival of crop diversity in Kwaryja village, particularly the diversity of peanut, was carried out in order to deal with the threats of losing crop diversity, while simultaneously honoring Jepepyri's memory. I was deeply involved with the initiative since its inception as a community based project. I had the opportunity to hear some narratives from Jepepyri during his last years, and counted on the generosity of many Kwaryja residents who kindly talked to me for long periods. Aramut Kaiabi, a Kwaryja resident working with the Health Service provided data on the village's population profile, organized by nuclear family, upon which I complemented data on the composition of expanded families. In an early village level workshop in 2002, I surveyed the history of Kwaryja village, and mapped the places where Jepepyri's family lived in the Xingu area. Later, in another workshop, we discussed environmental issues about this and other Kaiabi villages, giving particular attention to the availability of *Terra Preta* spots[34]. I also discussed the origins for peanut varieties during village level workshops in Kwaryja, and performed the characterization of varieties during the summer of 2004 and 2005. These workshops were attended mostly by young people, male and female. Elders help me to set up the workshops and acted as resource persons while I facilitated the development of the activities. Since I was not in Kwaryja village all the time, and from 2003 through 2005 I spent only three months a year in Xingu Park, Sirawan was in charge of the record-keeping for the peanut varieties plots from 2001-2006, and later Kwariajup also shared this responsibility. Tuiarajup always kept his own notebook, which was a very important backup information system for dealing with doubts. However, the identity of some varieties was compromised in 2005 due to mixing seeds and mislabeling of the containers during storage.

[34] Chapter three presents concepts and a discussion about *Terras Pretas,* a very important environmental feature for the practice of agriculture in Xingu by the Kaiabi.

From 2003 through 2006, every year we measured the peanut fields existent in the village and respective individual plots. After the harvest, the production was weighted, keeping information discriminated for specific varieties as much as possible. In addition, in 2006 I participated in the shelling of peanut to separate varieties to sow, when I was able to observe the dynamics of seed selection, and who took part in the work. Later this year, I accompanied the sowing[35] of all peanut fields in Kwaryja and was able to directly observe the processes of decision making about sowing specific varieties and other features (gender, age, and family affiliation) related to social labor organization.

I had the opportunity to map the social organization of labor through directly observing the people (and their villages of origin) involved in the work performed in each crop season, including taking decisions about the place for the field, opening the place, preparing the field, burning, cleaning the area, sowing, caring for the plants, harvesting, and storage. These data were complemented by participant observation, free conversations, and unstructured interviews with villagers and key informants (Appendix B). Furthermore, I accompanied Tuiarajup and his family visiting other villages, and in political meetings within and outside the Xingu Park. Therefore, I was able to observe and talk to them about the way they prepared themselves for these events, and the tools used to accomplish the tasks for which Tuiarajup had assumed responsibility.

I also explored the current dimension of peanut seed exchanges, including processes of exchanging old and new peanut varieties based on ancient and current practices; and patterns and reasons for peanut varieties flow among families and villages that shape the seed distribution system, identifying the main pathways for varieties circulation. Tuiarajup, Arupajup and Wisi'o

[35] Upon Kwaryja resident's request, I sowed six plots involving three old and three new peanut varieties, in fields belonging to three EF.

told me who gave peanut seeds to the Kwaryja village, and the varieties and destination of the seeds delivered from their village to other places. During interviews for the knowledge tests, farmers from other villages also provided information about peanut seed circulation.

Based on data provided by the informants and on my own observations, I was able to chart out the evolution of peanut varieties under multiplication (number, names, description); acreage and productivity of each variety; and the strategies and procedures adopted for dealing with the varieties. I also was able to identify new and old practices related to crop diversity management performed in Kwaryja and other places. In a more abstract level, based on direct observations, interviews and narratives of people from Kwaryja and other villages, I identified the driving forces and mapped the external institutional support for the peanut diversity, management and recovery initiative. Furthermore, through interviews with key informants and farmers during visits to other villages, I was able to gauge Kaiabi leaders' view of the process, and the willingness to carry out similar experiences on crop diversity management in different Kaiabi villages.

Peanut Diversity Knowledge, Repertoire of Varieties, and Mechanisms for Knowledge Transmission

Distribution of knowledge about peanut varieties

To test whether informants were familiar with different peanut varieties, and whether or not they knew their names, I first organized the data in two respective matrices containing the binary answers (yes/no) for these questions. I then ran the cultural consensus analysis and a reliability test on the binary matrixes. Lastly, I calculated an individual index for each question based on the proportions of positive answers each informant provided.

For testing cultural competence about the names for peanut varieties, I first assigned a unique number to each name the informants provided. The responses 'I do not know the name of this variety' were treated as missing data and also received a unique number in order to avoid inflation of agreement on missing data. In addition, I progressively eliminated sets of respondents with the same number of missing data from the original matrix, and then ran the consensus analysis and checked the fitness of the results to the Cultural Consensus Theory. To ensure a minimum acceptable number of cases within sub-groups of individuals, I kept the greatest number of informants as possible while holding the lowest number of missing data. At last I found a maximum of eight missing data values for each informant. All seventeen varieties were kept in the study.Consensus analysis provided information about the names for peanut varieties informants culturally agreed upon, and individual cultural competence scores.

As a group of respondents was excluded from the cultural consensus analysis test, I also addressed the distribution of knowledge about the names for peanut varieties based on individual knowledge indexes (ki). This index reflected the proportion of varieties each respondent correctly named. The standard names for varieties came from previous information obtained from elders and a shaman. I recoded the unique numbers assigned to each peanut variety name as one if the informant identified the correct name, and to zero if the answer was incorrect. I then ran a reliability test for the instrument (i.e. the recoded matrix).

I examined variation in cultural competence scores and knowledge indexes by aggregating individuals into subgroups related to two main themes, variables associated with characteristics of the respondents, and variables linked to peanut management practices. Subgroups of individuals related to characteristics of the respondents included gender, Kaiabi age category, age status, nuclear families and expanded families they belong to, current village of residence, and area of origins. I also explored differences between those individuals according to their occupation, religious position (status as shamans or not); participation in wage labor; and political position. Subgroups of individuals associated with peanut management practices included the following criteria: (1) predominant seed management system; (2) whether the informant ever cultivated a peanut field of her/his own; (3) whether their nuclear family had a peanut field in 2006; (4) whether they had participated at least in one opportunity in past selection events including the identification of new peanut varieties, and (4) whether they still performed this practice in 2006; and (5) whether they were aware of the existence of dangerous peanut varieties (related to food taboos). Information about subgroups of individuals was gathered during the knowledge tests, interviews with key informants and through secondary sources, for which I setup a database for all the respondents using the SPSS software.

To examine the distribution of knowledge about peanut varieties within Kaiabi society, I applied tests of analysis of variance to check for statistical differences among subgroups of individuals. I used cultural competence scores and knowledge indexes to study variation respectively within subgroups of informants included and excluded from the consensus analysis. In addition to the analysis of variance, I observed the strength of the relationship between cultural competence scores and each sub-group (independent variables), assessed through the partial eta squared test (η^2)[36]. Table 1-3 presents the expected results for such analysis. Descriptive statistics (mean, standard deviation, median, minimum and maximum) helped to scrutinize variation within subgroups of individuals.

Results from the consensus analysis allowed for the examination of the names for peanut varieties informants agreed upon. However, Ki is an aggregated index that does not address the knowledge associated with individual peanut varieties. To explore the distribution of knowledge regarding the names for specific peanut varieties for subgroups of individuals excluded from the

---

[36] Partial eta squared ($\eta 2$) is an estimate of the degree of association for a given sample, and can be interpreted as the proportion of variance in the dependent variable that is attributable to each effect (Tabachnick and Fidell, 2001).

consensus analysis, I used the proportion of interviewees who correctly named each variety. I also applied tests of analysis of variance and descriptive statistics to search for differences between categories within subgroups of individuals and for specific peanut varieties.

Repertoire of peanut varieties

Immediately after conducting the knowledge tests for the names for peanut varieties with individual informants, the couple head of each nuclear family was asked whether they had a peanut field of their own in the 2006-07 cropping season. If so, based on the visual stimulus of the same set of peanut samples used for the knowledge tests, they were asked to show me which peanut varieties they had in their fields. They were also stimulated to report the existence of any other peanut variety they had in their fields that were not represented by the samples. Contrasting to other villages, I participated in the sowing of all peanut fields in Kwaryja village in this same season, when I collected data from direct observation, complemented by interviews with the couples head of each family.

I identified the most commonly grown varieties and the rare ones using the proportion of each variety cultivated by all nuclear families, establishing a cut-off value of 20% below which a variety was considered to be rare. I also identified nuclear and expanded families who were cultivating a great diversity and those holding a low diversity in their fields by computing the proportion of varieties each family had under cultivation. In a similar way as I dealt with knowledge indexes, I also examined the distribution of peanut varieties within subgroups of nuclear families, based on characteristics of their individual members.

Finally, I conducted an exploratory longitudinal study comparing data about the repertoire of varieties of peanut cultivated in Kaiabi villages in Xingu Park in 2000 and 2006. I identified changes in crop diversity over time, including the most common and the rarest peanut varieties; and subgroups of farmers who were growing similar sets of peanut varieties; and the distribution of the repertoire of varieties among expanded families and villages, identifying the keepers of most crop diversity and those who were cultivating a limited number of varieties.

Knowledge transmission dynamics

I investigated issues about the current relative importance of, and changes occurring to, mechanisms for knowledge transmission and apprenticeship practices about crop varieties. Based on open interviews with informants from selected villages, I explored how, when and from whom each individual learned to identify and name peanut varieties. Based on this semi-quantitative approach, I calculated descriptive statistics. For further explanations about the theme, I included questions addressing knowledge transmission dynamics and recent changes in crop variety apprenticeship in non-structured interviews I carried out with 14 key informants (Appendix B).

Table 1-1. Peanut subspecies and varieties, their primary geographic area of origins, and main morphological features and cycle.

Subspecies	Variety	Cultivar type	Primary area of origin	Morphological features and cycle	
				shared	peculiar
hypogaea	*hypogaea*	Virginia	Brazil and Bolivia northern	Prostrated (spreading appearance); no floral axes on main axis; pairs of vegetative	Shorter branches; 2-3 (occasionally 4) seeds per pod.
	hirsuta Köhler	Peruvian runner	Peru	Branches and floral axes alternate along lateral branches; seed dormancy; long cycle (5 to 10 months).	Hairy leaves and longer branches; longer cycle; usually 3 seeds per pod, rarely 4.
fastigiata Waldron	*fastigiata*	Valencia	Paraguay, Central and Northeast Brazil, and Peru	Erect; floral axes on main axis; continuous runs of multifloral axes along lateral branches; no	Little branched; up to 4 seeds per pod.
	vulgaris C. Harz	Spanish	Argentina, Uruguay and Southern Brazil	Dormant seeds; shorter cycle (3 to 5 months).	Usually 2 seeds per pod; more branched; pericarp weakly reticulated; higher seed oil content.
	peruviana Krapov. and W.C. Greg.	Tingo Maria	Peru, NW Bolivia, Western Brazil (Acre)		Usually 3 seeds per pod, occasionally 4.
	aequatoriana Krapov. and W.C. Greg.	Zaruma	Ecuador and northern Peru		More than two seeds per pod; pericarp conspicuously reticulated.

Sources: Bunting et al, 1985; Valls, 2005; Weiss 2000; and Williams, 2006.

Table 1-2. Sample size for specific topics of the research. Kaiabi villages, Xingu Park, 2006.

	Individuals		Nuclear families		Expanded families		Villages	
	N	%	N	%	N	%		%
Survey of varietal diversity in 1999/2000	--	--	61	--	24	--	12	92.31
Identification of new peanut varieties (selection)	205	71.43	143	100.00	38	100.00	22	100.00
Core group	122	42.51	67	46.85	21	55.26	12	54.55
Additional selected informants	55	19.16	38	23.78	16	42.11	8	36.36
Cultivation of peanut fields	287	100.00	143	100.00	38	100.00	22	100.00
Knowledge tests about the names for peanut varieties	286	99.65	143	100.00	38	100.00	22	100.00
Awareness about dangerous varieties	171	59.58	143	100.00	38	100.00	22	100.00
Knowledge transmission processes	76-286	26.48 - 99.65	143	100.00	38	100.00	22	100.00

NF= nuclear families; EF= expanded families

Table 1-3. Subgroups of individuals researched about knowledge tests, and expected responses. Kaiabi villages, Xingu Park, 2006.

Subgroups of individuals	Expected responses from knowledge tests*
Subgroups related to characteristics of individuals	
Gender	
Female	+
Male	-
Age status	
Elder	+
Youngster	-
Age category	
Female	
Wawĩ	++++++
Iyruo	++++
*Kujãmuku*fet	++
Male	
Iymani	+++++
Iywyruu	+++
Kunumiuu	+
Kunumiuga	-

* + and - signals correspond to expected level of knowledge

Table 1-3. Continued.

Subgroups of individuals	Expected responses from knowledge tests*
Subgroups related to characteristics of individuals	
Area of origins	
Teles Pires	++++
Xingu	+++
Kururuzinho	++
Tatuy	+
Political leader	
Leader	+
Non leader	+
Paid job	
Paid job	-
No paid job	+
Shaman	
Shaman	+
Non shaman	-
Awareness about dangerous varieties	
Yes	+
No	-
Subgroups related to peanut management	
Ever cultivated a peanut field	
Yes	+
No	-
Peanut field in 2006	
Yes	+
No	-
Identified new peanut varieties in the past	
Yes	+
No	-
Still identify new peanut varieties	
Yes	+
No	-
Seed management systems	
A	++
A/B	++
B/D	++++
Ba	++
Bb	++
C	-
D	+++++++

* + and - signals correspond to expected level of knowledge.

CHAPTER 2
A CHANGING WARRIOR PEOPLE: AN OVERVIEW OF KAIABI HISTORY AND SELECTED CULTURAL FEATURES

Introduction

This chapter presents elements of Kaiabi history, along with comments about selected cultural features that serve as the basis and context for understanding crop diversity management. It seeks to answer the research question: what are the historical and socio-cultural driving forces involved in the creation, use and maintenance of crop diversity among indigenous peoples in the Amazonian region?

The chapter provides background information for discussing the hypotheses of this research. Context for, and information about agricultural practices and technology is presented throughout the chapter whenever data is available, including early information on Kaiabi agriculture and the transition to metallic tools. I address two interconnected main points in here: first, the issues involved in the expansion of the economic frontier are highlighted to help understand why the Kaiabi gradually gave up vast tracts of their territory in the middle Teles Pires and Tatuy[1] rivers and fled down the river to Kururuzinho area, and then migrated to the Xingu Park from the 1950s to early 1970s. Second, I discuss social and cultural characteristics of the group, and their changes throughtout history.

This chapter is based on the following sources of information, which were complemented by consulting original documents and by my own field observations[2] and oral narratives from Kaiabi informants. Georg Grünberg, the first anthropologist to study the group in depth, did an extensive

[1] As we will see later in this text, a small third Kaiabi group remained in the Tatuy river.

[2] Before starting my graduate training, I worked with the Kaiabi from 1996 through 2003.

review about Kaiabi history covering the period from the early records until the 1960s[3] (Grünberg, 2004). Grünberg also benefited from directly interacting with Father João Dornstauder[4], a Jesuit Priest who provided assistance mainly for the group at the Tatuy river from 1953 until around 1970. In addition to this source, the diaries of Fritz Tolksdorf[5] also chronicled aspects of the Kaiabi life around the late 50s. A book authored by the Villas Boas brothers (Villas Boas and Villas Boas, 1989) and the work of the anthropologists Berta Ribeiro (1979), Elisabeth Travassos (1984, 1993), Suzanne Oakdale (1996, 2005), and the field diaries of Eduardo Galvão (Gonçalves, 1996) provide additional information on several aspects of Kaiabi life, including social and political organization, agency, material culture, myths and shamanism. Arlindo Rodrigues (1993) was the only researcher to study in depth the Kaiabi agricultural system[6]. Later, Maria Lúcia Menezes wrote about the construction of the Xingu Park as a territory, including an analysis of the Villas Boas brothers' work and the transfer of the Kaiabi to this area (Menezes, 2000). Heloisa Pagliaro (2002) studied the group's demography, providing a detailed account on the history of the occupation of their territory in the Tapajós watershed. Simone Athayde (2003) and Athayde et al (2006, 2009) presented important considerations about the Kaiabi's material culture focusing on basketry making associated with their knowledge transmission system and their transfer process. Finally, I benefited from several conversations in the field with anthropologists Klinton Senra and Lea Tomaz.

[3] Grünberg's survey on the old records for the group was part of his doctoral dissertation presented to the University of Viena, representing a classical ethnographic account including an overview of the Kaiabi's material culture, social organization, cosmology and mythology.

[4] Father Dornstauder was in the region since 1946 until his retirement, providing the Kaiabi with social assistance. The Catholic Church maintained a mission at Utiariti, in the Juruena / Teles Pires area. The mission reported to the Diamantino Prelacy which command from 1955 onwards was assigned to the Jesuit. The Missão Anchieta (MIA) was a civil society created in 1956 aiming to perform social and philanthropic work with the Indians located in its area of influence.

[5] Tolksdorf, a German citizen who came to Brazil in 1936 at the age 24, moved to the Tapajós area in the late 1950s and occasionally served as an officer for the Indian Protection Service (SPI). His unpublished diaries were translated from German into Portuguese in 1999 by the Jesuit priest Peter von Werden.

[6] Besides Rodrigues (1993), the Villas Boas brothers and Berta Ribeiro, all other authors only incidentally touched the group's agriculture.

Overview of the Kaiabi History

The Kaiabi speak a language of the Tupi-Guarani stock. Although the majority of their population now lives in the Xingu river area (*Wyway* river), they used to live in the Upper Tapajós river basin. Until around the 1940s the Kaiabi occupied an area stretching from the rivers Verde (to the West) and the middle Teles Pires (*Wyrasingy* river, also called Paranatinga, or São Manoel) to the East, to near the mouth of the Peixoto de Azevedo river to the North, including the middle rio dos Peixes (*Tatuy* river or São Francisco) (Figure 2-1).

From Early Contacts through the Middle 20th Century

The French voyager Francis de Castelnau was the first to mention the Kaiabi[7] in 1844 (Castelnau, 1949). After his report, the tribe received considerable attention from commentators, in part because they were headhunters regarded as very hostile. As a matter of fact, the Kaiabi used to be a warrior people who waged constant war against surrounding tribes and fought consistently the incursion of their territory by Brazilian society (Grünberg, 2004).

The presence of non-indigenous people in the region began around the initial decades of the eighteenth century, in order to secure the Brazilian borders but also motivated by the search for gold and diamonds[8]. The first travelers explored the main rivers and opened up some mines, with limited success. The following period, from the middle 1700s throughout the 1800s was characterized by the search for a more reliable northward route to Belém, because until that time most of the commerce was conducted southward through the Paraná / Prata rivers system, controlled by the Spanish crown. The new route connecting Central-West Brazil to the North, via Arinos and Teles Pires / Juruena / Tapajós rivers system, was well known since the early 19th century and received at least one trip each year until the 1910s. However, besides being a river way, the area was not fully

[7] Probably before Castelnau's account the Kaiabi were referred to by other travelers using different spellings for their name. Therefore, earlier reports about the group cannot be identified.

[8] Cuiabá, the capital of Mato Grosso State, was founded in 1727 as a camp base for miners. In 1797, it was established as the main regional economic center with a population of 18,000 inhabiting its surroundings (Grünberg, 2004).

utilized because of the presence of several hostile tribes, with which most of the contact was discontinuous and for short periods (Grünberg, 2004).

Although previous references about the Kaiabi probably were done using other names, notice about them was provided by other tribes such as the Apiaka[9], Bakairi and Munduruku. For example, Castelnau (1949) was told about the Kaiabi by Apiaka informants in Diamantino, in 1844, and forty years later Karl von den Steinen (1942) heard about the tribe through the Bakairi (with which he encountered two captive Kaiabi women).

Even portraying a strong warrior tradition the Kaiabi avoided contact with the Neo-Brazilians, adopting a prudent distance from them. However, from 1861 on the first rubber boom[10] had begun in the region and by the end of the XIX century rubber tappers were found throughout the area. The extreme violence that characterized the contact between rubber tappers and other indigenous people reached the Kaiabi, who reacted through constant attacks on the invaders, including taking human heads to celebrate war rituals (*jowosi*) in their villages[11]. In an attempt to pacify the Kaiabi, the first direct contact with them occurred in 1903, when the Indians offered gifts to the Neo-Brazilians while in turn trying to pacify the white ones[12] (Grünberg, 2004). Despite their superior war apparatus, the presence of Neo-Brazilians brought several diseases to which the Indians had no

[9] In old times, the Apiaka and the Kaiabi were close neigbors, and narratives from individuals of both groups consider them as being relatives sharing many cultural features, including peanut cultivation. Later the relationships between the two groups degenerated and a strong enmity arose (Travassos, 1993; Oakdale, 1996; Grünberg, 2004).

[10] The first rubber boom in the region of the Teles Pires river begun around 1870, ceasing by the late 1920s. The second boom was shorter, from 1942 until the late 1950s (Franchetto, 1987).

[11] *Jowosi* is a complex war ritual celebration in which religion and society interpenetrates (Grünberg, 2004).

[12] See the section about agriculture and the transition to metallic tools later in this chapter for the Kaiabi motivations and agency to pacify the Brazilians (Travassos, 1993, p. 456-57; 480-82; Oakdale, 1996, p. 53-54).

resistance at all, causing the emergence of severe epidemics[13] and, consequently, a heavy death toll among the natives (Pagliaro, 2002).

Through the guidance of Marshall Rondon, the Indian Protection Service (*Serviço de Proteção aos Índios* - SPI) was established in 1910 by the Brazilian government to prepare and protect the indigenous peoples for the unavoidable intensification of their contact with the nationals. Accordingly, in 1915 an official expedition made peaceful contact with the Kaiabi at the Verde and middle Teles Pires rivers. However, when the traveler's stock of gifts was depleted, the Indians became irritated and attacked the travelers, who managed to escape alive (Pyrineus de Souza, 1916). Aiming to attract and pacify the Kaiabi, in 1922 the Pedro Dantas Post at the Verde river was opened by the SPI. This Post was destroyed and employees were killed by the Indians several times. After successive reconstructions, in 1929 the Post was set up some 200 km to the south and renamed Post José Bezerra[14]. With the same purpose, in 1941 the Kayabi Post was opened close to the Kururuzinho river, in the lower Teles Pires, in Pará State.

If the working conditions were hard under Rondon's leadership, the situation turned much worse when he resigned in 1930. SPI lost political power and its functions were at least partially perverted. Instead of protecting the Indians, the general strategy actually applied was to integrate them into the national society. At this point some Posts in the Kaiabi area promoted the Indians as a cheap labor force for rubber tapping companies while other Posts engaged directly in rubber extraction (Grünberg, 2004). Officers tolerated and even contributed to the abuse of women, facilitating the spread of sexually transmitted and lethal diseases (Pagliaro, 2002). Furthermore, "in 1945 some clothing brought to the SPI post proved to be infected with measles" (Hemming, 2003, p. 143). These facts led Herbert Baldus to denounce in 1948 that

[13] Besides the common flu, measles and chicken pox were especially active in killing a large part of the indigenous population of the area.

[14] This Post was officially extinct in 1956.

> Todos os esforços do SPI estavam dirigidos, até agora, unilateral e exclusivamente para aproximar da nossa cultura as tribos do Brasil, pacificando as hostis e acaboclando as outras[15] (Baldus, 1949, p. 162).

Grünberg goes further to say that, even though until the 1960s SPI was the most important institution to act in defense of the Indians,

> A expansão brasileira (na área do rio Teles Pires) desenvolveu-se na sua forma mais violenta, não podendo em nada ser moderada pelo SPI que lá atua desde 1922. Perdura até a suspeita de que este órgão participou ativamente da expulsão dos Kaiabi e na sua integração forçada nos seringais[16] (Grünberg, 2004, p. 53).

The author also argues that the treatment received by the Indians in the Posts contributed significantly to their escaping to work for rubber companies. It is noteworthy that male Indians who used to work in *seringais* had limited time to devote to subsistence activities such as agriculture, hunting and fishing, which trapped them in a situation of permanent dependence on the rubber boss (*patrão*) through a credit system (*aviamento*) in which they were provided the basic needs in exchange for labor (Pagliaro, 2002).

In addition to the SPI Posts, Father Dornstauder founded two other Posts to improve his assistance to the Kaiabi and to help fighting for their lands. The first, opened in 1958, was the Santa Rosa, occupying a site of an old *seringal* (a rubber tapping facility) at the Arinos river, close to the mouth of the Tatuy river. The second was the Post Tatuy, launched in 1960, 40 km from the main rapids down the river. Despite Dornstauder's efforts, severe epidemic outbreaks caused a high mortality among the Kaiabi (Grünberg, 2004).

The Kaiabi of Teles Pires faced prior involvement with rubber tapping companies and the presence of other foreigners in their land, unlike the group from the Tatuy river (Athayde et al,

---

[15] "Until now, all the efforts of SPI were directed exclusively to bring the Brazilian indigenous groups' culture near to ours through pacifying the untamed and turning the others into caboclos (mixed blood Brazilians)" (Baldus, 1949, p. 162). My translation from Portuguese.

[16] "The expansion of the Brazilian (economy in the Teles Pires area) developed in the most violent way, and it could not be moderated by SPI which operated there since 1922. Indeed, it is suspected that this institution actively participated expelling the Kaiabi (from their lands) and in their forced integration in rubber tapping activities" (Grünberg, 2004, p. 53), My translation from Portuguese.

2009). Due to his place-specific research, Georg Grünberg considered that the Kaiabi resisted the occupation of their territory until at least 1927, "o que teve como consequência a sua dizimação, mas preservou a tribo como um todo fechado"[17] (Grünberg, 2004, p. 50). More recent accounts push this date to the 1940s (Travassos, 1993; Pagliaro, 2002), when the second rubber boom hit the region[18]. By this time, rubber companies were operating all over the region and the Kaiabi were gradually induced to work for them.

In addition to rubber tapping companies, starting in the beginning of the 1950s, a large part of the region was divided into plots of land and sold to private entrepreneurs by the state government of Mato Grosso. The era of colonization projects began, with farms and ranches being opened along with the associated timber industry, putting a strong additional pressure on the Kaiabi territory (Grünberg, 2004).

Early Information on Kaiabi Agriculture and the Transition to Metallic Tools

As early as 1812 the first explorers of the Arinos and the Teles Pires rivers noticed swidden gardens and, most importantly, made reference to the fabrication of stone axes in the Tatuy river area (Castro and França, 1868). The members of this expedition found an abandoned Indian camping site and left there as gifts one metal axe, two machetes, some beads, knives and mirrors. Georg Grünberg commented that, although this early encounter was probably with the Apiaka, it occurred close to the area in which the Kaiabi used to live. An anonymous paper published in the 19th century by the *Instituto Histórico e Geográfico do Brasil* (1856) mentioned the same area as a source for indigenous stone axes. Symptomatically, both texts also report war among neighboring tribes disputing the control over the mining sites for stone axes. In his second expedition (1887), Karl von den Steinen did not succeed in establishing contact with the Kaiabi but he was able to

[17] "What brought about their decimation but preserved the tribe as a closed whole" (Grünberg, 2004, p. 50). My translation from Portuguese.
[18] See footnote 10 about the division of the rubber boom in the region occupied by the Kaiabi.

identify their Tupian affiliation and reported their hostile behavior, warfare disposition, and anthropophagic habits. Bakairi informants depicted the Kaiabi as their major enemy and explained to von den Steinen that this conflict had begun because of disputes involving women and stone axes, which were controlled by the Kaiabi in the Upper Teles Pires river[19].

A few years after Steinen's travels, in 1889 two officers with support from the Geographical Society of Rio de Janeiro, Lourenço Teles Pires and Oscar de Oliveira Miranda, departed for an expedition aiming to measure the Teles Pires river. However, the expedition failed, and most of their members drowned in an accident in the rapids[20]. Miranda, the co-chief of the expedition, was among the six survivors and wrote a report published in 1890, which describes an agricultural site recognized by an Apiaka chief as belonging to the Kaiabi:

> …Encontramos duas novas cabanas de índios com diversos instrumentos e armas, que trocamos por facas, machados, espelhos, sem consentimento porém dos donos, que não encontramos por mais que procurassemos; estes ranchos estavam dentro de duas roças de mandioca, amendoim, batatas doces, pecegos; estas roças eram assaz grandes e admiramos o trabalho de as fazer, dispondo para a derrubada apenas de machado de pedra. Tudo parecia indicar que taés ranchos serviam apenas para as épocas de plantação e da colheita, retirando-se depois os donos para suas aldeias [21] (Miranda, 1890, p. 146).

On May 8th 1915 an official expedition led by the Lte. Pyrineus de Souza (1916) established peaceful contact with a group of Kaiabi when his crew gave the Indians metal axes, machetes and beads. On that historical occasion, the Kaiabi greeted the Brazilians with respectful words which were mistakenly interpreted by them as requests for more tools, changing completely the development of the trip and its respective report (Oakdale, 1996; Grünberg, 2004). Anyhow, when

---

[19] At Xingu, a Kaiabi elder who lived as a boy in the Teles Pires river area confirmed the existence of a mining site like this mentioned by Steinen.

[20] Later, for suggestion of the Marshal Rondon, the river was named after the expedition chief's last name, Teles Pires.

[21] "… We found two new huts with several instruments and tools inside, which we exchange for knifes, axes and mirrors without consent from the owners, who despite our best effort we did not succeed in localizing. These huts were located within two fields plots planted to manioc, peanut, maize, sweet potato, *pecegos* (?). The fields were really huge and we got amazed by the fact that they were made just using stone axes. All the evidence showed that these were huts for temporary use during the planting and harvesting times, and after that their owners must have returned to their villages." (Miranda, 1890, p. 146). My translation from Portuguese.

in the next days the travelers encountered hundreds of Kaiabi and ran out of tools, they were attacked, but they managed to flee before being killed. Again, in 1927 Max Smith observed that the Kaiabi, at the Pedro Dantas Post, had clearly showed unpleased feelings regarding what they considered the small number of axes and machetes they had received, and kept distance from the Post for a long period (Schmidt, 1942).

Later, during his first visit to the Kaiabi of the Tatuy river in 1953, Father Dornstauder was offered a field with manioc and corn for him to take care of. He also noticed the presence of metal axes and machetes, and bananas, despite the comparative isolation of this group (Grünberg, 2004). Accordingly, Pagliaro (2002) found in the SPI records that Capitão Temeoni, the chief of this group, had visited the Kaiabi Post in the lower Teles Pires, in 1947, where he could have obtained such Brazilian novelties, but he probably got them earlier from other Kaiabi living elsewhere.

In fact, the presence of metallic tools all over the region deserves a more detailed explanation. In an article devoted to the Kaiabi warrior tradition, Elizabeth Travassos (1993) analyzed an oral narrative told to her by Kupeap[22] and translated by Kanisio in 1981 at Capivara village, Xingu Park. She pointed out that Schmidt (1942) had learned in 1927 that the Kaiabi had also embraced the task of distributing metal axes among the neighboring tribes as they did before with the stone axes. Thus, when approaching the Brazilians, the Kaiabi portrayed a double intention: to obtain metallic tools, and to pacify them[23]. This narrative refers to a historical period between a relatively recent war against the Munduruku - who had been contacted much earlier and already had such tools - at

[22] Kupeap is Temeoni's son. At that time Kanisio was the Capivara village chief, which still today is inhabited mainly by the Kaiabi who moved to the Xingu area from the Tatuy river, and their descendants.

[23] Kupeap's narrative states that "as soon as the Kaiabi stopped warring against other Indians, the last war they engaged in was against the white people (*caraibas*), in the Teles Pires area (…) They yelled to them: bring the canoe for us to cross the river, and the caraibas did it. The Kaiabi talked to the caraibas in their house: cook beans for us! They did it. Then, the Kaiabi asked for gifts from the caraibas: machete axes. The caraiba gave the gifts to them. They went back to their villages and told the people how they had pacified the caraiba and how many things there were in their house" (Travassos, 1993, p. 480-81). My translation from Portuguese.

the time just preceding the Kaiabi "pacification", and the more distant time when war was directed against the Bakairi because of the control over the mining sites for stone axes and their distribution. Her main point refers to the transition to metallic tools:

> (A) transição tecnológica entre os instrumentos de pedra e os de metal, na qual os Kaiabi não se vêem como elementos passivos de uma aculturação inevitável. A substituição progressiva dos machados de pedra é um marco na história cultural do grupo (Travassos, 1993, p. 457[24]).

Thus, the Kaiabi employed all the means available for them to get metallic tools, including peaceful relations and war. However, it should be noted that the Kaiabi frequently mixed trade (and exchanging of women as well) and war relationships with several enemy tribes, mostly the Rikbatsa, Apiaka, Tapayuna, Munduruku, and Bakairi. They also disputed the control over production and distribution of stone axes with these tribes (Travassos, 1993; Oakdale, 1996; Grünberg, 2004). Although involving economic issues (control over land, resources, knowledge), apparently there were no specific economic or personal motivations for the Kaiabi to make war (Oakdale, 1996; Grünberg, 2004). War was important as an opportunity for the men to gain prestige and to gather human trophies used in the *jowosi* ritual celebration (Grünberg, 2004)[25]. In this context, the role enmity plays for Tupian societies is highlighted as a 'significant point of orientation', and warfare is seen as performing complementary social relations (Viveiros de Castro, 1992). Accordingly, Suzanne Oakdale pointed out that Kaiabi history suggested that for them also "enemies were frequently equated with affines" (Oakdale, 1996, p. 46).

The Kaiabi told Georg Grünberg (2004) that they have a superior understanding of religious and social life, thus not perceiving any benefits of adapting their life style to the whites'. However, they also acknowledged the superiority of the Non-Indians' technology. In this context, metallic

---

[24] "…technological transition process between stone and metallic axes in which the Kaiabi did not see themselves as merely passive elements of an unavoidable acculturation. The gradual substitution of the stone axes is a milestone in their cultural history." (Travassos, 1993, p. 457).

[25] When war against other tribes wanned, official Posts and rubber taper facilities became a good place for the Kaiabi to get enemy heads to perform Jowosi (Oakdale, 1996).

axes seem to have found a place in their mythology: it refers to the stubborn Moon (twin brother to the Sun), son of Tuiarare, the creator of the Kaiabi people. Trying to work by himself, this young man spoiled the ancient tools that used to perform all the tasks by themselves, without any further human interference than taking the tools to the site where the work was needed to be done. According to what a young school teacher told Suzan Oakdale

> These new tools from the whites (…) were very similar to the tools that Moon had ruined; implements that would work by themselves clearing fields and felling trees (1996, p. 142).

A final remark in this section regards food offering and sharing meals, which are also emblematic social acts from the Kaiabi perspective (Travassos, 1993; Oakdale, 1996; Grünberg, 2004). Besides giving gifts (hairdressing and other objects), a clear sign of the intention for the Kaiabi to establish pacific relations with the Brazilians is represented by the Indians' food sharing (such as peanuts, honey, or manioc bread with peanuts) during encounters with the whites in the first decades of the 20th century, as reported by Pyrineus de Souza (1916) and Schmidt (1942). However, after the Indians were forced to work to receive the goods they wanted, relations got worse, and conflict arose. As a reaction to the violence of the Brazilians, and because of the shortage of the desired tools, on many opportunities the Kaiabi killed Post employees and those Brazilians working in *seringais* as well (Grünberg, 2004). Later on, some Kaiabi families were living in the surroundings of official Posts, providing them with food from their fields. This situation was inverted with the disaggregation of their social life through war and epidemics, when many Kaiabi visited the Posts looking for food (von Werden, 1999; Pagliaro, 2002). At the end of the decade of 1940 the Kaiabi were facing such an oppressive situation when they met the Villas Boas brothers, who convinced them to move to the Xingu area. The next section deals with the encounter of the Kaiabi with the Vilas Boas, including the account of the migration to the new area.

Encounter with the Villas Boas Brothers and the Movement to the Xingu Park

By the end of the 1940s[26], the Kaiabi were facing an unprecedented dilemma: rubber companies had occupied most of their territory and they could not fight the Neo-Brazilians anymore. Although many villages had been abandoned and the Kaiabi felt attracted by the *seringais* and the Posts, both places represented adverse conditions for their life style reproduction (Grünberg, 2004). The situation reached a peak of oppression by this time, when the Indians were forbidden to leave the Post. When they tried to do so they were chased by both SPI officers and rubber tappers. Women's abuse was a fairly regular menace and sexually transmitted diseases were spreading among the population, in addition to other epidemics such as flu, measles and chicken pox (Pagliaro, 2002). Furthermore, since 1950 their land began to be split into plots for farming and ranching settlements, which represented "the biggest tragedy for the Kaiabi", according to Father Dornstauder (1983). However, Grünberg (2004) stated that the transfer of the Tatuy group in 1966 was performed without prior agreement and against the will of the Anchieta Mission, which apparently opposed the move as it thought that it was still feasible to fight for the Kaiabi land, at least in this area.

It is relevant to observe that the Villas Boas brothers had proposed initially (in 1952) a huge area for the Xingu Park which was gradually reduced by some 75% prior to the official establishment of the indigenous land by the Federal Decree 50.455 signed on April 14th 1961. In the end only an area of approximately 22,000 km^2 was set aside for the reserve. Consequently, besides cutting off the area where the main Xingu river's upper tributaries run, several tribes living in adjacent territories were left without any protection, including the Kaiabi (Menezes, 2000; Pagliaro,

[26] It is hard to establish the exact dates for the historic events described here. My informants were not sure about exact years when specific events happened, and most of the literature is not clear as well. As I was not able to solve many contradictions, all the dates provided should be considered as best guesses unless I clearly point out a well recorded year associated with a particular event of the Kaiabi history.

2002; Hemming, 2003). In this scenario, the Villas Boas viewed the transfer of the tribe to the Xingu as the only alternative to the process of detribalization and marginalization experienced by the Kaiabi.

That was the situation when the Villas Boas brothers arrived at the Teles Pires river bank leading the *Roncador-Xingu Expedition*[27]. In one spring day of 1949 when three Kaiabi men first met the expedition's campsite, the group was facing a situation of conflict with no apparent likelihood of improvement. The Kaiabi had to choose between two options: to be passively integrated in the Brazilian society's economy or to accept the offer proposed by the Villas Boas to move to the Xingu area. There were several reasons for the Kaiabi to choose the second option. The first, more obvious cause was the ethnic pressure from rubber tappers the Kaiabi were experiencing in their own territory, and later, because of the direct alienation of their land promoted by the Mato Grosso State government, without effective protection from the Brazilian State (Grünberg, 2004). The second reason is linked to a previous cultural disposition for the Kaiabi to move to another area. Suzanne Oakdale (1996) provides an in depth discussion of the way Kaiabi construct their ethnic identity and the role that others play in this process, including the predisposition for them to travel. A third reason is presented by Menezes (2000), who stressed the fundamental role the Villas Boas brothers played in convincing the Kaiabi to move. According to her, they portrayed the Xingu as a paradise in which there would be endless land to cultivate, abundant fishery, material for the Indians crafts, and whatever more an Indian could desire.

[27] Under the command of the Villas Boas brothers (Agnelo, Leonardo, Orlando and Cláudio), the Expedition was the arm of the *Central Brazil Foundation* created to open up the country side (savannahs or *sertões*) of the Araguaia, Xingu and Tapajós rivers. As part of the interiorization policy instituted by the Vargas government, the expedition aimed to establish a string of airstrips in order to set up a shorter air route linking Manaus to other areas to the South of the Amazon, and to prepare the region for colonization (Oakdale, 1996; Grünberg, 2004). The Villas Boas brothers were seasoned *sertanists* who already had contacted and pacified other indigenous people prior to their encounter with the Kaiabi (Menezes, 2000).

Finally, the agency of two men was instrumental to turn this movement into a reality. Jepepyri, one of the Kaiabi's prominent political leaders during those difficult times, united the group around the idea of moving out. On the other hand, Cláudio Villas Boas prepared all that was necessary for the transfer according to Brazilian institutional rules. Later on, he stimulated and provided the material basis for Jepepyri to convince and bring to Xingu several other Kaiabi families that were living in the Teles Pires area, in Pará (Kururuzinho river), and in the Tatuy river.

According to the narrative of his son Arupajup, the impressive adventure to the Xingu Park began symbolically around 1948, when Jepepyri got involved in an argument with his boss due to mistreatment, and decided to finish his service term as an employee with a rubber company. He was in Cuiabá and ran away at midnight traveling hidden, on foot, feeding on wild fruits. After a week or so, he worked for short periods in farms to rest and to get food for the road. Three weeks later, when he finally arrived at the Post *José* Bezerra, he learned that during the time he was absent, his 9 year old daughter had passed away. The impact of this loss was great because she was his only girl, besides two boys[28] that had survived out of 12 children. The chief of this Post vigorously reprehended Jepepyri because of his escape, to which he replied that he was tired of working like a slave without anything to offer to his family, while nobody cared about them. That was the reason why he was losing his loved ones.

As Jepepyri still had some debt with the rubber boss at the Post, he decided to stay there until he harvested his field to be able to sell products and cancel his debt. The next day two Kaiabi pointed guns at him at his field, and took the family back to the Post, accusing Jepepyri of preparing to escape to the Tatuy river / Lower Teles Pires. Under these circumstances, he resumed his activities as an employee. Some days later, when Jepepyri was away cutting palm leaves for

[28] Arupajup, then the youngest boy was around ten years old. He is still alive and most information for this session is based on the narratives he told me unless otherwise referred to a different authorship. His oldest brother, Anísio, got lost from the family some days later and they never met him again.

roofing, the chief of the Post's son abused his father-in-law's young wife. After that incident they decided to leave the Post[29], which happened some days later when a truck arrived there. Anísio (also known as Chico) was taking care of his grandmother and due to a heavy rain both missed the car that was leaving to the river bank. Thus, the family[30] was split forever.

At the river bank they built a canoe from a wild cashew tree (probably *A. giganteun*) bark and traveled for four days without any stops. After slowing down the pace, they reached a village called Jakaretymap, which was abandoned after an epidemic killed most of its inhabitants. There they witnessed a shocking situation: wild peccaries had unburied several Kaiabi corpses, dead from epidemics, and their bodies were exposed all over the place. Resuming their trip to the Jatyta village, the place for Jepepyri's family, the group camped at a lagoon called *Jakunaap*. In addition to a field opened at Jatyta, they would also prepare another one at this place to provide food for their travel down the river. Aiming to make arrows for hunting on their way down the river, a Kaiabi called Paku served as a guide for the group to track to a nearby stream to gather a plant called *kamajyp*[31].

While carrying out this task, Paku and two other fellows found the camp of the Roncador-Xingu expedition, but did not approach it. This encounter was crucial for convincing the Kaiabi to move to the Xingu area[32]. Jepepyri went to the Villas Boas brothers' camp and established contact

[29] In another version of their escape from the José Bezerra Post, the Villas Boas brothers registered that Jepepyri was running away because he had killed an employee (Villas Boas and Villas Boas, 1989, p. 16). However, Arupajup did not confirm this information. See also Hemming, 2003, p. 714, for another source on an alleged Jepepyri's inclination to kill enemies.

[30] The group that escaped from the Post was composed of Jepepyri, his wife Karulina, Arupajup, his future father-in-law, and two other men, Torowo and Aukoawit.

[31] Kamajyp is a plant in the Poaceae family, genus *Guadua*, which has a thin bamboo-like stem the Kaiabi employ to make arrows for hunting (Athayde, 1998).

[32] This account is a short version of the Kaiabi perspective of their meeting with the Roncador-Xingu expedition. For other versions about this encounter see Villas Boas and Villas Boas (1989, p. 19-22), and Hemming (2003, p. 142-46, and 714).

with the expedition. The chiefs were in another camp site some miles inland. So the Kaiabi offered manioc flour and the Brazilians offered dried beef, so they shared a meal and talked. Next day Claudio and Orlando met the Kaiabi at their camp for a long talk. Jepepyri told his history again, emphasizing his long exposure to humiliation and suffering, and showed them his debt bills (the *aviamento* system). He added that he was moving to Pará with his group to meet with other Kaiabi that had fled over there. During the conversation, the Villas Boas brothers explained about the trail they had opened in the jungle from the Xingu area to there, and that they knew about the Kaiabi suffering and they had come to help them. Orlando proclaimed himself the chief of all the Kaiabi from that moment onwards. Claudio said that the time of slavery was over, and that at Xingu they would recover their freedom and could work with him and his brother, getting paid a fair wage (in goods). Next, they invited the Kaiabi to their camp ground, where they could meet other Indians (Yudja, Trumai and Kamajura, the last one speaking a Tupi language closely related to the Kaiabi). The Villas Boas brothers gave Jepepyri a rifle and lots of ammunition for hunting and defending himself and his family. Some days later the Kaiabi resumed their gathering activity, and afterwards went back to Jatyta village to open a new agricultural field. The Villas Boas brothers stayed around, camping close to a place where the Kaiabi used to mine stone for axes, in the middle Teles Pires. They visited Jatyta, getting to know several Kaiabi from other villages. Later, they decided to open an airstrip at the headquarters of the Ka'iy creek (Macaco Creek, a tributary of the Tatuy river), behind the Serra dos Kaiabi (Kaiabi's Ridge). Spending several months working together, the Villas Boas and the Kaiabi, especially Jepepyri, established the basis for a long term relationship. Before leaving, the two brothers explained how to take the trail to Xingu, calling attention to the interfluvial paths as well as the main rivers they should navigate in order to reach the Xingu. All set, upon the departure of the Villas Boas, the Kaiabi resumed their normal activities in the villages.

Sometime after the Villas Boas brothers had left, some Kaiabi decided to visit the Xingu area to check if they had told them the truth. However, the first attempts to reach the objective failed. From Jatyta, Jepepyri tried to meet Orlando at a newly opened airstrip at Peixoto de Azevedo (close to the current Cachimbo Military Base), but failed to get there. In the meantime, another group headed by Ewafua tried to reach the Xingu river, but failed also. Early in the 1950s[33] Jepepyri's group succeeded and eventually met Claudio Villas Boas (Hemming, 2003). Figure 2-2 shows the pathway Jepepyri's group took from the middle Teles Pires to the Xingu area, and the locations of his successive villages within Xingu Park.

Jepepyri took the way with a small group of adults, children and elders[34]. As the forest regrowth had already covered the way it was hard to find the correct track. Also, traveling in January during the rainy season, the group suffered with cold temperatures, and eventually they found themselves running out of food provisions. After three months they arrived at the mouth of the Arraias river at the Manitsaua Missu river (in the NW region of the Xingu Park), resting there. Resuming the travel they met the Yudja[35], whose village was located at the mouth of the Manitsaua Missu in the Xingu. Daa, a Yudja chief recognized Jepepyri from their first encounter at the Teles Pires camping site. The Yudja then provided the Kaiabi with food and helped them to recover from the travel before going to the Diauarum Post[36], where they received food and went up river to meet

[33] Although Hemming (2003) suggested it happened in 1952, this date is uncertain. A different account notes that in 1950, along with the Villas Boas Brothers and Indians from other ethnic affiliation, Jepepyri took part in an expedition for contacting the then untamed Kayapó (Menezes, 2000).

[34] Arupajup told me that the group that traveled to Xingu was composed of his parents, Jepepyri and Karulina, himself (around 14 years old), Kwaip, Kwamariwa, Sinhowy, Kupeowoo, Kupe'i, Tuim, Piunin (both adolescents), and Kujãun (then 7-8 years old). However, this list is not unanimously acepted. For example, Pagliaro (2002) added a man named Tujuk and did not mention other persons Arupajup included.

[35] The Yudja is a Tupian group that during the 17th century migrated from the mouth of the Xingu river into the Amazon to the Xingu Park area (Lima, 1995). Currently they live at the mouth of the Manitsaua river, surrounded by Kaiabi villages.

[36] Diauarum is a site with a long history of occupation. Its *Terra Preta* spot testifies that it was a village centuries ago. More recently, the Kĩsẽdjẽ (Suya) had a village there. Later, in the decade of 1950s it was used a base camp for crews of

Claudio. During their stay at Xingu, they also visited Trumai and Kamajura villages. Around one year later, a second group of relatives arrived from the Teles Pires looking for them, fearing that they could have suffered some atrocity. After getting together, the Kaiabi returned to their territory. Jepepyri spent a few years there and decided to permanently move to the Xingu area, taking four couples and some children with him. After this event, the Kaiabi movement to the Xingu area was intense, and many groups went back and forth many times during the 1950s. Table 2-1presents an approximate chronology of the gradual movements of Kaiabi groups to the Xingu.

When Jepepyri arrived in Xingu for the second time, his group went to live with Claudio Villas Boas at the Leonardo Post [37], in the South, an area locally known as the Upper Xingu[38]. According to Arupajup they stayed there helping to build the Post[39]. They cultivated fields[40] using local seeds, but were unable to fully benefit from the harvests because of heavy pillage by other Indians. This situation had annoyed the Kaiabi to the extreme. In addition, in 1954 chicken pox burst out in the region and several Kaiabi got sick (Hemming, 2003), including Jepepyri. Thus, when Jepepyri's cousin showed up at the Post, coming from the Teles Pires, Cláudio was convinced to let the entire Kaiabi group go and open a village in another place. The chosen site was located to

---

workers measuring the land to prepare for colonization settlements. Soon these Brazilians were expelled and Diauarum became an SPI Post serving the Yudja (Juruna), Kĩsẽdjẽ, Metyktire (Kayapo or Txukaramãe), and Kaiabi, which was officially installed in 1960 (Hemming, 2003).

[37] The Post was first created in 1946 with the name of Capitão Vasconcelos. It was put up after the Fundação Brasil Central had expelled the Villas Boas brothers, and took control over the Jacaré Post, where an airstrip had been built in 1953. Later, this place was transferred to the responsibility of the Brazilian Military Air Force (FAB) and the Villas Boas opened a new place at the Tuatuari river. The Post was renamed Leonardo Villas Boas after the third of the brothers, who died at the age of 43 (Menezes, 2000).

[38] The region of the so called Upper Xingu within the indigenous land encompasses eleven ethnic groups with a long history of conviviality and cultural exchanges. For a detailed history of this cultural complex, see Heckenberger (2000).

[39] Among other Kaiabi, Sabino was a leading employee with the SPI at the Teles Pires river for several years and moved to the Xingu invited by Jepepyri. Mariana Ferreira (1994) presented a narrative in which he described his duties during the construction of the Leonardo Post, among other services with the Villas Boas brothers. Suzanne Oakdale (1996) also commented extensively on the service performed by this man, and his relationship with Jepepyri, which was not always marked by harmony.

[40] As will be seen later, the Kaiabi agricultural system is quite different, much more diverse than that one practiced by the Upper Xinguans inhabitants.

the West of a lagoon a few miles upstream of the mouth of the Manitsaua Missu river at the Xingu, near the Yudja village.

They spent some time in this unnamed place, and then moved up river to a village called ‘Okang, at the mouth of the Arraias river. This was a strategic place, where the Kaiabi coming from the Tele Pires would necessarily pass by. Another reason for choosing this place relates to the Kaiabi’s agricultural diversity maintenance, as we will see later in this text.

Soon, other Kaiabi coming to Xingu spent some time resting and recovering at ‘Okang. Gradually, they started to open up their own villages, initially in the neighborhood of that first village. Later, encouraged by the Park administration, and looking for better access to tools, resources and health service, most of them moved to the surroundings of the Diauarum Post. In this new area, Galvão and Simões (1966) recorded the existence of six Kaiabi villages based on extended families, besides some other individuals living at the Diauarum and Leonardo Posts. However, he mentioned just those villages headed by Jepepyri, Monã, Myarupã and Sabino. In 1966, with the arrival of the group from the Tatuy river and those from the lower Teles Pires, another village was opened, which since then has been known as Capivara, and is located close to the site of the old Jepepyri village. Due to particularities of Kaiabi social behavior and settlement pattern, since this time the number and composition of villages in the Xingu area has been changing constantly, with important implications for natural resource management and agricultural activities, as I will comment later.

The Kaiabi faced a serious depopulation since the time of the first contacts with the national society. However, after moving to the Xingu area, in a few years they were able to recover their population.

Population Loss and Recovery through Kaiabi Recent History

Kaiabi population oscillated drastically through different periods of their history. At the time of the migration to the Xingu area, it was in a downward spiral (Grünberg, 2004). As commented above, the consequences of such depopulation were felt in several aspects of Kaiabi social organization, including but not restricted to the performance of religious rituals, food production and processing, marriage and other practices (Pagliaro, 2002; Grünberg, 2004).

Today the Kaiabi number about 1250 individuals[41] living in Diauarum Post and 21 semi-sedentary villages located in the Northern region of the Xingu Park. Appendix C presents data on Kaiabi population as of 2007, and the location of the villages is shown in Figure 2-3. Currently the group shows the larger population among all the 15 peoples sharing the territory, with 201 Kaiabi habitants in the Diauarum Post and villages' population ranging from 11 (Fazenda Kaiabi) to 170 (Tuiarare) individuals (DSEIX, 2007). It is remarkable that about 40% of the population is under 10 year old while those older than 20 and 35 year old represent respectively about 33 and 15%. The proportion of male to female was 0.94. The group's estimated annual population growth rate is about 4.4%, and the total population is expected to double in some 16 years (Senra and Jesus, 1997; Pagliaro, 2002).

In addition to those living in Xingu, there were around 260 individuals in the Tatuy area, and about 160 at Kururuzinho in 2007. These numbers represent an overall population for the group greater than the about 1000 individuals estimated almost a century ago (Pyrineus de Souza, 1916). Such population recovery can be credited to the favorable conditions the Kaiabi faced at Xingu, including the excellent health service the Indians enjoy in this area. As a consequence, mortality

[41] This number includes the whole population of Pequizal and Onze villages in which the male head is Kaiabi but many people living there are not. Also, the total population includes 17 individuals living at the former Tuiuiu Post, located in the North-East border of the Xingu Park. This is the only place that was not included in this research.

declined and birth rates are higher (Pagliaro, 2002). Changes in Kaiabi population over time were also reflected in the way they perform cross cultural interactions and construct their ethnic identity.

Cross Cultural Interactions, Migration, and Ethnic Identity

The migration to the Xingu profoundly touched the heart of the Kaiabi and divided them. Today many elders still regret having abandoned their ancient territory, in part blaming Jepepyri for bringing them to the Xingu, leading the Kaiabi people to give up their lands in favor of the white invaders. On the other hand, the younger generation born in Xingu recognize themselves as xinguans and shows a new cultural and political identity (Oakdale, 1996; Athayde et al, 2009).

Another point of debate regards the role played by the Catholic Church. Grünberg (2004) acknowledged the importance of Father Dornstauder's work in intermediating the relations between the rubber tappers and the Kaiabi, reaching an agreement that no Kaiabi would work on the rubber business after 1960 at Tatuy river. Furthermore, Dornstauder worked mostly on his own, forging alliances with protestant missionaries, the SPI staff, ethnographers and alike. Grünberg (2004) stated that without the help of the priest the Indians would have experienced "a integração na camada mais baixa do proletariado rural brasileiro[42]" (Grünberg, 2004, p. 181).

However, some authors criticized the way the Catholic Church worked in the Tapajós area, and the impact of evangelization on indigenous culture. Part of the missionary's endeavor was done by taking many young Kaiabi (both male and female, in general apart from their families) out of the villages to a boarding school at Utiariti, to the West. Grünberg (2004) recorded that this fact, along with the depopulation caused by diseases and the residence in the Posts, led to an imbalance in the age pyramid[43], which seriously affected the food supply system, the performance of religious rituals

[42] "Integration into the poorest strata of the rural Brazilian population" (Grünberg, 2004, p. 181). My translation from Portuguese.

[43] In fact, the effect of depopulation was felt for a long time: on December 1970, women counted for 42.7 % of the total Kaiabi population at the Xingu Park, which ensued several inter-ethnic marriages, diminished polygamy and infanticide was eliminated (Pagliaro, 2002, p. 165).

and contributed to the cessation of male initiation at Tatuy river villages. Others also claim that the school at Utiariti promoted strong acculturation by forbidding the use of indigenous language, through the use of uniforms, and following rigid schedules and rules. Thus, it would have in fact facilitated the integration of the Indians into the national society rather than promoted education. Furthermore, the school ran a capitalist system of production, with intensive indigenous labor, with the profits directed to the expansion of the Mission. Apart from the school, the missionaries would have acted as intermediaries between the white entrepreneurs, the State and the Indians, who were pacified just to be neutralized as potential enemies and to be integrated in the non-indigenous economy as cheap labor, while being exposed to diseases and other risks. In fact, this was a national policy at that time, which followed principles established by the 1916 Brazilian Civil Code (von Werden, 1999; Pagliaro, 2002; Hemming, 2003).

In addition, Grünberg (2004) also pointed out that the Catholic Church as an institution concentrated much more effort on the Brazilians than on the Indians. Indeed, he argued, despite the Church’s claims for fighting for indigenous land rights, it did not interfere with the appropriation and sale of Kaiabi lands by the Government of Mato Grosso State.

In contrast to the Church’s activities and other private actors, Pagliaro (2002) depicted the Villas Boas brothers as having made no attempt to transform the Indians into civilized people, but their task was to give them material conditions to avoid being attracted by the farms, and to provide them the means to defend their land in case their territory would suffer attack from the Brazilians. Accordingly, John Hemming (2003) emphasized the work of the brothers as a very important and unique experience providing the Indians a mix of protection and gradual preparation for interacting with the nationals, including the Kaiabi refugees.

These views were balanced by Suzanne Oakdale (1996) who emphasized that the Kaiabi were not stripped of agency, despite the violent occupation of their lands. Rather, they played an active role in shaping their own identity. Hence, following their own perspective, the Kaiabi interacted with the agents of the economic interests present in their old territory, missionaries and SPI staff, the Villas Boas brothers, and other members of the national and international society. More specifically, she referred to some features common to the Tupian societies[44] (the *metaphorical cannibalism*, in the voice of Eduardo Viveiros de Castro, 1992), stressing the particularities of the Kaiabi case. The Kaiabi portray a documented "propensity to orient themselves to points beyond" their society throughout their history, including other tribes, all kind of Brazilians - miners, rubber tappers, settlers, missioners, the SPI staff, the Villas Boas brothers and other indigenists (Oakdale, 1996, p. 65). In more recent times, in the Xingu Park, they were subject to larger social processes associated with the construction of a nation and, in the international context, of a reservation system.

This '*centrifugal dynamic'* can be seen, for example, in horizontal, geographical travels usually performed by young men as part of the construction of their personhood[45]. This would explain their openness to foreigners. Georg Grünberg (2004) also noticed that younger adults at Tatuy river were much more prone to get close to the rubber tappers in opposition to the behavior of the elders within Temeoni's group, who was depicted as conservative. In addition, Oakdale found that Kaiabi agency varies depending on who is talking: young male leaders participate in but assure their independence from the national society. Although elder men are familiarized with non-Kaiabi ways of life, they prize relations with their own senior fellows. Finally, shamans prefer relationships with ancestors and non-Kaiabi spirit beings, which belong to the cosmological domains and are associated with vertical travels (earth-sky). She summarizes these different perspectives in two contradictory but complimentary ways of thinking about power and abilities: the progressive,

[44] The Upper Xingu peoples portray a directly opposite orientation, which is oriented toward themselves.

[45] It is noteworthy to register that a mythical hero, Tujarare, used to travel incessantly until he created the Kaiabi from different types of natural resources with distinctive characteristics (Oakdale, 1996, Athayde et al, 2008).

optimistic view in which knowledge gradually increases as the generations pass, including external inputs, as expressed by young men; and the degenerative, pessimistic view in which the Kaiabi are becoming more distant from the lessons taught by their ancestors, as expressed by the elders and shamans. However, she concludes that

> These perspectives are reconcilable (…), partial views of a regular sequence according to which different earths or epochs are regularly destroyed and new ones take their place (…). The future holds both the promise of more full or complete powers as well as the complete destruction of society. Kaiabi seem to focus on these different cosmological possibilities depending on their interests in the present (Oakdale, 1996, p. 152).

Her commentaries also touch on the issue of the ‘more civilized’ look of the Kaiabi when contrasted with the more ‘culturally pure’ tribes of the Upper Xingu area – which has been considered to be a romanticized, pristine paradise. Stressing that all the Kaiabi are refugees in the Xingu Park, Oakdale expressed their view of the local Indians as a people descended from a group that came before the Kaiabi, ignorant about headhunting (for them having the reputation of peaceful behavior), less acknowledgeable about the spiritual world than Kaiabi shamans, and they even do not know which animals are edible (because of their strict food taboos). Nevertheless, the Kaiabi feel attracted to things from the Upper Xinguans, engaging in trade with them, providing raw materials such as feathers, fibers and resins and receiving in exchange industrialized goods (Oakdale, 1996). Occasionally, seeds (maize, peanut, fruits) and cuttings (manioc, bananas) of cultivated plants enter into this exchange network, as I personally witnessed several times.

Shortly after arriving in the Xingu Park, the Kaiabi began to gradually conquering political power. The next section presents a brief overview of how the Kaiabi succeeded in getting their space in the politics of the new area.

Kaiabi Politics and Identity in the Xingu Area

Part of the Kaiabi reputation of being acculturated Indians can be associated with the work of the Villas Boas brothers, particularly Cláudio. As Galvão and Simões (1966) noticed, many young

Kaiabi men were relatively fluent in Portuguese and displayed some *civilized behavior*, in part because of their longer contact with the Brazilians. This fact facilitated their being engaged in many tasks in the Park's administration as collaborators with the two brothers. Due to their previous experience with non-indigenous peoples, they had already translated at least part of this new system of values into an indigenous way of thinking, and were in a better position to help individuals from other tribes to internalize such thoughts and practices (Galvão and Simões, 1966). In a more pragmatic way, in the early 1950s Jepepyri was participating in expeditions to contact the Metyktire (Menezes, 2000), and many Kaiabi also served as the work force to build the Leonardo, Diauarum and Pavuru Posts. Later, some Kaiabi men shared important Xingu Park administrative positions with the Metyktire. Many of them were later hired as FUNAI officers and still hold their positions today (Ribeiro, 1979; Villas Boas and Villas Boas, 1989; Oakdale, 1996; Hemming, 2003).

The approach to the area as an ecological paradise and an original place for the "natives, pure Indians" was constructed by the Villas Boas brothers, the Brazilian government, the media, and researchers (Menezes, 2000). The Villas Boas brothers managed the Xingu Park from the 1940s until 1974 based on this paradigm. At the beginning, their official policy was marked by two main points: the end of warfare, and the strengthening of socio-cultural interactions among different groups.

For this to happen, the brothers influenced traditional forms of indigenous political organization, including the nomination of chiefs, while they started to prepare individuals to take over the administration of the Park (Menezes, 2000). A clarifying contrast can be drawn between Aritana, a Yawalapiti chief from the Upper Xingu region, who was born in a family of chiefs, and Mairawy Kaiabi, a boy who grew up under the tutoring of the Villas Boas brothers, and became a political leader (Ribeiro, 1979). Later, he was involved in the Park's administration as an auxiliary for the brothers, and was in charge of the Diauarum Post for many years. As part of his duties, he spent some years in Brasília. Aritana built up the first indigenous organization in the Park, the Fundação Kwarup, and Mairawy was a pivotal agent for the creation of the Associação Terra Indígena Xingu - ATIX in 1995. Both leaders made external alliances that channeled money and political power. These two men turned into the main political actors in the Park. A third strong political force was the Metyktire (Kayapó) people, who after contact settled at the north region of the Park, but later moved out to an adjacent, independent indigenous land (T.I. Capoto-Jarina).

In addition to preparing indigenous assistants, the Villas Boas brothers also introduced researchers and other external actors into the Park. Among them, the *Escola Paulista de Medicina* (EPM, later renamed *Universidade Federal de São Paulo*, UNIFESP) was put in charge of the health service in 1965, and became an important political force. At the beginning, EPM had very good relationships with the "native" Upper Xinguans, but later their relations degraded, and EPM moved its main focus to the north.

In the 90s, when the environmental movement united forces with the indigenous peoples, the *Rain Forest Foundation* (RFF) launched activities associated with the Kayapó, who had left the Park (Conklin and Graham, 1995). Later, RFF supported the creation of an NGO called *Associação Vida e Ambiente* (AVA), which directed its efforts to economic projects, local capacity building and the protection of the Park's borders, focusing mainly on the peoples of the north. In the middle 1990s, AVA was incorporated into the recently founded *Instituto Socioambiental* (ISA).

After decades of fighting against the non-indigenous peoples that brought a diversified array of pressures to their survival, in 1994 the Kaiabi and other Indians living in the northern region of the Xingu Park founded their own association, the *Associação Terra Indígena Xingu* (ATIX). ATIX was conceived as a Park-wide institution, but since the beginning, it primarily represented the “outsider” groups, and the political power was mainly with the Kaiabi[46]. The partnership between ATIX, ISA and RFF channeled money for its institutional development, the Park’s border enforcement, socio-cultural sustainability (such as educational activities), and economic and natural resources management community-based projects. The UNIFESP-led health service was also aligned with the association’s political guidelines.

At the beginning, the Association's board of directors was made up of members from the Kĩsẽdjẽ (Suya), Trumai, Yudja, Ikpeng and Kaiabi ethnic groups. In addition, a political council was assembled with representatives from almost all the indigenous peoples present in the Park. However, around the turn of the 21st century, after the emergence of organizations marked by ethnic affiliation, the Kaiabi expanded their presence in ATIX, including the positions for both the directors as well as the administrative staff. Since ATIX’s inception, the Yudja kept a position of observing the way the association was run. Later, the Yudja, the Kĩsẽdjẽ and the Ikpeng founded their own associations and since then ATIX has been managed exclusively by the Kaiabi, while still maintaining some supra-ethnic activities (such as borders enforcement, the environmental defense of the Park’s surrounding, and education activities). Nonetheless, the political council is still active as part of ATIX, discussing problems which affect the Park as a whole whenever necessary.

Among the early projects carried out by ATIX was the *Kumana Project* which aimed to promote the recovery of several aspects of Kaiabi culture through incentives for handicraft production and performance of festivals. Such initiatives were implemented through the *Culture Schools*, which were built in various villages. At the same time, the Kaiabi were also engaged in a movement to regain their areas of traditional occupation at the Teles Pires and Tatuy rivers. Accordingly, they developed a strategy keeping FUNAI under constant pressure to take legal and

[46] At that time, power to manage ATIX was shared mainly with the Kĩsẽdjẽ (Suya), with whom the Kaiabi have political alliances through the marriage of Mairawy with a sister of a Kĩsẽdjẽ’s chief.

administrative steps to officially identify the areas previously occupied by the group. It took around ten years for them to partially succeed, as the processes for the Tatuy and Kururuzinho rivers are underway while they still face fierce opposition from those currently occupying or using resources in these areas. Although progress had been made, none of the lands had the entire process completed as of December 2008.

In such a context of identity affirmation, the Kaiabi were put in a privileged position to make political claims, which sometimes were independent and indeed conflictive with the interests of the native Upper Xinguan peoples. This setting provided opportunities for the "outsiders" to manifest and strengthen their ethnic identity (Oakdale, 1996). Actually, these manifestations seem to have been kept even during the harder times of their transfer to the Xingu. For example, Elizabeth Travassos when talking about the ritual Jowosi stated that

> Os Kaiabi foram, destes grupos (Tupi da area do Tapajós), os únicos que conservaram – ou retomaram – seu ritual de comemoração das vitórias em guerra (Travassos, 1993, p. 467) [47].

In the last ten years, the Kaiabi have showed strong commitment to bring back, and to expose to foreigners, some features of their own identity such as feasts and handicraft production (Athayde et al, 2009). A less visible (and in a sense, not so valued) part of this "cultural display" includes an approach to agricultural diversity. Ideas about Kaiabi agrodiversity recovery gained momentum at the same time as their cultural identity was being reshaped in the context of the chosen activities for their new organizing strategies. In this context, an initiative for recovering Kaiabi's crop varieties (mainly peanut) was launched around 1999 (Kaiabi and Silva, 2001; Silva and Athayde, 2002). The turning point was the death of Jepepyri in 2000, when members of his expanded family decided to honor his memory by working on the Kaiabi traditional seeds. Technical support from ISA and

[47] "Among the Tupian groups of the Tapajós river area, the Kaiabi were the only ones who conserved – or regained – their ritual for celebrating success in warfare." (Travassos, 1993, p. 467). My translation from Portuguese. It is remarkable that in the context of their ethnic revival, the Kaiabi chose the Jowosi, a war ritual in which young male were initiated, as the most appropriate for representing the image they most valued of themselves and with which they most identified - that of warriors, as noted earlier by Travassos (1984).

funding opportunities also contributed to the establishment of a village-based project in Kwaryja, which I will analyze in details in a later chapter.

Current Lands Occupied by the Kaiabi

In 1966, during the transfer of Temeoni's group to the Xingu, a small section of the population living at the surroundings of the Tatuy Post refused to migrate. This fact ensured the opportunity for a portion of their territory to be officially recognized as indigenous land. Partially through the efforts of the Catholic Church, the Apiaka-Kaiabi Indigenous Land was homologated in 1991, encompassing 109,245 ha at the Tatuy river (or Rio dos Peixes, Figure 2-1). The Kaiabi demanded expansion of this land to include an area of 117.050 ha (the Batelão IL), which was officially declared indigenous land in 2007 but is still in dispute, occasionally involving violence by farmers and cattle ranchers (Silva et al, 2000). A third land, the Kayabi IL, was assigned to those Kaiabi who had moved down the Teles Pires river, in the area under the influence of the Kururuzinho Post. It has an area of 1,053,000 ha as declared in 2002, which also is still in dispute, involving violent episodes carried out mainly by miners, ranchers, and logging companies (ISA, 2008a).

After an interval of almost two decades of relative insulation, from the 1980s on the Kaiabi from different areas began to communicate with each other (Travassos, 1993), and families launched extended periods of visiting the Tatuy river and the Kururuzinho areas, and vice-versa to the Xingu. Eventually, members of these families married and established residence in the places they were visiting.

Although facing problems in protecting its borders, the Kaiabi are relatively well shielded against invaders in the Xingu Park. By contrast, the Kaiabi living in the other two lands are suffering strong pressure from logging and cattle ranching companies and from the expansion of crop land, mainly for soybean production. Gold mining is still a problem in the Kururuzinho area

(Athayde et al, 2009). In the Xingu area missionary activity is forbidden, although it has been occasionally (but not officially) allowed since no evangelization work was involved (Oakdale, 1996). Catholic missionaries have been present in the Tatuy area since the 1950s, and a Catholic priest currently teaches at Kururuzinho.

The three areas currently inhabited by the Kaiabi are not homogeneous from the environmental, historic and socio-cultural point of view. As the ecosystems are different, many plant and animal species, soil types, clay for pottery, and lithic material used by the Kaiabi in the Tatuy area, middle Teles Pires river and Kururuzinho areas are not found in the Xingu Park (Silva and Athayde, 1999). While the next chapter will deal with ecological issues in the context of Kaiabi agriculture, here it is important to anticipate that the Kaiabi occupied archaeological sites known as *Terra Preta do Índio* (TP) for establishing their villages in Xingu. Regarding historical and sociocultural matters, the differences between the Xingu Park and the old territory are also remarkable, both before and after the arrival of the non-Indians. Although there were other groups in the area, the region where the Kaiabi previously lived was home mainly for Tupi groups (Grünberg, 2004). In contrast, in the local Upper Xingu area, indigenous groups have lived for hundreds of years in a rich multi-ethnic and multi-linguistic cultural complex where Tupi groups arrived later (Heckenberger, 2000). Although Kaiabi elders feel like foreigners and youngsters feel at home, they only peripherically interact with other Indians currently living in the South part of the indigenous land.

Despite environmental advantages regarding the availability of raw materials and climate, the continuous exposure to external pressure has caused remarkable changes to the life style of the Kaiabi living outside the Park. The lack of economic alternatives with State or NGOs support is also a problem. In contrast, due to social and political pressures to adapt to a strange place, over the years the Xinguan Kaiabi were able to develop a process of cultural revitalization and construction of ethnic identity, which was not shared by their relatives living outside the Park. Ironically, these groups are losing knowledge of their language and of the performance of traditional activities such as textiles, basketry making, and agriculture (Athayde et al, 2009).

Comments on Selected Cultural Features[48]

Settlement Pattern

According to Georg Grünberg (2004), the settlement pattern predominant just prior to the transfer to the Xingu Park was based on the rubber tappers model. It showed the tendency for extended families to be divided into economically highly autonomous patrilocal nuclear families, living very close to each other. Thereby, this settlement pattern would prevent cooperation for food production and religious activities among families. However, there is evidence that this pattern was at least partially associated with the strong depopulation the Kaiabi suffered during the 20th century. Pyrineus de Souza (1916) suggested the co-existence of both small, one extended-family villages, and larger ones, with more than 100 persons. Kaiabi houses used to be large, sheltering all the members of an extended family, such as Temeoni’s house in the Tatuy area in the 1960s reported by Grünberg (2004). In the recent past it was possible to see such large houses in some Kaiabi villages in Xingu, which were built primarily as feast-houses (Capivara village), later occupied as residences (Ilha Grande village), or as the office for the local association and its culture school (Tuiarare village).

After moving to the Xingu Park, the Kaiabi settlement pattern was based mostly on extended families units. Initially, each family group took over a *Terra Preta* spot where agriculture is performed. The villages were located not so far from each other, allowing for frequent visits. However, soon the Kaiabi were encouraged by the Park's administrators to aggregate in larger, multi-families villages close to the main Xingu river, in order to provide health and administrative

[48] This section follows arguments advanced by Senra (1999).

services for them. In addition, this arrangement facilitated the relations between the administration, other Indians, and NGOs working in the Park (Pagliaro, 2002; Hemming, 2003). Elizabeth Travassos (1984) and Suzanne Oakdale (1996) explained that the settlement patterns they found in Xingu reflect socio-political transformations the Kaiabi experienced during the last decades prior to the transference. Both observed that in multi-family villages, extended families living independently maintained relations for agricultural work and for cooking and eating. Oakdale also noted that the new organization of the villages was linked to the transference of political power from the elders to young men, more acquainted with Portuguese and the functioning of Brazilian society. In this way, elders would still retain authority while accepting that youngsters were more prepared to channel benefits to the village. It is also noteworthy that in the case of small villages housing only one extended family, the organization of food production coincides with the organization of the domestic group.

After both Travassos and Oakdale completed their research, a combination of social tension among families and depletion of strategic natural resources in the then three largest Kaiabi villages (Tuiarare, Capivara and Kururu) triggered the sprouting of new, small villages. The dwellings of these new villages belong mostly to the same extended family, which moved in an agricultural site (called *fazendinha*, or small farm). Although the relative availability of *Terra Preta* spots (the preferred location for diversified fields) is decreasing as population increases, the division of larger villages is a practice that was still operating in 2006.

Domestic Group (Extended Family) and Food Production and Consumption

Understanding the social organization is crucial to fully appreciate how agrodiversity is managed by indigenous families. The Kaiabi society does not present any kind of structural social division. The nuclear family is the basic social and economic unit. The core of their social life is based on affinity through marriage, especially on power and solidarity between the father-in-law/son-in-law relationship upon which villages and kin groups are established. After marriage the husband is expected to collaborate and perform activities along with his father-in-law and brothers-in-law, paying the bride service. During this period, the husband tends to live in his father-in-law's house (uxorilocal residence). Afterwards he can either live exclusively in a separate house or alternate periods living with his father-in-law and in another place. Nevertheless, nuclear families keep strong mutual support relationships with the expanded family (Grünberg, 2004). Currently, it is common to hear complaints that the son-in-law does not respect his father-in-law anymore, indicating a certain relaxing in the obligations of the bride service. However, Oakdale (1996) observed that such relations are still considered to be a typical Kaiabi custom. Accordingly, I heard similar manifestations several times in different places and occasions while working in the Xingu Park.

The domestic unit is made up of the kin group, the most visible social grouping beyond the nuclear family. In the past the extended family used to be headed by the oldest, war-experienced man, called *wyriat*, or the one who is in charge of the 'place' (*wyri*). The cohesiveness of the extended family depends on the *wyriat's* personal skills to provide for his followers and on his own prestige, gauged by his capacity to keep his afinnal son(s)-in-law and other kin, such as a brother, living with him (Grünberg, 2004). Moreover, Oakdale (1996) pointed out that the prestige of a household can be judged by the size of the house, the abundance of food it produces and the frequency and amount of *kawĩ*[49] it offers to visitors, and the number of children and grand-children it houses. Nevertheless, nowadays it is common for young men fluent in Portuguese to occupy the position of leadership with great autonomy, playing the role of intermediaries between the villagers and non-indigenous ones. It seems that the ability to access resources and services (including

[49] The term *kawĩ* corresponds to the English word porridge, and can be made either of several agricultural products or of some wild fruits as well.

attracting researchers) to the village, which now is seen as a necessity, is becoming increasingly more important for the prestige of the leader than the size of his family. Also, the number of affines the leader keeps around him can be replaced by his capacity to recruit a group of young men to work whenever needed (Oakdale, 1996; Senra et al, 2004).

The head of the household organizes all the food production work, including agricultural activities. After he chooses a site for the field, under his command brothers-in-law working together open a field or a series of fields in the same place, but beyond this point each nuclear family is responsible for farming and for the production of its own food (Oakdale, 1996). In general couples and children work complementarily in agricultural tasks (Grünberg, 2004). Also, frequently physical space in a field is shared by father-in-law and his son-in-law, or by brothers-in-law (Travassos, 1984).

On a daily basis, most of the food available is exchanged within and among families according to strict rules in which women are the distributors and recipients of food, which is delivered by children (Travassos, 1984). This practice reasserts the mutual dependency among them and the responsibility toward each other (Grünberg, 2004), including those temporarily unable to work, and guests, maximizing the use of perishable items (Travassos, 1984).

At the village level the Kaiabi used to perform a ritualized, collective meal involving all the families. Georg Grünberg (2004) witnessed a food sharing ceremony at Tatuy river in 1966, pointing out that it was performed only with '*pure Kaiabi food*' such as *mutap, manioko or kawĩ* (all of them involving agricultural products). Travassos (1984) participated in some of these rituals in Capivara, and Suzanne Oakdale in Tuiarare village. She argues that "'eating out of one pot' is said to be a sign of village harmony and unity" (Oakdale, 1996, p.81). I partook several times in this kind of food sharing in different villages and noticed that currently it is not always performed in a strictly ritualized way.

Cosmology and Shamanism

The Kaiabi universe is conceived as various overlapping layers including the undergrounds, deep waters and swamp areas, current forests, and the sky. All these layers are inhabited by many supernatural beings, which populate Kaiabi myths and narratives codifying their cosmovision[50]. Among them, there is the dangerous *Karawat* (the owner of waters), and *anhang* and *mama'e* that can steal human souls; there are various 'animal chiefs'; many cultural heroes (such as Tuiarare, the creator of the people); and Ma'it gods, great shamans that live in the sky (Travassos, 1984). Kaiabi food taboos are mostly related to the avoidance of items that are considered to be food of supernatural beings. These items comprise fish and game meat, and wild and crops (Travassos, 1984; Oakdale, 1996). Avoidance of crops may include all the forms of a species or just particular varieties.

At least two of these supernatural beings are directly associated with agriculture: the hawk *Kwanuu*, which is a benefic spirit that takes care of agricultural fields, protecting them against damages and providing rain (Silva and Athayde, 2002); and *Kupeirup*, one of the shamans living in the sky in the top of a mountain to the East. She gave all the food crops to the Kaiabi[51] (see Appendix D for a short version of this myth), as commented below.

As for many other societies, shamanism plays a fundamental role in the Kaiabi model of a society in which ideally the action of a political leader is complemented by the activity of shamans (Travassos, 1984). However, it is not the objective of this study to focus on the practice of

---

[50] See Viveiros de Castro (1996a, 1998) for a vision on how Amerindians develop social relationships with natural beings within their specific cultural settings.

[51] There are several variations of the myth of *Kupeirup*, or the creation of crops for the Kaiabi, as recorded by Ribeiro (1979); Travassos (1984); Villas Boas and Villas Boas (1989); Pereira (1995); Oakdale (1996); Silva and Athayde (2002); and Grünberg (2004). In 2003 Tuiarajup started to tell the “complete myth of *Kupeirup*”, in which he incorporated elements from other myths such as the origins of the Kaiabi and the big flood the people faced in mythical time. He asked Rosana Gasparin (a geographer with ISA who supports educational activities) to record and transcribe his narrative. Unfortunately, as of 2007 the work was not finished yet.

shamanism. Therefore, here I only highlight a few features that contribute directly to the objectives of my research.

An individual is normally called for shamanic initiation as a result of a serious illness, because of an accident, or due to a remarkable social misbehavior[52]. Extensive training complements this initiation, in general under the guidance of an experienced shaman, and trainees only master the required skills at an advanced age. Kaiabi shamans develop their practice through naming and blessing children and adults; performing different types of therapeutic cures; or just traveling to visit supernatural beings or to pay back their visits. As intermediaries between the natural and supernatural world, shamans can act upon individuals for restoring social situations out of tune with the expected course of existence (Travassos, 1984). Occasionally, some Kaiabi shamans develop specialized relationships with a particular set of these beings. For example, Tuiarajup was taught by his father Jepepyri to communicate with *Kupeirup*. Tuiarajup frequently visits her in dream travels. He is acquainted with *Kupeirup*'s gardens where she and two sons maintain diversified fields in which all the crop varieties, old and new ones, can be found. In the same vein, Athayde et al (2009) mentioned the relationships between shamanism, knowledge and basketry making.

Conclusion: Renewing Traditional Agriculture

This chapter demonstrated the intimate linkages between food production and consumption and Kaiabi social organization, cultural features and cosmology. Although recorded history provides scanty information on these relations, it is clear that the Kaiabi society faced many transformations either as a result of cross-cultural interactions with a broad range of social actors and by their very own agency. While Kaiabi groups currently living in the three distinct areas were

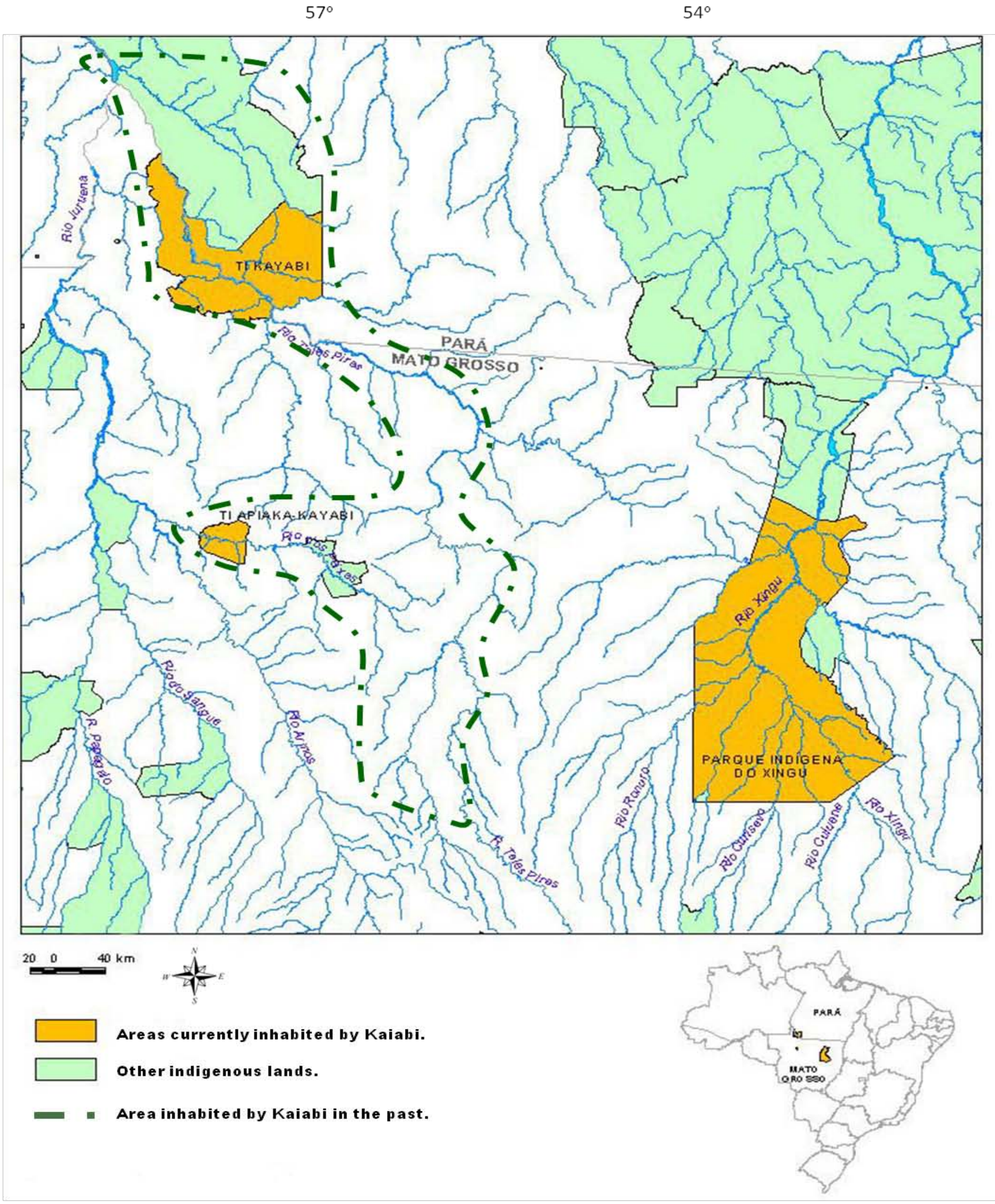
[52] Elizabeth Travassos noted that compared to other Tupi groups, in relatively recent times the Kaiabi have had fewer shamans. In early 2007 there were fifteen Kaiabi shamans in activity spread among 22 places in Xingu. Tuiarajup told me that just three of them were well prepared, himself included.

differently impacted by such changes, the people as a whole was able to withstand strong depopulation; deep technological changes (such as the acquisition of metallic tools); migration to a territory in which they encountered new human and ecological environment; and re-organization of settlement patterns, the dynamics of domestic group, and leadership. Other elements such as the practice of shamanism may also show variation over time. Hard lessons have been learned and passed on to new generations, building the basis for the Kaiabi to strengthen their ethnic identity. This enabled the Kaiabi to pursue a cultural revival process that is also expressed in their activities in policy arenas. Current agricultural activities are a product of the combination of all these changing factors, including the balance between loses and additions of crop and their varieties. As such, it forges new ways to perform traditional agriculture.

Table 2-1. Approximate chronology of the movements of groups of Kaiabi to the Xingu area.

Year	Family group	Observation	Source[a]
Before 1952	Ewafua and others	Probably reached the ManitSaua Missu river but failed to get to the Xingu	1
1952	Jepepyri; a second group followed him	Jepepyri's first trip[b]	2
Around 1953-54	Jepepyri	Jepepyri's second trip	1
Before 1955	Monã Moiawe and his son-in-law Tawapã Kainã	Invitation by jepepyri	2
Before 1955	Ewafua and family	Guided by Jepepyri	2
Between 1955-60	Myarupã and family	Guided by Jepepyri	2
Before 1963	Sabino and family	Guided by Jepepyri	2
Between 1963-66	Families from Upper Teles Pires	Guided by Jepepyri	2
1966	Most of the group from Tatuy river	Official "Operation Kaiabi"[c]	3
1966	Families from the Lower Teles Pires / Kururuzinho river, Pará	Official "Operation Kaiabi"[c]	3
Between 1969-73	Families from the Lower Teles Pires / Kururuzinho river, Pará	Voluntary movement[d]	1, 2
Early 1990s	One family from the Kururuzinho river, Pará	Voluntary movement	4

a) Sources: (1): from Arupajup Kaiabi, oral narrative, my own field data; (2): Pagliaro, 2002, p. 100-101; (3) Grünberg, 2004, p. 65; (4): Oakdale, 2005, p. 18 and note 6, p.178.
b) See note 27 in the text.
c) The "Kaiabi Operation" was an official expedition organized by the Villas Boas brothers in order to transfer, by plane, the Kaiabi from the Tatuy river to the Xingu area, which received extensive press coverage (see Azevedo and Mamprin, 1966). Several Kaiabi participated in the expedition, including Jepepyri and his son Arupajup. Jepepyri's involvement in the expedition was crucial for convincing Temeoni to move to Xingu, which in turn was an incentive for other Kaiabi to do the same (Oakdale, 1996).
d) Voluntary movement here implies that nobody guided these groups for moving out but they felt under extreme external pressure (by gold miners, ranchers and loggers), and were attracted by the news they heard about the good situation their relatives were facing in the new area.

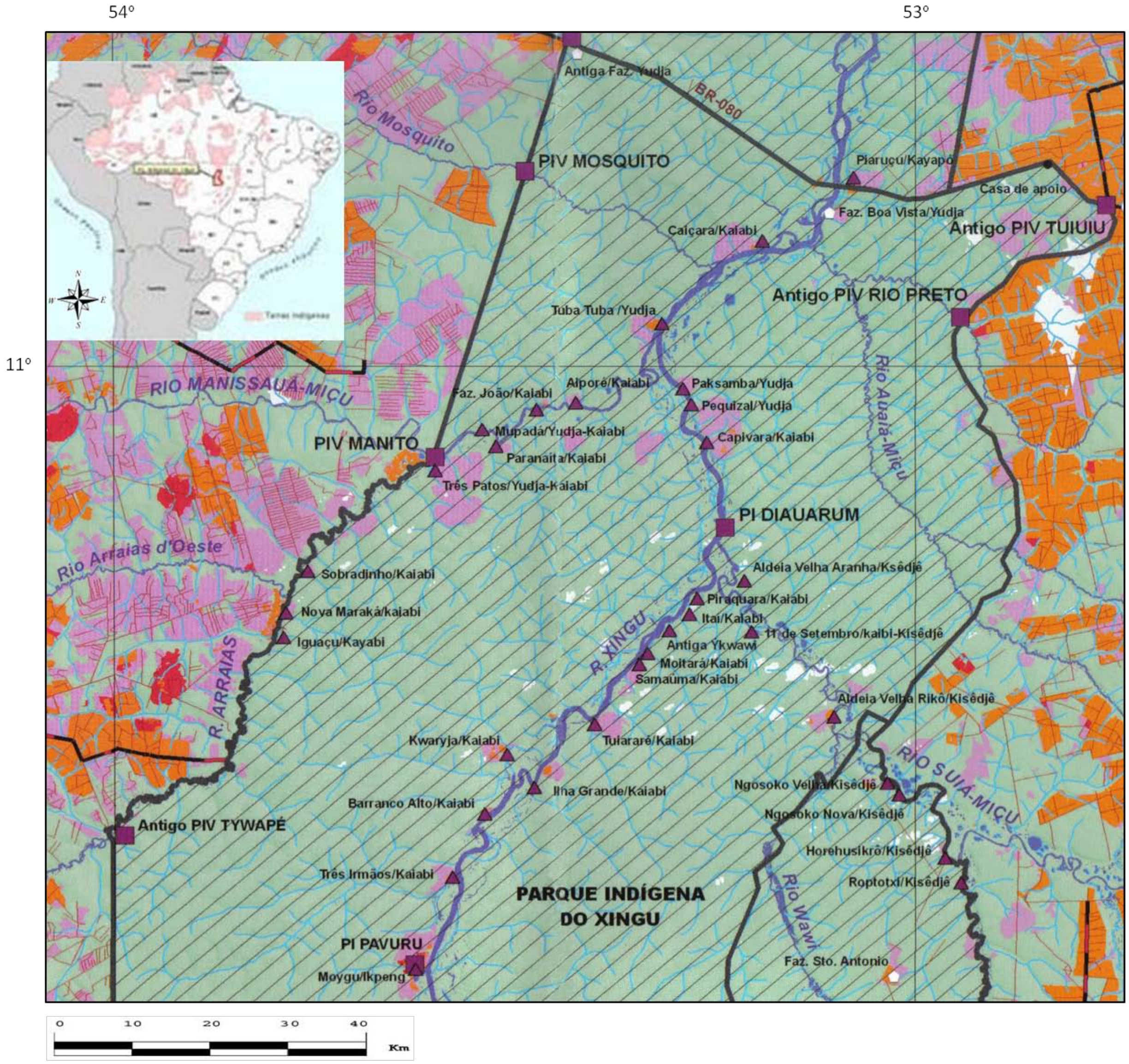


Source: Adapted from Grünberg, 2004.

Figure 2-1. Kaiabi old territory in the Tapajós basin (green line), and location of current Kaiabi Indigenous Lands, Mato Grosso and Pará States, Brazil.

Source: Drawing: Sirawan Kaiabi, 2001. Adapted from Silva and Athayde (2002).

Figure 2-2. Pathways the Kaiabi took from the middle Teles Pires river (red dashes) and Tatuy river (purple dashes) to the Xingu area.



Source: Adapted from ISA, 2008b.

Figure 2-3. Current Kaiabi villages as of 2008.

CHAPTER 3
ENVIRONMENT, AGRICULTURAL SYSTEMS AND AGRODIVERSITY

Podemos, sem dúvida alguma, encontrar agricultores iguais aos Kaiabí, entre os índios brasileiros, porém não melhores do que eles. (…) Nos aldeamentos Kayabí o que mais impressiona os visitantes são as lavouras, seja pela variedade dos seus cultivos, ou pelo capricho com que são tratadas. Villas Boas and Villas Boas, 1989, p. 48-49[1].

Introduction

This chapter aims to discuss the human and ecological context in which Kaiabi agriculture is performed, and crop diversity is managed. More specifically, it addresses research questions related to historical and socio-cultural forces involved in the origins, distribution and circulation of crop varieties within nuclear and expanded families, and between villages. As such, it also examines the role farmers at different ages play for keeping agrodiversity in their fields, and the influence of external actors upon varieties maintenance and turnover.

The chapter opens presenting key social aspects of Kaiabi agricultural system and recent changes the Indians have been facing. Then I discuss environmental zones as perceived by the Kaiabi, contrasting the Xingu area and their old territory. *Terra Preta* soils (or *Amazonian Dark Earths*) receive special attention due to their importance to the diversified Kaiabi agriculture. Following, I analyze their farming system and agricultural technology highlightening the selection of sites; field size and cycles; and timing and agronomic features. Flow of external inputs is also discussed. Then, components and variations of agrodiversity are presented, followed by a discussion of cropping patterns. Finally, manioc diversity management is discussed as a case study because it is currently the staple crop for the Kaiabi, and also because it is the most important crop within the indigenous agrodiversity debate in the Amazon.

---

[1] "Without doubts, we can find Indians farmers similar to the Kaiabi but we will never find better farmers among the Brazilian Indians. (…) At Kaiabi villages what is most impressive to foreigners is their fields, due to crop diversity as well as because of the care with which they are performed." My translation from Portuguese.

The Kaiabi are historically considered to be excellent shifting cultivators (Nimuendajú, 1948a; Ribeiro, 1979; Villas Boas and Villas Boas, 1989; Rodrigues, 1993). The integration of agriculture (manioc fields, diversified fields, and homegardens) and gathering in fallows and forest, along with hunting and fishing has been the basis of their economy (Grünberg, 2004). The Kaiabi agricultural system is distinct from that of the indigenous societies living in the Xingu Park during the last centuries[2], and has been praised as such (Ribeiro, 1979; Rodrigues, 1993; Villas Boas and Villas Boas, 1989).

The study of Kaiabi agrodiversity provides a unique case within the greater spectrum of shifting cultivators. They portray two characteristics that distinguish them from the great majority of the current farmers worldwide: most of their production addresses subsistence purposes, and they operate their diversified fields based on Black Earth forests. On the other hand, the Kaiabi share a feature common to many agrarian societies of the tropics and subtropics: increasing population growth (Rice, 2003).

Population growth is not the only challenge for the Kaiabi to keep their agriculture alive. As their history demonstrates, the Kaiabi were able to maintain their agricultural system through complex social, political, economic, technological, cultural, and biophysical changes. However, such changes affected Kaiabi groups currently living in Xingu (MT), Tatuy (MT) and Kururuzinho (PA) with distinct intensity (Athayde et al, 2009). The outcomes of these differentiated processes are expressed in the current farming practices of each area. Ironically, those that moved to the Xingu Park were able to maintain a substantial part of their agronomic and social practices related to agriculture, and kept a more diversified repertoire of crop varieties than their relatives living in other places. Also relevant, the Xinguan Kaiabi have weak direct links with agricultural markets.

[2] An example is the Kuikuro's agricultural system, which is heavily based on cassava cultivation (Oberg, 1953; Carneiro, 1983; Heckenberger, 1998, 2000).

Agricultural production is sold mainly for cash or exchanged for industrialized items within the Xingu Park, providing food to families with paid workers, supplying FUNAI Posts (Ribeiro, 1979; Rodrigues, 1993; Villas Boas and Villas Boas, 1989), and outsider-led events. Although locally relevant, the overall outward movement of agricultural goods is limited. The exception is manioc flour, which reaches nearby towns markets along with internal sales. However, low prices are a disincentive for intense commerce involving the product from the villages.

Kaiabi Agricultural Social Organization

Cooperation in agricultural tasks is particularly important for the Kaiabi (Grünberg, 2004; Oakdale, 1996). In general the newly married husband is required to pay the bride service and afterwards he keeps strong mutual relationships with his extended family. Couples and children work complementarily in agricultural tasks (Grünberg, 2004), but the fields are referred to as belonging to the male head of the nuclear family (Travassos, 1984). Men are mainly involved in selecting the site, clearing the vegetation, chopping trees (mostly young men), and burning. They also share the caring of the field with women.

While there is no gender or age specificity for planting crops, women tend to do most of this work. Planting also involves an opportunity to select people whose abilities are tested for life: at an early age children are assigned a limited piece of land to plant specific crops. At the harvest time the adults evaluate the yield. In cases of very successful production that person is considered to be a *specialist* and will be requested to plant that crop every year, regardless who is the owner of the field.

Depending on the crop, harvesting can be a task shared by females and males, or be performed mainly by women with some help from men and children. In the case of a large field, its owner can ask members of other families to help with harvesting, providing food for the workers.

Occasionally a delimited area of a field can be given to another person to harvest, usually someone who did not plant a field for a particular reason (Travassos, 1984).

The Kaiabi say that selecting and caring for the seeds is equally done by women and men. However, I observed mostly older women performing these activities, followed by older men, both having youngsters as co-workers and apprentices.

Mosirup, another important feature of farming, is the invitation for people from other villages to help in the establishment of a new field (mainly men, for clearing and chopping) and/or to harvest it (mainly women). Besides the strengthening of social ties, the visitors benefit from being assigned part of the production, which also allows for crop varieties to circulate. Nowadays, this kind of invitation is becoming less common.

Today, given the history of relations with the national society, the economy of the Xinguan peoples is facing transformations. From the 1970s on, external assistance, market-oriented handcraft production and paid jobs (currently, employment at FUNAI, village teachers, staff of the local association, honey-keepers, and workers for the health care system), launched the use of industrialized items in the villages (Athayde, 1998). Money and external influences coming into villages also facilitated the purchase of some industrialized food, and pushed a relative depreciation of the traditional diet, bringing a process of field simplification associated with changes in the diversity of crops. Although present in most households, industrialized food did not replace the indigenous food. However, evidence from the Xingu Park Health Service (*Distrito Sanitário Especial Indígena do Xingu*) suggests that families with greater income grow less diversified fields and are more exposed to food-related health problems. In addition to these changes, inter-generational conflicts are common within the Kaiabi society (Oakdale, 1996), and impact labor organization and agrodiversity management as well.

Furthermore, one of the most powerful influences I witnessed in the villages was the spread of TV sets. In 1996 there was just one TV set at the Diauarum Post (with dish-based TV stations, powered by a diesel generator that serves the Post). Now it is rare to find a village where they do not have at least one TV, and in such cases there is a strong demand from the villagers to acquire one soon. Obviously, this new communication capability brought new aspirations of consumption, promoted new ways of behavior and subtracted the time for the people to gather and chat, or just to listen to stories and narratives from the elders.

Environment and Ecozones

Contrasting Places: Xingu and Old Territory

The xinguan environment strongly contrasts with the Amazonian rain forest of their place of origin through vegetation forms, climate pattern and soils. The Upper Xingu area exhibits great biodiversity (Capobianco et al, 1999), and it is characterized by the ecological transition from semi-deciduous forests and savannas to the South, and the Amazonian rain forest to the Northwest, including floodplain forests (Radam Brasil, 1981). According to the Köeppen classification, the Xingu Park's area has an Aw climate type, which presents a total annual precipitation greater than 2000 mm, and less than 60 mm in at least one month. In contrast, the climate in the old Kaiabi territory is the type Am, characterized by more than 2500 mm of uniformly distributed rainfall throughout the year, usually with a small dry season (Radam Brasil, 1980). The longer dry season, which can in some years exhibit no precipitation for some 60 days, combined with soil characteristics of the Xingu area put additional pressure for the Kaiabi to adapt their agriculture to the settings of the new place.

The Kaiabi manipulate the landscape according to their perception of environmental zones and associated natural resources (Silva and Athayde, 1999; Schmidt, 2001). Their landscape knowledge expresses concepts of time and space, and allows the identification of transitional features between specific environments. The main environmental criterion is the division of the year between the rainy and the dry season, and the corresponding fluctuation of the main rivers' level. Table 3-1 shows the main ecological zones recognized by the Kaiabi and the respective ethnopedology classification of soils occurring in each of them. In addition, the Kaiabi recognize places where there is a concentration of a particular plant of interest, applying the suffix *typ* and its variations. For example, *inatatyp* corresponds to a place where there is abundance of inajá palm[3] (*Attalea maripa*). Likewise, *uruyryp* identifies a spot with great concentration of *uruyp* (or arumã, *Ischnosiphon* spp).

Floodplain forests (*yapopet*) are never used for agriculture by the Kaiabi. All their agricultural activity is performed in just two environmental zones, the *ka'a rete* and the *koferarete*. The *ka'a rete* corresponds to the upland forest, which in the area of the Xingu Park is a transitional form between the seasonally deciduous forest (Floresta Estacional Semidecídua) and the Amazonian rain forest (Floresta Ombrófila Aberta Amazônica). It is a multi-strata, heterogeneous forest with some 20-25 m height dominated by species[4] such as itaúba (*Mezilaurus itauba*), almécega (*Protium* spp e *Trattinickia rhoifolia*), copaíba (*Copaifera* sp), jequitibá (*Cariniana* sp), and cedro (*Cedrela* cf *odorata*), besides several other Moraceae, Lauraceae, Fabaceae, Caesalpinoideae, Mimosaceae. Lianas may be occasionally present. Of cultural importance, the inajá palm tends to dominate fallows until other species regain density in a late stage of the forest regrowth (Schmidt, 2001).

The tallest trees reach 30 m, including sumaúma (*Ceiba pentandra*), jatobá (*Hymenaea courbaril*), *Parkia pendula*, and species of *Ficus* spp. The Kaiabi point to four other species of their special interest in *Ka'a rete*: the rubber tree (*Hevea brasiliensis)*, açaí palm (*Euterpe oleracea*),

[3] Inajá has a great cultural importance for the Kaiabi at the Xingu area, where its leaves are used for roofing, and the fruits provide oil and raw material for handcrafts. They also suffer predation by a worm (*Coleoptera*) which is used as fishing bait, and occasionally is eaten by humans. In old times, the ashes of the inner part of the trunk were used to produce salt.

[4] The species were identified by Simone Athayde (Silva and Athayde, 1999).

siriva (*Astrocaryum* spp), and Brazilian nut (*Bertholletia excelsa*). However, the first three occur in low densities just on the North-West portion of the Xingu Park, and Brazil nuts can be found only some kilometers away from the Park's border.

Koferarete is the name applied to the forests on Terra Preta. They are also multi-strata and besides being taller than *ka'a rete*, the Kaiabi say that there is a floristic differentiation between these ecozones. Due to their higher density, size or exclusive presence, the Kaiabi use some species as indicators, such as sumaúma, jatobá, taiúva or tatajuba (*Bagussa guianensis*), *Trichilia* sp (Meliaceae), and *Flacourtia* sp (Salicaceae). In addition to these trees, an herb of unknown scientific name is also used to identify *koferarete*. Yet, dense stands of inajá palm are associated with old fallows and thus are an indirect evidence of *koferarete*.

Ko is the Kaiabi word for field (or roça, in Portuguese), and *kofet* means literally the *place where a field was already opened*. In addition, the suffix *ete* / *rete* means true, legitimate, valued, powerful (Tibiriçá, 1984). Thus, *ka'a rete* is the true forest, and *Koferarete*, the true fallow (or capoeira, in Portuguese). Likewise, the suffix *rãn* means false. Thus, *koferãn* means a not well developed *kofet*, or a transitional area with less conspicuous archaeological signals, and a combination of vegetation and / or soil properties lying at some point in between *ka'a rete* and *koferarete*. Although also used to grow the most demanding crops, in general the Kaiabi say that the agricultural potential of transitional areas is lower than the fully developed *kofet*.

According to the Kaiabi, both *ka'a rete* and *koferarete* occur in their old territory and at the Xingu area. However, vegetation and soils are distinct at each place. It is noteworthy to mention that the Tatuy river watershed is located in the area with the most complex geomorphic, hilly landscape of the Mato Grosso State. At the Xingu area, in pedological terms *koferarete* grows on *Terra Preta* soils (Anthrosols) and the *ka'a rete* ecozone is developed on *ywypirang* (Red Earth) (Rodrigues, 1993; Silva, 2002). Red Earths are mostly sandy loam Oxisols (Acrustox e Haplustox, Radam Brasil, 1981). In Tatuy, Red Earth corresponds to other types of darker loam Oxisols and Alfisols. In addition, there is a soil category called *ywy esage* (literally, good soil), a loam / sandy Oxisol mostly with a sub superficial concretionary layer, that does not exist at Xingu. *Ywy esage* occur at the lower parts of the landscape, close to the main rivers, and portray elevated natural fertility. Another soil category encompassing *ywypytang* and *ywypytangpytang* corresponds to less colored sandy Oxisols. Finally, sandy Inceptsols and occasionally Quartzopesamments occurring mostly on the hills are called respectively *ywysigo on* and *ywysing*. The fertility of these soils can be good, but it is a site-specific quality that varies according to their position in the landscape (Radam Brasil, 1980; Silva et al, 2000). When visiting old village sites at the Tatuy river in 1999 I observed agricultural sites both on *koferarete* and *ka'a rete*. The first was not a *Terra Preta* forest in the strict sense but a fallow forest showing signals of anthropic influence, including a few banana plants remaining from an old field (abandoned for more than 30 years). Kaiabi elders (Kupeap, Tewit and Takaperun) who lived at Tatuy as young adults before moving to Xingu, told me that both soil types used to provide good harvests for multicropping fields, thus contrasting with the Xinguan environment (Silva et al, 2000).

Exercising their perceptions of environmental distinctiveness, upon their arrival at the Xingu Park, the strategy adopted by the Kaiabi for keeping their diversified agricultural system was to put in a combination of manioc (currently the staple crop for the people) as a monocrop stand and multicropping systems including peanut and other crop species on small, less widespread, more fertile *koferarete*.

Terra Preta Earths

In order to understand the strategy adopted by the Kaiabi it is important to explain some special features presented by *Terras Pretas do Índio* (TP), also called Amazonian Dark Earths[5] (ADE). TP are soils built by pre-Columbian peoples. They present dark color, high content of stable organic matter and plant nutrients, low levels of toxic aluminum, and abundant charcoal, exhibiting cultural remains such as ceramics and lithic materials (Kern et al, 2004).

Indigenous peoples have managed and shaped Amazonian landscapes for thousands of years, in a process called co-evolution or biocultural evolution (Norgaard, 1994; Denevan, 2001). The dynamic process of interaction between indigenous peoples and the landscape allowed for the creation of mosaics of successional stages that influenced and might have enhanced the overall environmental diversity at both species and community levels (Posey, 1985; Balée, 1989; 1994; Balée and Gély, 1989; Hecht and Posey, 1989; Heckenberger, 2007).

Although higher plant diversity in TP spots is not necessarily universal[6], their recognition as archaeological sites is well established (Smith, 1980; Heckenberger et al, 2003; Neves, 2003, 2004; Petersen et al, 2001). Likewise, the use of *Terra Preta* soils for growing the most demanding crops since colonial times reveals the farmers' recognition of their positive physical and chemical properties, when compared to most of the surrounding upland soils (Ferreira Penna, 1869; Brown and Lidstone 1863; Smith 1879; Smith 1980; Hiraoka et al. 2003). *Terra Preta* sites occur throughout the Amazon and Orinoco Basins (Smith, 1980; Eden et al, 1984; Posey, 1984; Balée,

[5] A debate is still open about the origins of *Terra Preta* soils. Some scholars prefer to call them *Amazonian Dark Earths* (ADE), considering that darker types, which they name *Terra Preta*, were built in areas of settlement and those brownish types, called *Terra Mulata*, showing a small nutrient pool and high carbon content, resulted from intensive agricultural practices (Denevan, 2004; Sombroek, 1966). Erickson (2003) and Schmidt and Heckenberger (2008) stated that these processes are not mutually exclusive, and operated in a continuum allowing for the variations currently found among sites. In agreement with them, I apply the term *Terra Preta* through out this study. When relevant, I employ indigenous categories to highlight variations among TP sites.

[6] Clea Paz Rivera (2003) found no statistical differences between selected trees in TP and the surrounding upland forest in one site in Bolivia. Also, abandoned TP sites can harbor concentrations of oligarchic species such as babaçu, tucumã, urucuri, and others (Moran 1995).

1989; Kern, 1996), where they present patchy distribution in the landscape. Given the diversity of human and environmental dimensions involved in their creation, TP vary in associated cultural remains, size, shape, color, anthropogenic soil depth, and inherent chemical and physical properties (Denevan, 2004; Heckenberger, 1996; Kern et al, 2003), and vegetation (Posey, 1985; Balée, 1989; 1994; Balée and Gely, 1989; Hecht and Posey, 1989) For example, the size of the recorded spots varies from 0.2 ha up to 80 ha, the most common values ranging from 4 to 8 ha (Smith, 1980)[7], and the depth of the anthropogenic layer averages 30-40cm although in some sites it extends beyond 200 cm (Sombroek, 1966; Smith, 1980).

In the upper-Xingu river area where the Xingu Park is located, archaeological research carried out with the Kuikuro (an Arawak people) identified the occurrence of complex indigenous settlements in the last thousand years, which might have produced deep alterations in the forests and other local ecosystems, leaving a legacy of a great number of *Terra Preta* spots (Heckenberger et al, 2003). Indeed, most *Terra Preta* within the current limits of the Xingu Park were built by Arawak peoples (Heckenberger, 2004, pers. comm.). In the region occupied by the contemporary Kaiabi, paths of TP are located at different geomorphic features such as at high river bank bluffs; at shores in a straight stretch of the main river; adjacent to small interior creeks (some as far as 40 km from the main river); at small bays or at a branch of the main river; or in interior areas, protected by a lagoon, an abandoned meander or a stretch of floodplain forest. All these locations, related to the settlement patterns of ancient Indians, allowed for the access to a variety of resources in environmental transitional areas. Also important, these areas could be reached by canoe at least during the rainy season. However, some of the TP sites are less attractive for contemporary villagers

[7] For the Xingu area, Heckenberger and Schmidt (2008) report an old Kuikuro settlement with some 50 ha, where the archaeological layer averages 30 cm but can reach more than 200 cm at some specific cultural features.

for agricultural purposes, as they require the hauling of the harvested products from distant locations during the dry season when transportation by water is not always feasible.

Soil chemical fertility of TP sites is much more favorable for the production of the most demanding crops when compared with the predominant Oxisols and Ultisols of the Amazon. In general, the availability of macro (particularly P) and micro nutrients, values of pH, organic matter and soils indexes such as Sum of Basis and Cation Exchange Capability are reportedly higher for TP (Balée, 1989; Kern and Kämpf 1989; Pabst 1991; Smith 1980; Sombroek, 1966). High content of charcoal is a plus, which would promote specific microbial life forms able to ensure stability to this pool of nutrients and hold it for centuries in a tropical climate (Glaser et al, 2003). In addition to the chemical properties of the TP, Wim Sombroek (1966) demonstrated that although the humidity equivalent is similar for the TP and surrounding Oxisols and Ultisols, anthropogenic soils have superior overall fertility which attenuates the effects of droughts, allowing for the cultivation of the most demanding crops.

In addition to the natural variation in soil properties in general, due to the differential pattern of occupation and associated activities performed in indigenous settlements TP qualities are even more variable within and between sites (Smith, 1980; Eden et al, 1984; Kern, 1996; Denevan, 2004). Based on a mapped archaeological context, Schmidt and Heckenberger (2008) analyzed the variability in chemical properties of TP soils of several sectors of a current, a historic, and a pre-historic Kuikuro village (including domestic and refuse areas, and the plaza), comparing them to soils of agricultural fields, savannah areas and the surrounding upland forest. Soil signatures varied horizontally and vertically, allowing for inferences about anthropic modifications of the landscape. Of interest to the current Kaiabi agricultural practice, the study demonstrated the great variability in soil properties within *Terra Preta* sites built by Arawak people in the Xingu area.

Agroecosystems

Agricultural Sites and Fields

Kaiabi farmers use several indicators for locating privileged agricultural sites: land use history, directly known or interpreted as a function of the vegetation structure and composition (observing indicator species); the presence of ceramics; soil color, structure and smell (tested with the help of a machete); and geomorphologic features. The presence of some species of game (particularly monkeys and birds) is also used as an indirect proxy for finding good agricultural sites because of the relationships between such animals and their foraging habits on specific plants. Thus, hunting is also a way to identify TP spots which can be used for agriculture in the future. Although not indicators per se, distance from the village of residence and easy access by water by canoe or motor boats are important issues. In general, when the agricultural sites are located far from the village, the Kaiabi build a house there, a practice witnessed by some of the first non-indigenous who entered in contact with them (Grünberg, 2004).

The fields system composes a macro framework of agroforestry management in different environmental zones distributed in the landscape[8] (Rodrigues, 1993; Silva, 1999; Schmidt, 2001). The regional vegetation pattern shows a complex mosaic where patches of *koferarete* are inserted in a matrix of *ka'a rete*, exhibiting spatial units with different land use history, composition and ages, with or without current fields. In addition, mosaics of succession on *ka'a rete* can be adjacent to *koferarete* patches or far from them, depending on the distance to the contemporary village (Silva, 1999).

Indigenous farming systems in the Amazon can accommodate different arrangements in cropping patterns, including dynamic combinations to better explore environmental, dietary and

[8] After the abandonment of the field, an orchard mixing banana, papaya, pineapple and other fruits may form, and will be harvested until around the fourth year. In addition to the fields, fallows and forests provide firewood, medicines, timber, fruits, raw materials for handcrafts, and shelter for game animals (Silva, 2002). The Kaiabi know more than 126 wild and semi-domesticated fruits, and use at least 69 different species for artifacts (Athayde, 1998).

market opportunities in specific cultural settings (Beckerman, 1987; Denevan, 2001). Agronomically speaking, the Kaiabi perform all the variations in crop arrays[9] found in the literature (Andréws and Kassam, 1976), as presented in Table 3-2 (for details, see Appendix E). It is essential to keep in mind that Kaiabi farmers carefully select microenvironments to plant each crop or combination of crops in order to reap maximum benefits and minimize detrimental ecological relations, considering all factors involved.

Areas on *ka'a rete* are planted with manioc practically as monocrops, accompanied by small patches of secondary crops. It is relatively common to see manioc fields side by side, in an ample sequence of time. In contrast, fields on *koferarete* can display great variation in multicropping, polivarietal systems. Depending on the size of the village, the same family plants adjacent fields on *Terra Preta* for some years and then abandons that patch, or most inhabitants place adjacent fields clustered in the same spot.

Field Size and Cycles

Kaiabi fields can show significant variation in dimension but the basic plot size for *Terra Preta* is about 0.6 ha. I also saw some fields with two and three times this size. Manioc fields usually are larger (about one hectare) but their size is more variable. However, my informants told me that the Kaiabi never opened a really big field (*ko'tuwiuu*) in the Xingu area[10].

A field with the basic size (0.6 ha) takes about three days to clear all bushes and lianas using sickles (*jyjapat*) and machetes (*tamoap*), and nearly another three days to cut down the trees using steel axes (*jywapyj* or *jywapina*). Sumaúma and jatobá are generally left untouched due to their large girth. Although the inajá palm is commonly cut down, its sprouts are tolerated in the fields.

[9] Berta Ribeiro (1979) and the Villas Boas brothers (1989) briefly described the Kaiabi agricultural system. I consider the differences between their information and mine to be part of the inherent variation in agricultural practices among the Kaiabi families from different villages, and due to the specific focus of their publications.

[10] Grünberg (2004) reported field sizes ranging from as small as 400 m^2 up to 0.5 ha for the Tatuy river, in 1966. All those fields were considered to be very small by his Kaiabi informants.

However, in recent years chainsaws are becoming popular, and I have noticed that more and more fields have been cleared using them. This fact has great relevance because of the (male) labor and energy implications it brings. Furthermore, trees once tolerated in the fields have now been cut down (Silva, 1999).

The Kaiabi recognize phases of vegetation succession in fallows based on the physiognomy and other criteria, as can be seen in Table 3-3. According to their nomenclature and based on my field observations, I estimated the following variations in fallow ratios. Although highly variable, depending on village-level particularities, I suggest that in general the cropping to fallow ratio might be around 2 to 3:15 to 20 years for *Terras Pretas,* and some 2:10 to 20 yr for Red Earths. However, in many circumstances I could observe shorter fallow periods, and I would estimate a ratio of 2: 5 to 10 or even less in areas where *Terra Preta* sites have either good productivity or are in short supply. It is noteworthy that even when land is abundant, the fallow period on Red Earths is reduced occasionally as a result of labor constraints, as is the case in the vicinity of Diauarum Post. There, in some places the ratio of 2:5 to 8 is a reliable figure, with poor productivity of manioc. However, I never saw these figures in villages.

Aiming to assess variations of soil fertility over time, Rodrigues (1993) carried out compound soil analysis of different ecozones under cultivation and fallows of different ages at Capivara Kaiabi village. His data confirm the elevated average fertility of *Koferarete* spots compared to *Ka'a rete,* and showed no strong evidence of soil nutrient depletion during the cropping phase and early forest regrowth, mainly for the *Koferarete* areas. I observed crops in sections of fields occasionally showing variations in productivity, which I regard as a consequence of the inherent variability within TP sites and / or due to differences in burning of slashed vegetation. Based on the literature and on my own field observations, I generally support Rodrigues' (1993) conclusions. However, he did not present his data according to the Kaiabi classification of vegetation successional phases (see

Table 3-3), which poses difficulties to interpret his findings. Furthermore, he established the age of some fields at 10 to 15 years, which is misleading. The Kaiabi visit old fields for some specific purpose for years, but this by no means implies that the field once cultivated in a particular site is still active for such a long time.

Timing and Agronomic Features

The Kaiabi year begins with the rainy season, roughly from September through May. The agricultural calendar starts with clearing and felling trees (April-May, and June), burning (August), planting (September through November), caring for the field, and harvest (Figure 3-1).

Agricultural activities are ruled by a series of natural events that signal the time for clearing, burning, and planting. Several signs for the beginning of the dry season mark the time to start working in a new field. The bird *junyra* never sings during the rainy season, so hearing it is one of the first signs. Also, the hawk *towotauu* can be spotted only in the dry season. The falling of the leaves of the *yagyp* tree is another sign of the beginning of the dry season. The appearance of large concentrations of *panã-panã* butterflies at the river's edge flying upriver indicates that the water level is at its peak, and will stabilize for three to four weeks before to start moving downward (*ytyryk).* In addition, windy days at the end of the Fall season, when the temperature is lower and provides a more comfortable time for working, signal the time to begin clearing the place for the field.

The Kaiabi carefully choose the site for their fields. Before opening an agricultural plot they study carefully the entire place, looking for micro environmental variations. Then, a thin trail is opened surrounding the area intended for the field. Kaiabi fields used to be circular (Villas Boas and Villas Boas, 1989), or *koewiwauu*. According to Arupajup, son of Jepepyri, in the Xingu area only one plot had this shape recently, in the middle 1980s, at the site of the old Krukisa village. As for other indigenous peoples in Brazil (Frikel, 1959, Galvão, 1963), post contact influence brought the rectangular shape (*kofuku*) to Kaiabi fields, which is the current pattern.

When a *Tabebuia* sp tree with dark flowers (*tameju'yp)* is blooming, the rainy season is about to come, so it is time to burn the field. The burning is performed by a group of men setting fire at different points of the site, from the edges to the center, in a day with calm wind. In general, the fields are protected by firebreaks, but it is not uncommon for the fire to escape and burn a significant portion of the surrounding forest. If the work is well done, the site burns for two or three days and then is considered suitable for the planting to begin. A second burning of debris is not commonly done, the exception being for specific spots, mainly for peanut cultivation.

The Kaiabi do not apply any type of fertilizers to their fields. However, Grünberg (2004) reported the leveling of the terrain at the Tatuy river, and I occasionally saw this practice in some villages in Xingu. The leveling is done with a stick, followed by throwing ashes and the remains of termite nests into depressions that show up after completing the burning. On this occasion, soft charcoal from the burned vegetation can be ground and spread over the soil. Commonly the Kaiabi place the most demanding crops close to burned trunks in order to benefit from the nutrients released by the ashes.

The most common tool used for planting is the hoe (*jywapekanget*). However, in at least one village[11] a planting stick made from a branch of the *api* tree[12] (*api yp*) was still in use, mainly for planting peanuts.

Although the Kaiabi can plant some crops such as yam and sweet potato before burning the field (a technique probably borrowed from the Kayapó), most commonly the sowing work begins

---

[11] Georg Grünberg (2004) anticipated that the use of the planting stick in Tatuy river was about to be abandoned in 1966. However, descendants of those who moved from this area to Xingu, currently living in Capivara village, kept performing this practice until today.

[12] The Kaiabi believe that using a piece of wood from a tree that fruits profusely (such as *api*, *Naucleopsis* sp, Moraceae) helps the peanut to provide an abundant yield.

after burning. Although manioc can be planted before the rains, the sign for planting most crops is what the Kaiabi call the *frog rain* (*kutap amana*), which usually comes in late September or October. This name comes from the *kutap* frog, which appears in great abundance on this occasion, and which is collected to prepare a dish called *kutap mutap*[13]. Most crops follow a fairly strict calendar for planting; hence, most families plant their fields at the same time. Maize and manioc are the exceptions, and can be planted from the beginning of the rains, in September, until late November. Replanting is done when necessary since the cropping season is still beginning.

In general, one or two light weedings are done with a machete (*tamoap*) at the beginning of the growing season, and sometimes close to the end of the cycle, to facilitate the harvest. Occasionally this practice is repeated in the second year but not for the whole area, addressing just spots where specific crops are grown. As a consequence of the modest weeding effort applied by the Kaiabi, Rodrigues (1993) postulated that they promote the regrowth of the forest through the lack of strong intervention in the establishment of earlier successional vegetation[14]. Thus, weed infestation would not be the cause, but the consequence of shifting fields. Although the topic of field abandonment is beyond the scope of this study, it deserves further research to clarify why the Kaiabi really shift their fields, investigating in depth a mix of soil conditions, weeds, and socio-cultural determinants.

The harvesting period varies according to the crops, starting in January (corn) through May-June (peanut), until one or two years later (sugar cane, manioc, cotton, banana). After the harvest, some products are stored in different types of storage facilities (*jiraus*).The structure built for yams

[13] *Mutap* is a kind of porridge prepared with manioc flour and game or fish meat, or field vegetables including yams, taro (roots), peanut, fava beans, pepper, leaves of a variety of taro and of manioc, and mushrooms. More recently, fried *kutap* are also appreciated.

[14] This statement is supported by recent propositions that, in normal conditions, *Terra Preta* soils have a faster weed colonization than the surrounding upland forest (Major et al, 2003), and might bear a better capacity to recover after agricultural disturbance (Erickson, 2003).

is roofless whereas those for maize (*y´pe ok awasiryru*) are covered with inajá palm leaves. In general the former is located close to the field, while the later can be placed either there or in the village of residence.

Loss of Production

Even with a remarkable agrodiversity and complex cropping arrays, loss of production can occur due to a series of environmental factors (climatic variations, predation by wild animals, pests, and diseases), non-material aspects such as witchcraft, and the intensity of land use. For the two first cases the Kaiabi apply agronomic practices, specific for crop, and others, magical and ritual. However, they do not fence their fields to prevent predation on fields by animals (looking for manioc, taro, sweet potato, peanut, maize)[15]. Pushed by these risks the Kaiabi people often plant a larger area than required by their immediate necessities (Villas Boas and Villas Boas, 1989). In years of abundant yield, overproduction encourages part of the field not to be harvested, and a sort of live gene bank is left in fallow areas scattered throughout the landscape (Rodrigues, 1993).

However, such practices do not always solve the emerging problems. Plants not harvested potentially offer opportunities for pests and diseases to multiply, which can lead to localized problems. In recent years I witnessed partial loss (some 30 %, I estimate) of peanut production in one field, probably due to a soil fungus. I also heard reports that in the early 1990s cotton production was seriously affected, but my informants were unable to tell me exactly what had happened (Silva, 1999). The ultimate explanation for these cases was that some people (in general the Xinguans are blamed for such acts), jealous of the exuberance of Kaiabi fields, sought to destroy their crops through witchcraft.

Recently, another less visible socio-economic issue regarding agrodiversity management surfaced in relation to the intensity of land use. As the Kaiabi occupy a huge area in the Xingu Park,

[15] Indeed, they use active field areas as hunting sites.

it appears that they would have abundant land for cultivation[16]. However, as I pointed out earlier, food multicropping systems depend on the availability of *Terra Preta* spots.

The first villages at Xingu were located on *koferarete* spots, and sheltered only more mobile extended families (Villas Boas and Villas Boas, 1989). From the 1960s on, villages became progressively more sedentary, first in order to facilitate services provided by the administration of the indigenous land, and later as a result of the establishment of infrastructure (pharmacy, school). Furthermore, a portion of the Kaiabi was willing to live in larger villages (Oakdale, 1996). This settlement pattern brought a growing demand for natural resources (fisheries, game, and specific plant species), including *Terra Preta* soils for agriculture.

Another important factor contributing to the demand for agricultural lands was the establishment of market-oriented, occasionally mechanized, rice and banana farming (Travassos, 1984). Although all these projects failed and were abandoned, they left a legacy of exhausted soils at some large villages. In this context, the limited dimensions of *Terra Preta* spots combined with sedentarism and the increasing land use pressure is leading to a decreased fallow period, compromising the productive potential of the most sensitive crops, peanut included. Also, land overuse poses risks to dynamic processes that characterize tropical forests under indigenous management (Gunderson and Holling, 2002).

In order to alleviate such pressures, some families adopted a strategy of establishing fields apart from their village of residence, in a *koferarete* site (*ko pe*, small farm, referred to as *fazendinha* in Portuguese). These farmers gain usufruct rights until they abandon the site or cede the use to others, usually a relative. Often there is a house for temporary use in these sites, and

[16] When calculating the land availability for agricultural purposes in the Xingu area, Rodrigues (1993) concluded that there is land enough for the Kaiabi to cultivate for the next coming generations. However, he pooled together Red Earth and Terra Preta, overlooking the most relevant environmental differentiation for agriculture, and thus invalidating his findings.

occasionally the family moves permanently to the place, constituting a new village. However, not all the people can establish their field sites outside their villages, or they are not willing to do so. Furthermore, occasionally the chosen place does not support a desirable level of productivity either at the village or at the *fazendinha*.

Several villagers stated to me that they have lost yields and seeds in recent years due to land-quality problems. They added that there are other more remote, unopened spots of *Terra Preta* in the interior of the upland forest, but they would need a tractor[17] (and its maintenance) to be able to reach such areas for performing agricultural activities on them.

Beyond the risk of losing harvests and crop diversity, changes in fallow cycles can also alter the floristic composition and the dynamics of the vegetal succession in field plots across the landscape (Ogkibo, 1984; Peters and Neueschwander, 1988; Sanchez, 1976). If this process is intensified at a regional scale, in the long run the whole Kaiabi agricultural system and the stability of their forests can be affected (Rodrigues, 1993). Altogether, the manipulation of land use intensity is complex in the context of historical and current environmental, social, cultural, economic and technological issues. Nevertheless, while acknowledging the dimension and nature of land use problems, outstanding farmers told me that people lose production and their seeds because of lack of care for their fields, and laziness. However, the subject deserves further ecological and social research which lies beyond the scope of this study.

Agrodiversity

Diversity and Identity

More than just an economic activity, among other representations of their material culture (Oakdale, 2004), crop varieties represent Kaiabi symbols that have been used to strengthen their

[17] Berta Ribeiro (1979) provided an early record for the desire of some Kaiabi men to have a tractor available in order to expand their fields, at that time aiming to produce surplus for marketing (mainly rice and beans).

own ethnicity, and to reaffirm their identity to other indigenous groups and non-indigenous as well (Ribeiro, 1979; Rodrigues, 1993).

The abundance of food is a hallmark of the Kaiabi people (Grünberg, 2004; Oakdale, 1996; Ribeiro, 1979; Villas Boas and Villas Boas, 1989). The Kaiabi say that it is shameful to ask for food but is even more shameful to not offer food to anyone visiting their homes (Travassos, 1984).

Most field products are used predominantly for food, but some of them are used in rituals, for fibers, utensils and pigments, and for feeding domestic animals. Just like their agriculture, Kaiabi cuisine is highly diversified. The staple diet of manioc flour (*kui ete* and *kui uu*) and fish and game animals is complemented by manioc bread (*manioko*, or *beiju*) plus various drinks and porridges (*kawĩ*) based on manioc, maize, peanut, sweet potato, banana, cocoyam, yam, and wild fruits (Grünberg, 2004; Ribeiro, 1979; Villas Boas and Villas Boas, 1989).

Through marriage, each Kaiabi fiancé brings seeds to form their agricultural plots, and most families tend to maintain a homegarden[18]. Also, as people keep track of old agricultural sites, *kofeterarete* can be a source of cuttings for some crops such as taro, manioc, sweet potato, and bananas (Silva, 1999). In addition, reciprocal visits to other villages provide opportunities to visit fields, when agricultural products and seeds can be offered as gifts. Moreover, curiosity leads to the experimentation with unknown materials, and Kaiabi farmers exchange germplasm with other indigenous groups, adopt plant novelties from rubber tappers and other social actors (in old times), and keep bringing crop and varieties from surrounding farms, cities and elsewhere. It is well known that among the crops that the Kaiabi consider to belong to their traditional agriculture there are species whose center of probable origin is located outside South America, signaling the very long

[18] Rodrigues (1993) noticed the spatial differentiation between fields and homegardens. The later display perennial fruit species, mostly exotics such as orange, mango, papaya, lemons, macaúba (*Acrocomia* sp), along with some native plants such as pequiá (*Cariocar villosum* (*Aubl*.) *Pers*.), genipapo (*Genipa americana* L.), murici (*Byrsonima* spp), guayaba (*Psidium guajava* L.), different types of ingá (*Inga* spp), mangaba (*Hancornia speciosa* Gomez), cashew (*Anacardium occidentale* L.), and occasionally peppers, cotton and annatto. Many medicinal plants are also present. Cuttings and seedlings of crops can be multiplied in this space.

time they have been planted by the people (Grünberg, 2004; Ribeiro, 1979; Rodrigues, 1993; Villas Boas and Villas Boas, 1989).

Externally led events carried out in the Xingu Park also can turn out to be an opportunity for an informal exchange of germplasm. I saw the crew working in the kitchen for such events taking samples of seeds or cuttings to plant in their fields, and some of my informants told me explicitly about this practice.

Nonetheless, a great variation in field composition (crops and varieties) can be found among farmers of the same village (Silva, 1999). Furthermore, Rodrigues (1993) argues that due to their historical migration, the adaptation process to the new environment, and recent socio-economic changes, several Kaiabi crop varieties disappeared and others became rare.

Virtually all the ethnic groups living in the Xingu Park value Kaiabi diversity. The Kĩsẽdjẽ and Kayapó (Metktyre) used to visit the Kaiabi to obtain seeds (Ribeiro, 1979). I witnessed several times the Yudja and Ikpeng doing the same (sometimes through the amateur radio instead of personal visits), and I heard about frequent seed requests from Xinguans[19]. Likewise, on several occasions I saw the Kaiabi bringing seeds from other places to plant in their fields, as noted by Grünberg (2004), Ribeiro (1979), Rodrigues (1993), and Villas Boas and Villas Boas (1989).

Non-indigenous were also attracted by Kaiabi crop diversity. Dr Warwick Kerr (personal comm., 1998) told me that he collected samples of Kaiabi maize in the late 1950s in the Teles Pires area. Berta Ribeiro (1979) and the brothers Cláudio and Orlando Villas Boas (1989) reported Kaiabi agriculture with superlatives. Recently, Kaiabi crop diversity caught the attention of a Brazilian research institution, which carried out a project including collection of peanut germplasm in one village in Xingu Park.

[19] On some opportunities, I was told that most Xinguans would actually consume the seeds as food instead of planting them. However, the Kaiabi consider better to attend their requests to avoid retaliation through witchcraft.

Crop Diversity

The repertoire of the main crops cultivated in Kaiabi fields amounts to about 35 species from 16 botanical families, and more than 150 varieties (Tables 3-4 and 3-5). My crop list and respective varieties were worked out through elders' free listing and group discussions I performed mainly in Capivara, Kururu (now Ipore) and Kwaryja villages, from 1996 through 1998. The list was reviewed in 2006.

The data on varietal diversity is a compilation of the results from a field survey I carried out in all Kaiabi villages in the 1999-2000 crop season (Silva, 2002). Table 3-5 shows that the figures obtained in my research extend beyond the information previously recorded on the group by Georg Grünberg (2004)[20], Berta Ribeiro (1979); Villas Boas and Villas Boas (1989), and Arlindo Rodrigues (1993)[21]. Nevertheless, Ribeiro (1979) warned that while the Kaiabi show the most diversified agricultural system within the Xingu Park, their crop diversity should also be compared to other Amazonian indigenous people. Recent data for manioc (e.g., Emperaire et al, 2004) confirm her statement, putting the Kaiabi in a moderate position among Amazonian groups with greater agrodiversity. Later in this chapter I discuss the number of, and names for Kaiabi manioc varieties.

Although Kaiabi crop diversity is comparatively modest, I believe that the apparent lower number of varieties reported by Grünberg (2004), Ribeiro (1979); Villas Boas and Villas Boas (1989), and Rodrigues (1993) derived from the specific focus of their studies, and the relatively

---

[20] Grünberg (2004) also ranked the crops according to their importance and highlighted the most used varieties.

[21] Regarding their sources of information, Georg Grünberg (2004) collected data with a few adults at Capitão Temenoni on the Tatuy river in 1966; Berta Ribeiro (1979) worked mainly with two informants (Mairan and Sirawe) in 1977, at Diauarum Post and surroundings; the brothers Cláudio and Orlando Villas Boas (1989) did not name their source but worked close to the Kaiabi since 1950. Although they referred to food and diet in other sections of their works, these three authors spent no more than three or four pages to describe the Kaiabi agricultural system. Rodrigues (1993) worked in Capivara village for 6-7 months in 1990 and 1991, and his main informants were Awatat, Kanisio and Juru. He dedicated two entire chapters of his Thesis to what he called the *Kayabi soils and agroforestry management*. Later on, Oakdale (1996) added relevant information about social and economic organization of households, nuclear and expanded Kaiabi families including agricultural issues.

scarce time dedicated to explore agrodiversity in the field. Above all, it seems that past research did not put enough effort into understanding the way the Kaiabi recognize and name crop varieties.

Origins, Maintenance and Decline of Kaiabi Agrodiversity

Before my study, Rodrigues (1993) was the only researcher to discuss Kaiabi crop diversity in depth, concerned with the conservation of biological diversity and the associated indigenous knowledge in the Amazon. He concluded that the conservation of both biological and cultural diversity is a key to guiding development of the region, rather than clearing the forest for agribusiness-oriented land uses.

Rodrigues (1993, p. 201). asked “why (does) such a small population (the Kaiabi) grow such a large number of different plants”? He pointed out three fundamental aspects that could shed light on the problem: the origins, maintenance, and decline of agrodiversity. Regarding the origins, Rodrigues contended that crop variability is a product of Kaiabi agricultural practices. He stated that the deliberate preservation of germplasm as such is not exercised by the Kaiabi, but the seeds are planted and recuperated every year at harvest time. This process allows for occasional mutations and gene combinations to be incorporated in the prevalent gene pool, enlarging it. Except for Rodrigues not mentioning the presence of crop diversity keepers, my field observations fully support his observations about the genetic dynamics of crops. This conclusion also confirms that *in situ* strategies for agrodiversity management have the potential to maintain the dynamic interplay of people, plants and landscape (Altieri and Merrick, 1987; Brush, 1995; Salick et al, 1997; Engels and Wood, 1999; Brookfield, 2003).

Expanding his arguments, Rodrigues (1993) asserted that each family grows its own fields, tending to have a little of everything. Products are kept for consumption and for seeds to be planted in the next season, without separation. Therefore, each family in a given village maintains a kind of ‘gene bank’. Thus, “the need for independence of the nuclear unit (the family) may be one of the mechanisms to explain maintenance of diversity", wrote Rodrigues (1993, p. 2002). In addition, he noted that the seeds are not strictly private, and in the case of loss for any reason seeds could be easily obtained from other families. This practice would contribute to and benefit from the cultural patrimony agrodiversity represents to the Kaiabi as a people.

My third point refers to Rodrigues' assertion that each family grows its own fields, a generalization that omits important information. Every married man is expected to open fields every year; however this expectation is not always fulfilled for several reasons. Instead of having individual family fields, some families may decide to work together in a collective, village level field, which in general is less diversified. Jyapã Kaiabi told me that

> Antigamente cada um fazia a sua roça, ou também quem tinha família grande fazia uma roça grande só para esta família, neto, nora, genro, tudo mais. Houve um mudança muito grande que (hoje) a gente pensa mais em fazer um mutirão, vamos considerar assim, uma roça comunitária. Isso mudou muito prá mim, mas sempre os nossos velhos não deixam de lembrar disso. Na minha aldeia acontece isso.[22]

Unexpected events that prevent people from opening a field may be linked to health problems or last minute travels. The involvement with what the Kaiabi called "activities of the whites" (working as teachers, for the health service, as a staff member of their association, or participation in meetings at the time to prepare the fields) is also an important reason for not planting a field. This phenomenon is more common among young adults, although not exclusively. Elders condemn such behavior, and say that the young do not want to work for their fathers-in-law anymore (in other words, they do not fully perform the bride service). In their view, many young men only want to find paid jobs, wear nice clothing and *stay clean*, dance to Brazilian music (*forró*) and play in soccer tournaments, forgetting about their obligations to the family. Sometimes, the nuclear families

[22] "In old days, everyone had their own field or whoever had a big family had a big field just for their family (including the grandchildren, son and daughter-in-laws, nephews and nieces, etc.) There was a big change today though and now we think more about working as a group (mutirão), like a big community field. This changed a lot for me, but the old folks don't forget about it [the old way]. In my village that happens". Jyapã Kaiabi, Capivara village. My translation from Portuguese.

lack an adequate supply of food, and they need to rely on other members of the extended family. To some extent, this behavior is socially tolerated on the grounds that for the Kaiabi it is shameful to ask for food, but is even more shameful to not give food to those in need of it.

Nonetheless, elders are also attracted to industrialized items and, consequently, support the search for paid jobs. Accordingly, a relaxation of the '*old*' requirements of exhibiting proper social behavior, knowing how to make utilitarian and symbolic artcrafts, and performing economic activities (such as farming, hunting, fishing, building a house, etc), came along with a new conceptualization of a good potential husband / son-in-law as one who can get a paid job and/or is able to provide external goods to his extended family (Oakdale, 1996; Senra et al, 2004).

This situation also reflects the Kaiabi's '*centrifugal dynamic'* as part of the construction of their personhood (Oakdale, 1996). She observed that young males are the most outgoing persons among the Kaiabi. Indeed, current elders criticize new generations for showing outward behavior despite having themselves spent their youth in relatively close contact with non-indigenous. From a strictly agricultural point of view, the ultimate outcome of both elders' and youngsters' behavior is decreasing the relative importance of farming (and the 'traditional' diet), and therefore, a drop in diversity of crops and cultivars. Oakdale (1996) stated that the future of the Kaiabi society depends on the struggle between the Kaiabi progressive and degenerative (conservative) perspectives about power and knowledge (which are contradictory but complimentarily). This view can be expanded to include the future maintenance of Kaiabi crop diversity.

A final point regarding not having a field relates to laziness. According to my informants, since ancient times there were those who used to not plant agricultural fields, or just made small ones that were not enough to feed their families. These people needed to beg for food from relatives. In Capivara village, Travassos (1984) reported the existence of a man considered lazy (*pukaje'em*) who did not clear a single diversified field for many years, and occasionally cultivated only manioc[23]. He was still living there during the time of Rodrigues' research, who directly mentioned his name. During my own time in Xingu this middle-aged man was living in the same place, exhibiting the same behavior. Furthermore, one of my key informants told me that this kind of laziness and lack of care for the family is a kind of family inheritance:

> (Isso acontece) porque ele puxa a raça da família dele, porque as vezes dentro da família, tradição, tem essa pessoa igual essa pessoa. Desde o tempo antigo. Ele puxa a regra da família dele. As vezes (…) faz de conta que não aprendeu nada, fica assim, não preocupa com a vida dele, com família. Fica pobre de alimento, não consegue ter as coisas dele.[24]

A fourth argument to discuss Rodrigues' (1993) findings concerns the provision of seeds for the next field. Several Kaiabi reminded me that, since old times, putting aside a provision for seeds immediately after the harvest is a practice every farmer is supposed to perform. Thus, the consumption of the entire harvest and the consequent lack of seeds for subsequent fields is also considered inappropriate behavior. Although tolerated, this behavior is socially condemned:

> (Isso) não acontecia não, é uma coisa daqueles que falta controlar, porque (…) aquele que tem tá ali, é sagrado, não tem que mexer. Tem que arrumar outro jeito (para comer) se tiver com fome. Tem que saber controlar isso. Antigamente, o que era pra comer ficava na roça, a semente bem guardadinha, não se toca, acabou. Voce só vai comer depois de plantar. Semente é semente. Porque não acabou antes? Se tivesse acontecido isso (não separar semente da produção para o consumo), já teria acabado há muito tempo, logo depois do contato com o branco[25].

Yet, certainly the seeds are not strictly private, but neither are they totally free. Those who receive seeds from anybody else must be open to providing his/her own seeds to others in need. As

[23] Indeed, such a behavior is considered a social illness, and Travassos (1984) commented on the intervention of a shaman to try to reestablish the correct order, and to bring this man back to his duties.

[24] "(This laziness happens) because he follows his family's breed, because sometimes, within his family, tradition, there is somebody like him. Since old times. He follows the law of his family. Occasionally, he pretends that he did not learn anything, he remains this way, he is not concerned with his life, with his family. He is low in food, unable to have things of his own." Jowosipep Kaiabi, Tuiarare village. My translation from Portuguese.

[25] "It didn't happen before, (but) it is done by those who lack control because…what's there (the seeds) are sacred and should not to be messed with. You have to find another way (to eat) if you're hungry. You have to know how to control that (urge). In the old days, what would be eaten stayed in the field and the seeds were well kept, no one touched them, that was it. You only eat after planting. Seeds are seeds. Why didn't they run out before? If that had happened (not separating seeds for production), it would have ended a long time ago right after contact with the whites." Mairawy Kaiabi, ATIX's former president. My translation from Portuguese.

such, it puts pressure on everybody to take on the responsibility for maintaining the seeds, a collective patrimony and reason for tribal pride (Rodrigues, 1993).

My field observations show broad variation in the circumstances in which an individual might need seeds, in addition to health problems in the family, death or another justified problems. Apart from not making a field, loss of production is frequently used as an explanation for not having seeds. Although the line separating demand for seeds caused by uncontrolled (including environmental reasons) and human-induced problems is difficult to be clearly plotted, currently the social tolerance for re-incidence seems to have bent to the lower side. Thus, in recent years some families were reluctant to deliver their seeds, accusing some of those in need of not having fulfilled their responsibilities. Moreover, in 2004 people in Capivara told me that some families were trying to charge cash for seeds, bringing elements of the capitalist rationale into an area until then regulated by the practice of social reciprocity.

Going further, Rodrigues (1993) commented on the ecological resilience of diversified agricultural systems to justify why the Kaiabi maintain relatively high crop diversity, and do not concentrate just on the most productive varieties. Keeping several varieties with lower productivity would help guarantee satisfactory harvests in the long run, and allow for the recovery of at least some seeds when facing a catastrophic event. In fact, if crop diversity faces deleterious changes and the system is based on only a few, more productive varieties in the short term, the ecological and social resilience can be potentially reduced (Peroni and Hanazaki, 2002). Although plausible (see Altieri, 1999; Altieri and Merrick, 1987; Berkes and Folke, 1998; Brookfield, 2001; Kresovich and Mcferson, 1992; Plucknett and Smith, 1984; Salick and Merrick, 1990; Swift and Anderson, 1994; Qualset et al, 1997), concepts of ecological resilience and sustainability represent theoretical understandings that demand further research to be proven in the Kaiabi context.

Finally, when addressing the issue of declining crop diversity Rodrigues (1993) noted the lack of several varieties that were previously grown by the Kaiabi in Capivara village, pointing to a loss of diversity. He stressed that elders' memory still kept the names of the lost varieties, and the pride of having great crop diversity. As the main causes for this process he blamed the transfer of the Kaiabi to the Xingu area, and the (then) incipient but rising market pressures[26]. In order to attend market demands, old crops and varieties would be at risk of being replaced to accommodate new priorities of space, time and labor devoted to cultivated plants. In order to discuss these assertions, a more detailed appraisal of the dynamics of Kaiabi crop diversity is called for.

A Quantitative Appraisal of Current Kaiabi Agrodiversity

Table 3-5 presents the number of varieties per crop found by previous studies, along with my own data for 2000[27]. The Table includes a tentative number of rare, *vulnerable varieties* per crop, which were conceptualized as those varieties cultivated by less than 20 % of the families (Silva, 2002). Here, I comment on the findings for selected minor and major crops.

Minor crops

Rice, pineapple, sugarcane, squash, papaya, arrowroot, wild cane, and the fruit trees at the end of the list were not included in the 2000 survey on Kaiabi agrodiversity[28]. Of these crops, the Kaiabi say that arrowroot and wild cane have just one variety. The remaining crops came from different external sources and present more than one variety.

[26] Although at the time of Rodrigues' research there were some initiatives to promote the market of agricultural goods, and still today some families, mainly of those living close to roads, do sell products in the nearby cities, this economic activity is not very intense among the Kaiabi. Manioc flour is the only agricultural product that reachs such markets, but neither quantity nor periodicity are regular.

[27] For details about this survey, see the sub-section on Crop diversity under the section about Agrodiversity in this chapter.

[28] At that time, Kaiabi farmers were concerned with diversity of the main annual crops, which influenced the survey design for excluding minor crops.

Calatea (*tamitoaram*) was cultivated by 17 % of the families, but it is associated with food taboos that prevent youngsters from eating it. Also, due to difficulties with harvesting all the roots, the plant can be found growing spontaneously in old fallows, which might be another reason for fewer positive responses concerning its cultivation.

Tobacco (*pytem*) is a special, powerful plant which is not planted by ordinary people[29]. Although it is occasionally present in fields, it is mainly grown in homegardens.

The majority of Kaiabi gourds (*y'a*) belong to the species *Lagenaria siceraria Standl.*, and have lost much of their importance as a crop due to access to industrialized utensils[30]. *Crescentia* is almost a curiosity, planted occasionally in homegardens.

Concerning peppers (*ykyj*), I surveyed only the 'traditional' variety, *ykyjete*, which was cultivated by some 16 % of the farmers. Currently the Kaiabi grow more than 10 different types of peppers in regular fields and in homegardens. The exact type cultivated by a family seems to be dependent on the opportunity to obtain seeds, and on personal preferences.

Major crops

Maize (*awasi*) is likely to have had greater agricultural importance for the Kaiabi in the past. Currently, it is still prescribed as an essential diet item during female seclusion, pregnancy, breast-feeding[31], for the couple during the couvade period (mainly for the first child), and in all the situations considered to be dangerous to a person (Grünberg, 2004; Travassos, 1984). Traditional maize varieties[32] were grown with varying popularity, with the percentage of Kaiabi nuclear

[29] Although the majority of male adults smoke a lot, they usually buy tobacco, avoiding cultivating the plant.

[30] Villas Boas and Villas Boas (1989) reported that the Kaiabi abandoned clay pots at an earlier time, when they still lived in the Teles Pires area. Although not far from abandonment, it is plausible to assume that gourds also lost importance since a long time ago.

[31] When commenting on the formation of a child's body, Oakdale wrote that "The most effective or healthy breast milk is the result of drinking corn *kawĩ*. The *kawĩ* becomes blood; the blood, milk." (Oakdale, 1996, p. 161).

[32] Here it is important to keep in mind that maize is an open-pollinated plant presenting metapopulations in indigenous fields (Louette, 1999). Hence, morphological variability is constantly found during harvest, blurring the boundaries

families who cultivated the crop ranging from 10% for *awasi aryry* up to 86 % for *awasi sing*, which has the greatest acreage among all maize varieties. On the other hand, more than 50 % of the interviewed families grew externally sourced popcorn and '*dent*' maize (mainly used to feed chickens). Although I was aware of the existence of distinct materials for these types, they were surveyed by their *general name*[33], respectively *awasi'i* and *awasi'uu* (small and big maize, respectively). Moreover, I included in the 2000 survey a variety called *awasi afua (*with short ears), the only one mentioned as a lost variety for the crop. Concerned with the recovery of agrodiversity, Tuiarajup (from Kwaryja village) actively searched for this type, and found similar maize in a Kĩsẽdjẽ village. He planted this variety in his field and later told me that, although similar, it was not the actual Kaiabi *awasi afua*. Therefore, he kept looking for the right type.

Yams (*ka'ra*): there were at least 16 varieties of *ka'ra* under cultivation by the Kaiabi in 2000. The most common variety is the traditional *ka'raete* or *ka'rasing'i*, which was cultivated by 46% of the farmers. Four more varieties were grown by more than 20% of them, and the remaining varieties were grown by 16 - 3% of the farmers. An important issue concerns the identification of some varieties such as the native *ka'ra ywypep* (*forest yam, or cará do mato*). This name is applied to any *Dioscorea trifida* plant found in successional plots, encompassing great morphological variability. Another example that mixes naming and origin issues involves *ka'rau'i*, which was received from the Xavante Indians some decades ago. Currently, many adults overlooked its source, perceiving the variety as a truly traditional Kaiabi one.

---

among varieties. Furthermore, Kaiabi farmers frequently plant different maize varieties close to each other, separated by a short time interval. Most varieties are separated after the harvest based on morphological traits of the ears and kernels.

[33] I decided to use the *general name* because maize is not the main focus of this research. Subsequent finer morphological particularities (color and shape of the grains, length of the ear, etc), plant architecture and cycle, among others could be applied as successive distinctive criteria for discriminating maize varieties, but I did not have the time to devote enough attention to track their uniqueness, specific names and correct origins.

Cotton (*amyneju*): there are two "traditional" varieties of cotton belonging to *Gossipyum barbadense (amyneju owising*, and *amyneju pytan* or *amyneju owiwytang)*. They are easily separated by the color of the fibers, respectively white and brown. Although unevenly cultivated across villages, respectively 64% and 25% of the farmers grew these varieties in 2000. A third type is a *G. hirsutum* (*amyneju piamuku)*, from the city, which possibly came from more than one source. It is praised because of its longer fiber, and was grown by just 10% of the farmers.

Taro / cocoyam (*namu'a*) is an interesting case. Two families declared to have one variety (*towana'ja*) which was counted in Table 3-5 as one of the vulnerable varieties. I never saw it, and after the survey some Kaiabi looked for this type to propagate it in their fields. Nobody was able to find it, and this variety was considered to be extinct. The other varieties were cultivated by 4% and 28% of the nuclear families.

Manioc Diversity

Rodrigues (1993) called special attention to manioc, for which he found eleven varieties. He questioned why the Kaiabi exhibited such low diversity for a crop important for their subsistence. He concluded that other crops demand attention, time and labor to keep a diversified agricultural system, which would prevent the Kaiabi to devote efforts to develop manioc diversity. The transfer to Xingu would also have contributed to decrease the number of manioc varieties.

Checking his hypothesis, I identified 15 manioc varieties in 2000, when I still had a limited understanding about the identification and the correct name of some of them, and did not know many varieties. In 2006 I used this list of varieties as a preliminary guide to ask married farmers from all Kaiabi villages about what manioc varieties they were cultivating[34]. I found 53 varieties in cultivation in the villages.

[34] The sample included 36 out of 38 extended families because it was not possible to interview the Kaiabi head of the Kaiabi- Kĩsẽdjẽ Onze village; and a second family was not cultivating any fields during the 2006 cropping season. In

As there is no published study of the genetic makeup of the Kaiabi manioc varieties, it is not possible to draw conclusions about the relationships between variety names and genetic diversity. In this context, counting varieties by name without genetic identification could be misleading (Sadiki et al, 2007). However, I privileged farmers' perception of diversity. To avoid misidentification of varieties, during the interviews I was accompanied by a very acknowledgeable Kaiabi farmer[35].

Kaiabi taxonomy for manioc considers mainly morphological traits (color of the stem, leaves and buds; height; branching habits; color of the external and inner skin of roots; and color of the raw flesh); main uses; and sometimes, the source of a given variety. However, some varieties are very similar, and harvesting a toxic variety by mistake instead of a non-toxic one occasionally led to accidental deaths.

Distinct names are applied by the Kaiabi to four *broad types*[36] of manioc according to their use and assumed cyanogenic potential[37], which are generally used as a prefix for the names of individual varieties: *many op* is a toxic manioc used mainly for flour, and secondarily for starch; *typyak*, also considered poisonous but with varying toxicity, is used mainly to extract starch; *maniakap*, is less toxic and produces sweet juicy roots used to prepare a special beverage; and *maniatata*, the non-toxic manioc[38], is used mainly cooked. However, within each broad type there is

---

total, one hundred forty three nuclear families living in twenty one places were interviewed. Looking for all the variation available, the interviews were semi-structured.

[35] Nevertheless, it was not possible to verify the identity of some varieties.

[36] Although these broad types of manioc represent covert categories that were translated into Portuguese as *nomes gerais* (*general names)*, the Kaiabi did not refer explicitly to them as such. In addition, most the time they included the starch type (*typyak*) along with the toxic group. I presented the four groups separately as an artifice for helping to explain manioc diversity management.

[37] For a discussion on the distinction between bitter and sweet manioc varieties, see Mkumbira et al (2003), Nye (1990); Wilson (2003). For data on the proportions of toxic and non-toxic manioc varieties for several indigenous and traditional populations in the Amazon, see Desmoulière (2001); Emperaire et al (2001); Emperaire (2004); Salick et al (1997).

[38] The Kaiabi grew only bitter manioc (*maniy ete*) before entering in contact with non-indigenous travelers. Until around the middle 1960s, the non-toxic type (*maniatata*) was almost a curiosity or just a symbol of social status showed to the rubber tappers (Grünberg, 2004; Villas Boas and Villas Boas, 1989).

no unique use for any variety, and from a utilitarian perspective they could be replaced without prejudice. Here taste and aesthetics play a role in establishing preferences. Also, the findings are concordant with Salick et al (1997), Emperaire et al (1998), and Elias et al (2001a), who concluded that there is no correlation between morphological characteristics and use, and most manioc varieties were adequate for different uses.

Manioc varieties under cultivation by the Kaiabi in 2006 were split among the broad types as follow: *many op* (bitter): 15 (28.3 %); *typyak* (starch): 2 (3.77 %); *maniakap* (sweet): 9[39] (16.98 %); *maniatata* (non-toxic): 27 (50.95 %). The literature discusses manioc diversity management based just on the distinction between toxic (frequently called bitter) and non-toxic (mostly known as sweet) manioc varieties. The proportion between toxic and non-toxic varieties for selected cases in the Amazon shows a wide range between the extremes of 0 to 100% (Desmoulière, 2001; Emperaire et al, 2001; Emperaire, 2004; Salick et al, 1997). According to how a "bitter" variety is conceptualized, this proportion for the Kaiabi varies from 49.05% when *typyak* and *maniakap* varieties are added to *many op* ones, to 28.3% when considering only *many op* varieties.

The origins of Kaiabi manioc varieties are not homogeneous, and they are difficult to track. Nevertheless, I present a tentative picture. *Typyak* came from other Xinguans Indians. Two *maniakap* are considered to be traditional to the Kaiabi, while another six came from Xinguan Indians but have an uncertain origin. All *maniatata*[40] came from rubber tappers and, more recently, from neighboring farms or cities through farmers' social networks, sometimes intermediated by other Indians. Although historically absent from their fields, it is remarkable that today *maniatata* varieties account for half of the total number of the Kaiabi's manioc collection.

[39] The 2006 survey included just eight varieties. I was told about a ninth one during one of my last interviews. Therefore, I was unable to check whether other farmers were cultivating it.

[40] Grünberg (2004) and Villas Boas and Villas Boas (1989) make it clear that the first non-toxic types of manioc were introduced by rubber tapers. The Kaiabi did not have great appreciation for these types until at least their migration to the Xingu area.

Sources of *many op* varieties were more difficult to identify, with four considered to be Kaiabi from the Teles Pires / Tatuy areas, and four from Pará. Seven remaining varieties have uncertain origins, and may have been introduced from other Indians, farms or cities.

Overall, at least 10 varieties out of the 53 (18.87 %) are considered to have been with the Kaiabi for a long time. In addition, I witnessed a *maniakap* variety (in Três Patos village) and a *maniatata* variety (in Kwaryja village) recovered in old fallows, probably originated from seeds[41], which were not counted in the 53 total.

Because of the above mentioned disjunction between varieties' names and genetic makeup, and the required effort to conduct field surveys, recent reports on manioc diversity lack commentaries on what are the most common varieties and what ones occupy the largest area. Likewise, the proportion of farmers who grow each variety is seldom recorded. An exception is the case of the Kuikuro of the Upper Xingu, who in 1975 had 46 manioc varieties under cultivation of which only six were common, accounting for some 95 % of all planted manioc (Carneiro, 1983).

For comparative purposes and to discuss Rodrigues' (1993) conclusions about Kaiabi diversity management, I analyzed the manioc varieties grown by the Kaiabi in 2006 aggregated by broad types, and individually. I split the data into sets of nuclear and expanded families, and by elders and youngsters, for Capivara and for all of the farmers of the remaining Kaiabi villages in Xingu.

In 2006, all the villages grew all the broad types, except two, Três Buritis and Mupada, where *maniatata* and *maniakap* respectively were absent (Figure 3-2). The average percentage[42] of broad

---

[41] As mentioned earlier, indigenous farmers are aware of manioc's reproductive biology, and take advantages from it to generate crop diversity (Chernela, 1986; Salick et al, 1997; Pinton and Emperaire, 2001; Elias et al, 2001b). However, the Kaiabi do not conceptualize cross fertilization as a biological event. Hence, manioc plants from seeds are considered to be gifts from the ancestors mediated by spiritual beings.

[42] Average percentages were calculated for each social segment considering the percentage of the number of varieties for specific broad types each individual farmer was cultivating in 2006.

types of manioc varieties grown by nuclear and expanded families, and for elders and young farmers, in Capivara and for all the remaining Kaiabi villages, in 2006, is depicted in Figure 3-3. Comparing the mean number of manioc varieties for each of the four broad types, for all manioc varieties polled together, and varieties cultivated by less than 20%, I found most figures for extended families to be statistically higher than those for nuclear families for both Capivara and all the remaining Kaiabi villages, (Tables 3-6 and 3-7). However, within Capivara the mean values for *typyak* (starch) and *many op* (toxic) were different. In addition, the means for expanded families in Capivara and all extended families living in the remaining villages, and the means for nuclear families in these same locations were consistently not different. The same conclusion applies for the mean number of manioc varieties grown by groups of both elders and youngsters, in Capivara and elsewhere. Therefore, independent of place, nuclear and expanded families, and elders and youngsters, showed a similar pattern in terms of the mean number of manioc varieties under cultivation in 2006. However, for Capivara only the means for *maniakap* and the total number of manioc varieties for the group of elders were statistically higher compared to the youngsters. For the remaining villages, *typyak* and the number of varieties cultivated by less than 20% of the farmers were not different for elders' and young's groups. These findings suggest that expanded families may have distinct strategies for distributing manioc varieties within their fields. While some families grew broad types in distinct fields belonging to nuclear families at different ages, others mixed them to a varying degree.

Of the 52 varieties surveyed, 15 (29%) were under cultivation by more than 20 % of the nuclear families in all Kaiabi villages except Capivara, encompassing 2 *maniakap* (25%), 2 *typyak* (100%) , 7 *many op* (47%), and 4 *maniatata* types (15%) (Table 3-8). Individually, the most common variety was *tukunare*, a toxic type that was grown by 86% of the nuclear families in Capivara in 2006, while among the remaining farmers this proportion reached 55% (Figure 3-4).

The second and third most popular varieties were starch types, respectively *typyak un* and *typyak sing*. Following, were *maniy witang* (toxic), *maniatata sing* (non-toxic), and *jakamangi*, a traditional sweet type. Maniyaka sing (sweet) completes the list of 7 varieties cultivated by more than 50% of the nuclear families. The other varieties cultivated by more than 20 % of the farmers were *maniy wuni* (toxic), *maniy ywuwi* (toxic), *maniatata ywoni* (non-toxic), *typyak sing* (starch), *maniysing* or *maniy ete* (toxic), *maniatata ywowi* (non-toxic), *man'ywa kãmuku* (toxic). Finally, *maniatata that looks like the type kãmuku* (non-toxic) was cultivated by 19% of the Capivara farmers, but was not found in other villages; and *piawuu*, a toxic variety that came from Pará, was grown by 27% of the farmers outside Capivara, but was not under cultivation in this village in 2006.

Seven out of the 15 (47%) varieties cultivated by more than 20% of the farmers were considered to be traditional to the Kaiabi. *Tukunare*[43] came from outside Xingu[44] and in 2006 occupied the largest acreage[45] of all manioc varieties. It produces a much-praised flour, which is used both for consumption and for marketing. In contrast, *maniysing* (also known as *maniy ete*), a toxic variety that is considered to be the true manioc for the Kaiabi, showed a relatively low presence in the fields. By contrast, starch types *(typyak)* were adopted by the Kaiabi to prepare a white, finer *beiju*[46] in the Xinguan style, from the starch extracted by sun drying the water from washing ground root flesh. Before their transfer, the Kaiabi used to prepare a yellowish, thicker kind of *beiju* (*manioko ete*) that is made from the flesh of fermented *many op* roots (*puba*). Currently, both kinds of *beiju* are found in the villages, implying an enrichment of the diet rather

[43] This variety is very similar to three other types, *maniy witang*, *piawuu* and *karupã*, all directed to make flour. In my 2000 survey I was not aware of such distinction, and probably overlooked the differentiation of these types, biasing my results.

[44] I was told contradictory information accounting for its origin, which could be from the Kayapó Indians, from the Kaiabi territory in Pará, or from the city. Maybe it came from more than one source.

[45] Comments on acreage are based on my field observations and on narratives from the Kaiabi. I do not have quantitative data on the area planted to each variety.

[46] *Beiju* is a round flat cake made of manioc dough, usually with a diameter of 30-50 cm.

than substitution. In turn, old sweet types (*maniakap*) share acreage with Xinguans varieties, but all of them have similar usage (for preparing a porridge, or *kawĩ*). *Maniatata* varieties, in turn, all of which came from elsewhere to Kaiabi fields, showed great variation in their distribution. While some varieties were fairly widespread in 2006, others were found in only one or two places.

Eleven manioc varieties were under cultivation by less than 20 % of the nuclear families in Capivara, or 21% of the total (Table 3-9). In comparison, for all the remaining villages there were 41varieties (79%) in the same condition. However, the proportion of varieties within each broad type differed from Capivara in relation to the other villages, with the most contrasting type being *maniatata*. Overall 29 (56%) varieties were not in cultivation in Capivara in 2006 and just one variety was not found in all other villages.

Although the data available do not allow conclusions about the genetic makeup of manioc varieties, the popularity of the *tukunare* variety shows either a change in taste for manioc flour (when directed to subsistence purposes), or the influence of market demands for crop diversity composition, as claimed by Rodrigues (1993). It is noteworthy that manioc is the sole Kaiabi crop that reaches both the internal (Kaiabi families and other Indians) and external (nearby cities) markets at significant volumes. Other crops occasionally sold are directed mainly to Kaiabi families (seconded by other tribes), and operate in a different dynamic than that for manioc flour. So far, direct market influences on agrodiversity seem to be circumscribed mainly to manioc. However, cultural determinants expressed in changes of food habits also influenced agrodiversity management, as can be seen in the case of the starch and non-toxic varieties. Yet, while the majority of the villages grew all the broad types, the distribution of specific varieties seems to be at least in part spatially discrete, with different families favoring a set of varieties which in general mixes popular varieties with other less widespread and rare ones. Family repertoires include manioc varieties considered traditionally Kaiabi along with others coming from outside the group.

Pinton and Emperaire (2001) identified two models for manioc diversity management in the Amazon: one connected to dispersal and the other associated with centralization, with variation between the extremes. Both models show the linkages of agrobiodiversity with the global functioning of societies and with the respective agroecosystems, and are associated with the way diversity is perceived. In many cases, these models are also connected to public policies.

The first model represents a *dynamic management* based on a continuous renovation of diversity through broad social networks exchanges, and additions from seed-derived plants. The patrimonial dimension of the varieties is highly considered both by families and individual farmers. In this case, the whole set of varieties, or the collection, is what makes sense as the diversity management unit.

The second model is referred to as *static management*, which aims to select varieties well-adapted to local, economic or ecological pressures. Plants from seedlings are rarely incorporated as a source of variation, and diversity is constrained to a few varieties. The management unit is the variety itself. This model is more associated with non-indigenous settlers in the economic frontier in the Amazon, but contemporary indigenous peoples more influenced by market forces may fit in the model as well.

For the Kaiabi, a centralization trend can be identified in the case of the toxic type of manioc, as illustrated by the *tukunare* variety. Although Kaiabi manioc varieties are not a family patrimony like it occurs in the Rio Negro area, it is clear that the Kaiabi case is much closer to the *dynamic management* system. It includes the acquisition of varieties from exchanges with relatives, other Indians, and non-indigenous, and from seed-derived plants. No individual or family cultivated all the available manioc varieties; nevertheless, diversity keepers take care of a high proportion of varieties while others contributed only modestly to this goal. In the end, all farmers benefit from these repositories.

Currently, the loss of priority or the abandonment of varieties seems to be isolated to a portion of the total available to the Kaiabi, with a limited number of concerned farmers keeping less common traditional varieties in their fields. Rather than being lost, the number of Kaiabi manioc varieties is increasing over time. However, while new varieties are added, contributing to within-crop diversity, the Kaiabi are experiencing cultural and socio-economic transformations that raise the risk of loss of specific varieties (and their genes). In this case what is meaningful for the Kaiabi is the management of the whole set of varieties instead of focusing on specific ones, as noted by Pinton and Emperaire (2001) in other areas of the Brazilian Amazon.

Overall, the 52 manioc varieties represent more than four times the figures reported by Rodrigues (1993), many of which have a well established record prior to his research. Acknowledging that part of these varieties may be new does not allow concluding that such a great number of varieties arrived or was created in the last 15 years. Therefore, the arguments Rodrigues used to justify an apparently low diversity for an important crop, based upon an economic approach and a historical tragedy (the transfer to Xingu), are at best partial explanations to his quest for why the Kaiabi grow a relatively high number of crop varieties. Apparently, he overlooked the importance of identifying and naming Kaiabi varieties, and their family and spatial distribution. Moreover, Rodrigues did not realize the dynamic management of agrodiversity performed by the Indians that includes other social and cultural determinants. In this context, Kaiabi adaptation to the new human and ecological environment is remarkable, demonstrating that their history, and economic and cultural changes did not prevent their agency to be expressed through crop diversity management.

Conclusions: Transforming Agrodiversity

Empirical research has demonstrated context sensitive, multicausal motivations for indigenous farmers to appreciate, create, and manage crop diversity (Emperaire et al, 2001; Brush, 2004; Cleveland et al, 1994; Thrupp, 1998; Zimmerer, 1996). The findings of this chapter suggest that the Kaiabi as a group were able to incorporate socio-cultural and technology changes to adapt their agricultural system to the new human and ecological environment after moving to the Xingu area. One of the most remarkable strategies for adapting was to rely on the use of *Terra Preta* sites for agricultural purposes. However, today several villages are suffering the consequences of the scarce availability of *terra preta*, Kwaryja and a few others being the exception. There are signs that intensive land use has led to resource depletion, which poses challenges for agrodiversity management. Furthermore, ongoing transformations in social organization related to agriculture, farming technology, the emergence of paid jobs, and the intensification of cross cultural interactions play an increasing role contributing to reshape agrodiversity management. For now the body of Kaiabi farming technology is still well preserved as a whole, even if it is not exercised in all opportunities. The adoption of new elements such as metallic tools, new crops, and even chainsaws has not caused structural changes to the system. As good land is an essential basis for keeping Kaiabi diversified fields operative, if the incipient use of new agricultural technology components, such as chainsaws, becomes widespread, it may contribute to environmental and social changes in the long run. Crop varieties are technological components also subjected to changes.

The study of manioc varieties showed how dynamic Kaiabi agrodiversity management is. Although counting varieties by name can be misleading for estimating genetic diversity (Cleveland et al, 1994; Zimmerer, 1996; Sadiki et al, 2007), studies about the origins, exchanges and naming manioc varieties in the Amazon exposed the fluidity of indigenous crop genetic resources (Emperaire, 1998; Elias et al, 2000; Heckler and Zent, 2008). Also, it is clear that varieties names may obscure their management history (Emperaire, 2005, and Sadiki et al, 2007). Therefore, the appraisal of indigenous crop diversity is necessarily linked to the researcher’s ability to uncover native ways of identifying and naming crop varieties (Emperaire, 2005), and to understanding how diversity management operates (Pinton and Emperaire, 2001).

Kaiabi farmers maintain agrodiversity through a process performed with relative independence by different families in distinct villages. Novelties are incorporated into within-crop diversity and, depending on their morphological particularities and uses, new materials can receive a different name, or the same name as a previously existent variety. As a particular variety spreads across the villages, it occasionally receives other names, and synonyms surface. Occasionally, the origin of a given variety is lost, and it comes to be considered a truly “traditional” variety.

Nevertheless, Kaiabi farmers adhere to this general management framework at varying degrees. Priority and attention can vary according to crops, family history, personal perspectives, and degree of relations with market (in the case of manioc). While some farmers seem to not care about their varietal patrimony, others work actively to maintain or increase it. In this context, relaxing social practices for agricultural production such as collective work through *mosirup* contributes to decrease crop diversity, through diminishing opportunities for exchanges. However, visiting other villages (and by extension, agricultural fields) is still a solid practice that did not show signals of weakening. In addition, nuclear families keep interacting within their respective expanded families for agricultural production, which may apply peculiar strategies for crop diversity management. In general, Kaiabi elders take decisions about the repertoire of crops and their varieties (because of specific requirements related to age or food taboos, culinary tastes and cultural memory), and their distribution in fields belonging to young and elder members of their expanded family. Therefore, the expanded family is the social unit for agrodiversity management, and the biological unit is the whole collection of varieties available, which may likely vary over time in the fields of a given family.

I also demonstrated that although youngsters could be blamed for pursuing paid jobs and showing an increasing lack of interest in working in the fields, elders also feel attracted by external novelties and industrialized goods. Consequently, while differences between age groups do exist, threats to the agricultural system have deeper roots within the whole society, and extrapolate a specific age group. For crop diversity specifically, elders' and youngsters' behavior determines varietal abandonment or turnover, which may vary depending on each crop.

Stephen Brush (2004) extends Levy-Strauss's analogy of premodern peoples as "bricolers" to farmers. He put emphasis on the assembly of discrete elements related to crops, varieties, and agricultural technology available to farmers from experience, which are selected and maintained for meeting specific functions in household production. Kaiabi farmers continue to be proud of their crop diversity, and constantly reaffirm it as a symbol of their identity. As many other Tupi groups, they show a propensity to orient themselves outside their society (Viveiros de Castro, 1992; Oakdale, 1996), incorporating behaviors, processes, knowledge, and technology from outside into their own cultural settings. Along with other manifestations at the core of their most important values, crop diversity coming from distinct sources has been historically internalized as a truly Kaiabi creation. The product of such additions, crop diversity, is exhibited as part of their own expression of ethnic identity.

Just like other aspects of their culture, the ultimate balance between additions and losses of Kaiabi crop diversity mirrors the effort to reconcile the demands for staying close to the ancestors' lessons, while accommodating desires for novelties from curiosity and interactions with an ever-changing world.

Table 3-1. Main Kaiabi ecozones and respective ethnopedologic categories (adapted from Silva and Athayde, 1998).

Ecozone	Description	Main soils	Water influence (WI)
Ka'a rete	Dominant upland, mutistrata forest, up to 25 m; low light in the lower strata.	a) Ywypirang (red earth), ywypytang, (brown earth); ywypytangpytang or ywyparap (intergrade between the two previous) b) *Ywyrugou* (soft soil with abundant root systems adhered to)	a) Variations of Red and Yellow Oxisols, some Ultisols. b) High organic matter hydromorphic soils WI: punctual and infrequent
Kofet and variations	Mosaic of secondary succession on upland forest at different phases, predominating herbs, bushes or trees according to particular site conditions.	Same as above	same as above
Koferarete	TP, multistrata forests and its successional phases; presence of indicator species; fallows and fields.	Ywy on (black earth)	TP; virtually free of WI
Kofet remejep	Transition between *Koferarete* and *ka'a rete*.	Ywypytang (brown earth); ywypirang on (blackish / reddish earth)	Transition TP / Oxisol; virtually free of WI
Koferãn	A "false *kofet*", with vegetation and / or soil partially developed; also, a fallow in the transitional area between *koferarete* and *ka'a rete*.	Ywypirang on	Transition TP / Oxisol; virtually free of WI
Yapopet	Pioneer forest under fluvial influence; the floodplain forest. Shorter (15 m), less strata than *ka'a rete*. Presence of selective species; deciduous trees.	*a)Ywysigo on* (sandy dark earth); b)*Ywysing* (sandy white earth); c) Tujuk (clayey / loamy white earth, at river benches)	a) High organic matter hydromorphic soils b) Quartzipsamment / hydromorphic soils c) Lower organic matter hydromorphic soils Strong WI; flooded during the rainy season.
Yatarã	Vegetation of inundated areas, mainly in areas of the influence of creeks. Pioneer formation with presence of selective species.	a) Ywy on (black earth); b) *Ywysigo on* (occasionally);	a) High organic matter hydromorphic soils b) Quartzipsamment; intense WI.

Table 3-1. Continued

Ecozone	Description	Main soils	Water influence (wi)
Ypoo	Pioneer formation on sandy areas. Less diverse than yapopet, predominance of bushes and shorter trees.	*Ywysing*	Quartzipsamment; Strong WI throughout the year.
Ka'a papawet	Pioneer formation adjacent to lagoons and delta of creeks; grassland with bushes and sparse, deciduous trees.	a) *Y*wysigo on; b) *Y*wysing; c) Tujuk	Soils: same as yapopet; Strong WI throughout the year, subjected to seasonal flooding.
Jũ	Grassland Savannahs with sparse bushes and occasional short trees.	a) Ywysigo on; b) *Y*wysing;	a) Hydromorphic soils b) Quartzipsamment Strong WI, subjected to seasonal flooding.
Jũsing	Savannahs with mixed physiognomy including trees and bushes occasional short. Less floristic diversity than yapopet.	a) *Y*wysigo on; b) *Y*wysing;	Soils: same as jun Strong WI, subjected to at least partial seasonal flooding.
Jũpiray	Savannahs Park with trees and bushes on the hills (eweteri), and herbs and grass on the ground ipirã).	a) *Y*wysigo on the ground; b) Ywypytang on the hills	a) Hydromorphic soils b) Yellow / Brown Oxisol Strong WI

Table 3-2. Variations in cropping patterns in Kaiabi agricultural fields (Silva, 1999, 2003).

Kaiabi name	Common name	Mixed	Small patch	Row	Monocrop patch	Relay	Strip	Ratoon	Monocropping
1.Amyneju	Cotton			X		X		X	
2.Awasi	Maize			X	X	X			X
3.Jetyk	Sweet potato				X	X			
4.Ka'ra	Yams				X				
5.Kumanai'i	Beans	X							
6.Kumanauu	Fava	X							
7.Kumarataia	Curcuma		X						
8.Maniyp	Bitter manioc			X	X	X	X		X
9.Munuwi	Peanut			X	X				
10.Muãngtai'i	Ginger		X						
11.Namu'a	Cocoyam, taro				X				
12.Pytem	Tobbacco		X						
13.Tamituaran	Calatea		X						
14.Urucu	Anato								
15.Uruywypy	Arrow root		X						
16.Wuy'wa	Cana brava								X
17.Y'a	Gourd	X							
18.Ykyj	Pepper		X						
19.Arusi	Rice				X				X
20.Juparaparauu	Pineaple		X	X					
21.Kana	Sugar cane				X				
22.Kuirua'uu	Squash	X							
23.Maniatata	S. manioc			X	X	X	X		X
24.Menansi	Water melon			X		X			
25.Mõmõ	Papaya	X							
26.Pakua	Banana			X	X	X		X	

Table 3-3. The Kaiabi main categories for successional vegetation phases.

Phase	Main features
Iapoé	The place chose for a field but not opened yet.
Iapoyau	The end of a new field, corresponding to the beginning of the successional process.
Koja yp	A second year field, also corresponding to the beginning of the successional process.
Iapopyret	A place where a field was put two years ago or so exhibiting a transition between initial and intermediary successional process.
Kofet rymã	An old fallow around ten years old corresponding to an intermediary successional process.
Kofet rymamã	An old fallow around twenty years old corresponding to a transition between intermediary successional process and the secondary forest.
Kofetemã	An old fallow of advanced, unknown age in a *ka'a rete* area.
Kofetrã	A false *Kofet* occurring at places subject to hydromorphic conditions.

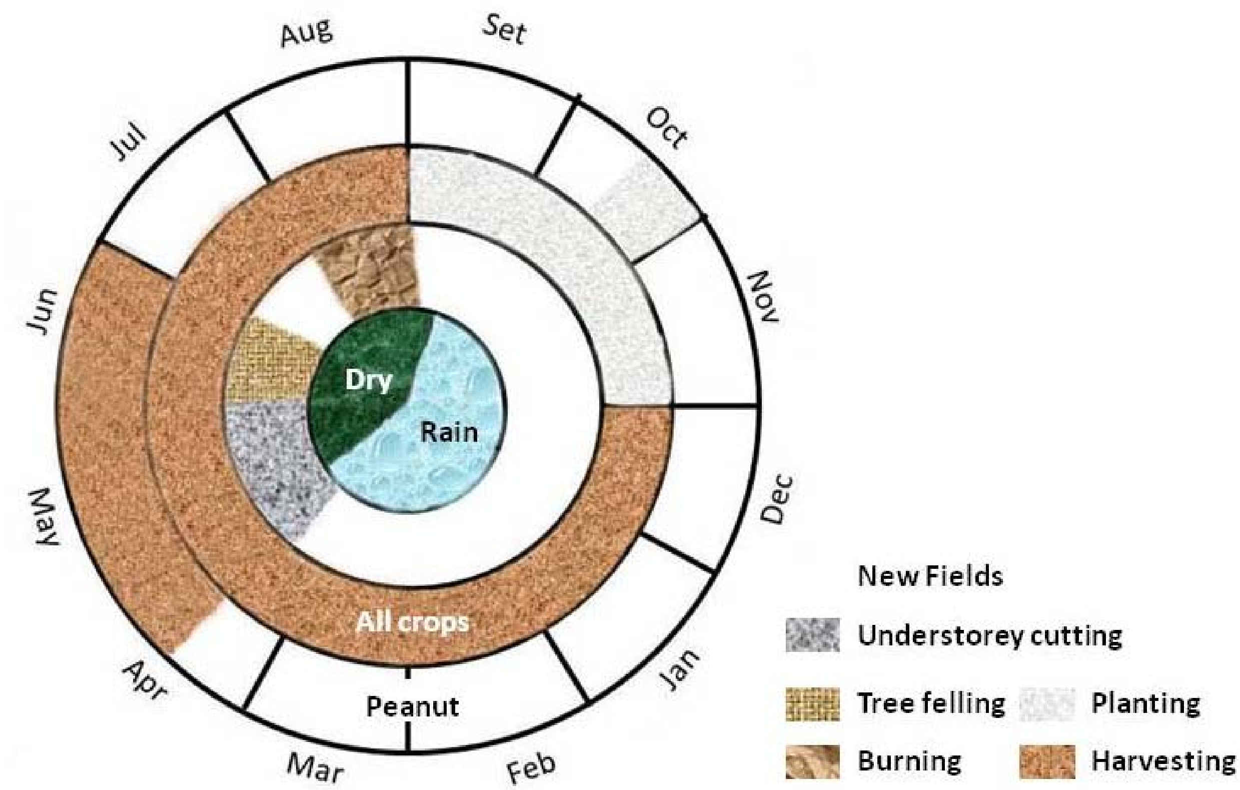


Figure 3-1. Preferred periods for major Kaiabi agricultural activities (adapted from Rodrigues, 1993).

Table 3-4. Identification of crops cultivated in fields[a] by the Kaiabi people[b].

Kaiabi name	Common name	Species	Family
1.Amyneju	Cotton	*Gossypium barbadense* L.; *G. hirsutum* L.	Malvaceae
2.Arusi	Rice	*Oryza sativa* L.	Poaceae
3.Awasi	Maize	*Zea mays* L.	Poaceae
4.Jetyk	Sweet potato	*Ipomoea batatas* (L.) Lam.	Convolvulaceae
5.Juparaparauu	Pineaple	*Ananas comosus* (L.) Merr.	Bromeliaceae
6.Ka'ra	Yams	*Dioscorea* spp	Dioscoreaceae
7.Kana	Sugar cane	*Sacharum officinarum* L.	Poaceae
8.Kuirua'uu	Squash	*Cucurbita* spp	Cucurbitaceae
9.Kumana yp[c]	Pigeon pea	*Cajanus cajan* (L.) Millsp.	Fabaceae
10.Kumanai'i[c]	Common beans	*Phaseolus vulgaris* L.	Fabaceae
11.Kumanaran pewyuu[c]	Catjang	*Vigna unguiculata* Walp. ssp. *cylindrica* (L.) Verdc.	Fabaceae
12.Kumanauu[c]	Fava	*Phaseolus lunatus* L.	Fabaceae
13.Kumarataia	Curcuma	*Curcuma longa* L.	Zingiberaceae
14.Maniakap[c]	*Sweet manioc*	*Manihot esculenta* Crantz	Euphorbiaceae
15.Maniatata[c]	*Non toxic manioc*	*Manihot esculenta* Crantz	Euphorbiaceae
16.Maniyp[c]	*Bitter manioc*	*Manihot esculenta* Crantz	Euphorbiaceae
17.Menansi	Water melon	*Citrullus lanatus* (Thunb.) Matsum. and Nakai	Cucurbitaceae
18.Mõmõ	Papaya	*Carica papaya* L.	Caricaceae
19.Muãntai'i	Ginger	*Zingiber officinale* Roscoe	Zingiberaceae
20.Mukajyp	*Caraua*	*Neoglaziovia spp*	Bromeliacea
21.Munuwi	Peanut	*Arachis hypogaea* L.	Fabaceae
22.Namu'a	Cocoyam, taro	*Colocasia esculenta* (L.) Schott; *Xanthosoma* sp	Araceae
23.Pakua	Banana	*Musa* spp	Musaceae
24.Pytem	Tobacco	*Nicotiniana tabacum* L.	Solanaceae
25.Tamituaran	Calatea	*Calathea sp*	Marantaceae
26.Uruywypy	Arrow root	*Maranta arundinacea* L.	Marantaceae
27.Wuy'wa	Wild cane	*Gynerium sagittatum* (Aubl.) P. Beauv.	Poaceae
28.Y'a	Gourds Calabash tree	*Lagenaria siceraria Standl.* *Crescentia cujete* L.	Cucurbitaceae Bignoniaceae
29.Ykyj	Pepper	*Capsicum* spp	Solanaceae
30.Acaju	Cashew	*Anacardium occidentale* L.	Anacardiaceae
31.Mang	Mango	*Mangifera indica* L.	Anacardiaceae
32.Maracuja	Passion flower	*Passiflora spp*	Passifloraceae
33.Urucu	Anato	*Bixa orellana* L.	Bixaceae
34.Ywa'	Lemons	*Citrus spp*	Rutaceae
Totals		35 +	16

a) Plants 1-29 are commonly planted in fields, and plants 30-34 are mostly grown on homegardens. I included the second set here to value the first reports on Kaiabi diversity and its sources. b) Botanical identification of plants performed by myself and Simone Athayde, supported by consulting Leon (1979). Orthography and families are according to USDA, NRCS. 2008. c) Plants numbered 9-12 receive the general name of *kumana* (beans), and plants 12-14 are altogether called *many ete* (manioc).

Table 3-5. Plants cultivated in fields by the Kaiabi, and their respective number of varieties. Tatuy area (Grünberg, 2004) and Xingu Park (remaining authors).

Kaiabi name	Common name	Grünberg, 2004[c]	Ribeiro, 1979[d]	VBoas and VBoas, 1989[e]	Rodrigues, 1993[f]	This study, 2000[g]	Vulnerable varieties[h]
1.Amyneju	Cotton	ni (13)	2	Ni	2	3	1
2.Arusi	Rice	--	ni□	--	ni ∞ ×	2	ni
3.Awasi	Maize	2 (2)	4	4	8 ⌂	7	1
4.Jetyk	Sweet potato	ni (4)	3	3	6	6	1
5.Juparaparauu	Pineaple	ni (9)	ni	ni ●	ni ∞	2	ni
6.Ka'ra	Yams	4 (3)	4	2	9	16	8
7.Kana	Sugar cane	ni (16) *	ni	ni ●	ni ∞	4	ni
8.Kuirua'uu	Squash	--	--	ni	ni ∞	2+	ni
9.Kumana yp	Pigeon pea	--	--	--	ni ∞	1	1
10.Kumanai'i	Beans	--	2	--	5▲	3	2
11.Kumanaran	Catjang	--	--	--	--	1	0
12.Kumanauu	Fava	ni (5)	3	2	4	7	4
13.Kumarataia	Curcuma	--	--	--	--	1	0
14.Maniakap	Sweet manioc	ni	ni	ni	1 ♦	3	0
15.Maniatata	Non-toxic manioc	ni	ni	ni	2 ∞	3	1
16.Maniyp	Toxic manioc	ni (1)	ni	ni	8 ☼	9	4
17.Menansi	Water melon	--	ni □	ni	ni ∞	4	0
18.Mõmõ	Papaya	ni (17) *	2	ni ●	ni ∞	3	0
19.Muãntai'i	Ginger	--	ni	--	--	1	0
20.Mukajyp	Caraua	--	ni	--	--	1	0
21.Munuwi	Peanut	ni (6)	7	10+	13	18	8
22.Namu'a	Cocoyam, taro	3 (7)	4	2	8 ♣	6	2
23.Pakua	Banana	ni (8) **	2□	2	9	9	ni
24.Pytem	Tobbacco	ni (14)	ni	ni	ni	1	ni
25.Tamituaran	Calatea	--	1	--	ni α	1	0
26.Uruywypy	Arrow root	--	ni	--	--	1	ni
27.Wuy'wa	Wild cane	--	ni	--	ni ɵ	1	ni
28.Y'a	Gourds	ni (12)	6	ni	--	12	9
29.Ykyj	Pepper	ni (10)	ni	2	ni	7	1
30.Acaju	Cashew	ni[a] (15)[b] *	ni ◊	ni ●	ni ∞	3	0
31.Mang	Mango	--	ni □ ■	ni ●	ni ∞	4	0
32.Maracuja	Passion fruit	--	ni □	--	--	3	0
33.Urucu	Anato	ni (11)	ni	ni	ni	2	0
34.Ywa'uu	Lemon	--	ni ■	ni ●	2 ∞	2	0
Totals					77+	147+	43

a) ni = no information on the number of varieties; b) -- = not mentioned; c) Grünberg (2004): parenthesis show the order of importance he identified for the crops; * plants introduced by Father Dornstauder after 1955; ** found in cultivation by the Kaiabi when Father Dornstauder arrived in the Tatuy river area in 1953. d) Ribeiro (1979): □ plants that the Kaiabi begun to grow after receiving them from rubber tappers; ■ plants which the Villas Boas brothers gave seeds and incentivized the Kaiabi to plant after arriving at the Xingu Park; ◊ the Kaiabi knew wild cashew but did not plant it. e) Villas Boas and Villas Boas (1989): ● plants which the Kaiabi begun to plant after arriving at the Xingu Park; fruits are always planted in the surroundings of the houses. f) Rodrigues (1993): ∞ from the city / non indigenous; × recent introduction, starting to be produced as cash crop; ⌂ including two types from the city, pop corn and the 'dent' type; ▲ small beans from both the Kaiabi and the city; ☼ bitter types included one from Suya specially fit to produce starch; ♦ from the Upper Xingu cultural complex; ♣ the author listed two types of which the Kaiabi told they do not know by the given names; α identified as being *Solanum tuberosum*; ɵ considered as a not cultivated, wild resource. g) Data from the 1999-2000 crop season (Silva, 2002). h) Varieties were in a v*ulnerable status* when they were under cultivation by less than 20 % of the nuclear families.

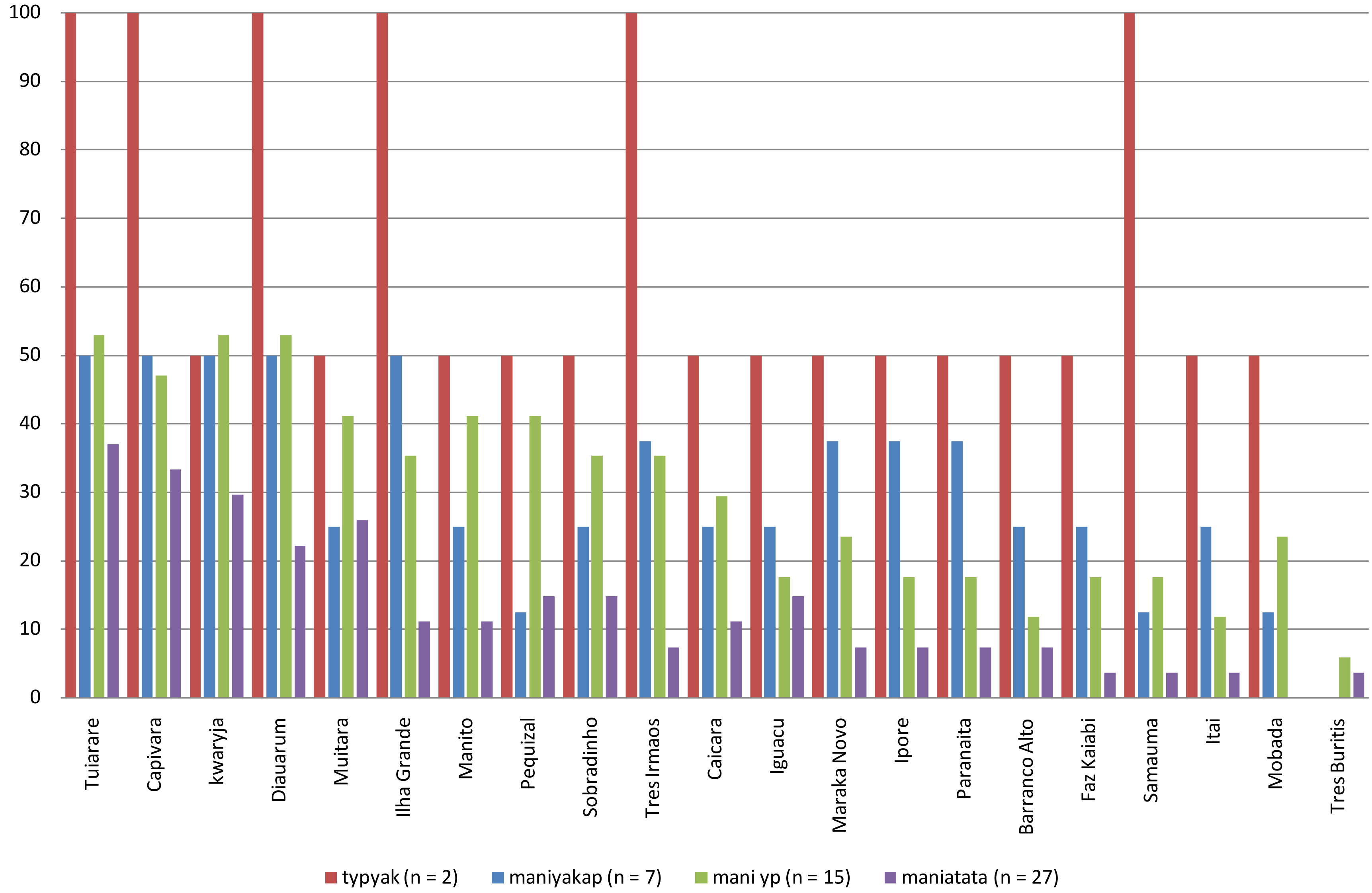
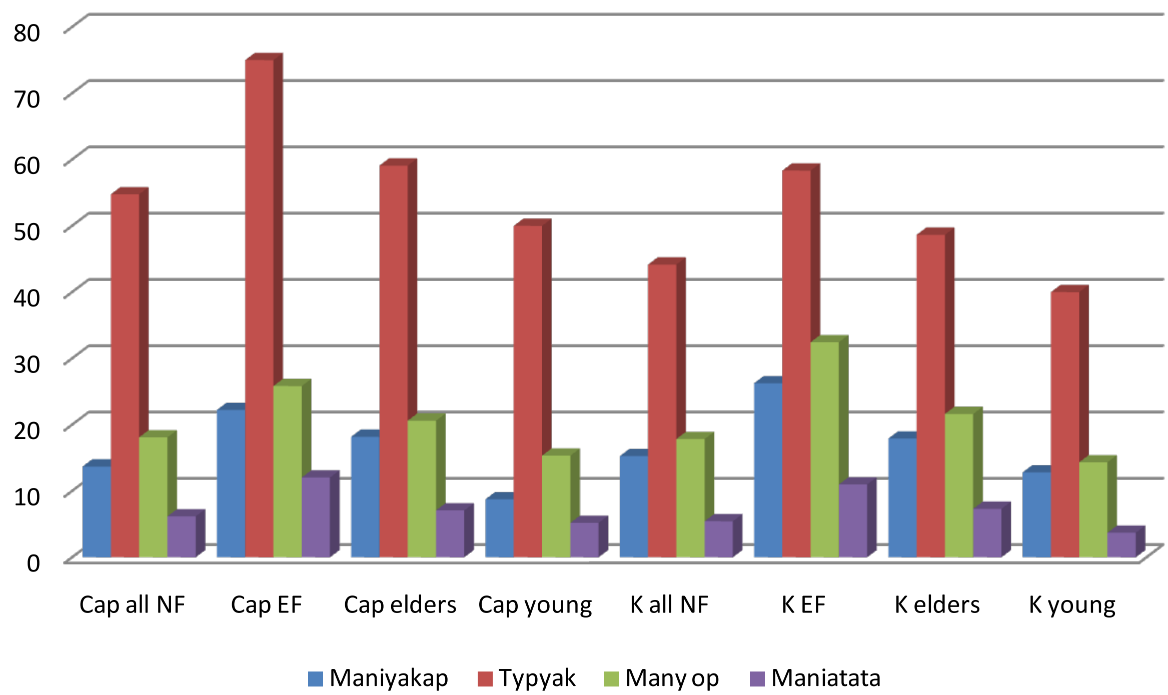


Figure 3-2. Percentage of broad types of manioc varieties cultivated in Kaiabi villages, Xingu Park, 2006.



Cap = Capivara village; K = all Kaiabi villages except Capivara; NF = nuclear families; EF = expanded families

Figure 3-3. Averaged percentage of broad types of manioc grown by Kaiabi farmers. Xingu Park, 2006.

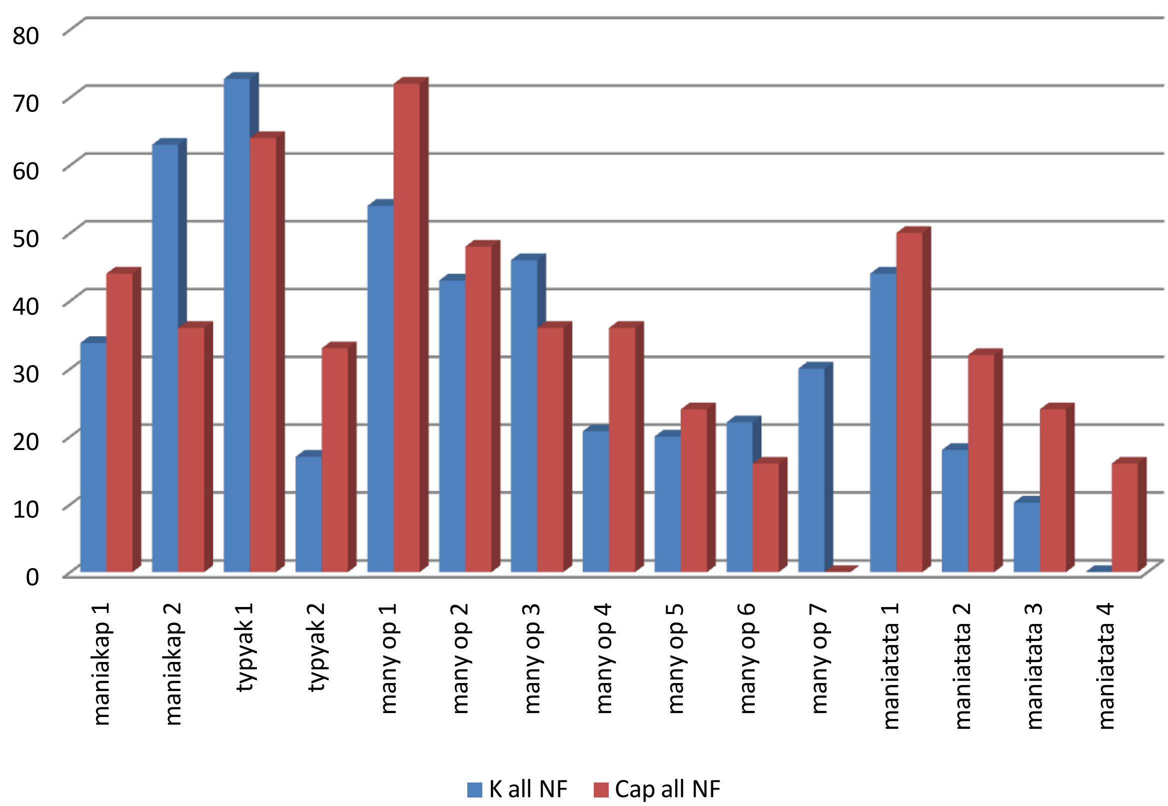
Table 3-6. Descriptive statistics for the number of manioc varieties according by broad types, grown by Capivara village residents and all Kaiabi farmers. Xingu Park, 2006.

Group of farmers	Statistics	*Maniakap*	*Typyak*	*Maniy op*	*Maniatata*	All manioc varieties	Grown by < 20%
Capivara All NF	Mean	1.10	1.10	2.71	1.67	6.57	1.95
	STD	0.83	0.54	1.23	1.11	2.60	1.02
	Minimum	0	0	1	0	3	0
	Maximum	3	2	5	4	11	4
Capivara EF	Mean	2.00	1.50	3.88	3.25	10.63	5.50
	STD	0.93	0.54	2.03	1.83	4.44	3.25
	Minimum	1	1	1	1	4	2
	Maximum	3	2	7	6	15	11
Capivara Elders	Mean	1.45	1.18	3.09	1.91	7.64	2.27
	STD	0.93	0.60	1.22	1.14	2.62	1.10
	Minimum	0	0	1	0	3	1
	Maximum	3	2	5	4	11	4
Capivara Youngsters	Mean	0.70	1.00	2.30	1.40	5.40	1.60
	STD	0.48	.471	1.16	1.08	2.12	0.84
	Minimum	0	0	1	0	3	0
	Maximum	1	2	4	3	9	3
Kaiabi All NF	Mean	1.22	0.88	2.68	1.47	6.25	2.10
	STD	0.87	0.56	1.67	1.48	3.32	1.24
	Minimum	0	0	0	0	1	0
	Maximum	3	2	8	7	17	5
Kaiabi EF	Mean	2.10	1.17	4.87	2.97	11.10	5.37
	STD	1.00	0.53	1.93	1.85	3.97	3.18
	Minimum	0	0	1	0	3	1
	Maximum	4	2	8	8	19	13
Kaiabi Elders	Mean	1.43	0.97	3.24	1.95	7.59	2.38
	STD	0.80	0.55	1.85	1.70	3.49	1.09
	Minimum	0	0	1	0	2	0
	Maximum	3	2	8	7	17	4
Kaiabi Youngsters	Mean	1.03	0.80	2.15	0.90	4.88	1.73
	STD	0.89	0.56	1.31	1.01	2.54	1.30
	Minimum	0	0	0	0	1	0
	Maximum	3	2	6	5	12	5

Table 3-7. Significance for the comparison of means for the number of manioc varieties cultivated in Capivara and in all remaining Kaiabi villages. Xingu Park, 2006.

Farmers groups		*Maniakap*	*Typyak*	*Many op*	*Maniatata*	All varieties	< 20%[a]
Cap all NF	Cap EF	0.017**	0.081	0.07	0.008*	0.005*	0.005*
Cap all NF	K all NF	0.555	0.125	0.921	0.569	0.679	0.699
Cap EF	K EF	0.799	0.124	0.209	0.702	0.771	0.762
K all NF	K EF	0*	0.019**	0*	0*	0*	0*
Cap elders	Cap young	0.034**	0.454	0.145	0.306	0.046**	0.910
K elders	K young	0.039**	0.178	0.004*	0.001*	0*	0.692
Cap elders	K elders	0.939	0.286	0.799	0.947	0.971	0.713
Cap young	K young	0.274	0.307	0.743	0.172	0.550	0.949

a) Number of manioc varieties cultivated by less than 20% of farmers (nuclear families).
*significant at the 1% level; **significant at the 5% level



Cap = Capivara village; K = all Kaiabi villages except Capivara; NF = nuclear families; EF = expanded families

Figure 3-4. Percentage of farmers cultivating manioc varieties grown by more than 20 % of the nuclear families in all Kaiabi villages except Capivara. Xingu Park, 2006.

Table 3-8. Number and proportion of Kaiabi farmers cultivating manioc varieties. Xingu Park, 2006.

Varieties	Cap NF (n=21)		K NF (n= 77)	
Maniakap	#	%	#	%
Jakamangi	11	52.38	26	33.77
Maniyaka sing	9	42.86	48	62.34
Maniyaka un	2	9.52	7	9.09
Maniyaka pirang	1	4.76	5	6.49
Maniakaran	0	0.00	1	1.30
Maniyaka sing Ikpeng	0	0.00	4	5.19
Maniyakap Kĩsẽdjẽ	0	0.00	1	1.30
Tapi'ypy	0	0.00	2	2.60
Typyak				
Typyak un	16	76.19	56	72.73
Typyak sing	7	33.33	12	15.58
Many op				
Tukunare	18	85.71	42	54.55
Maniy witang	12	57.14	34	44.16
Maniy wuni	9	42.86	36	46.75
Maniy ywuwi	9	42.86	16	20.78
Maniysing	6	28.57	13	16.88
Man'ywa kãmuku	4	19.05	17	22.08
Yudja mae many op	2	9.52	2	2.60
Uruwu	1	4.76	6	7.79
Piawuu	0	0.00	21	27.27
Maniy pepirangi	0	0.00	9	11.69
Maniy pirangi	0	0.00	5	6.49
Many wunu uu	0	0.00	2	2.60
Branquinha (Tuait)	0	0.00	1	1.30
Maniy wuni pirang	0	0.00	1	1.30
Maniy ywypywai	0	0.00	1	1.30

Cap NF = nuclear families in Capivara village; K NF = nuclear families in all remaining Kaiabi villages.

Table 3-8. Continued.

Varieties	Cap NF (n=21)		K NF (n= 77)	
Maniatata	#	#	%	%
Maniatata sing	11	37	47.44	52.38
Maniatata ywoni	8	15	19.23	38.10
Maniatata ywowi	6	8	10.26	28.57
Looks like m. Kãmuku	4	0	0.00	19.05
Maniatata pirang	2	3	3.85	9.52
Maniatata pirangi	2	11	14.10	9.52
Maniatata pirapirangi	1	1	1.28	4.76
Maniatata kãmuku un	1	5	6.41	4.76
Vassourinha	1	4	5.13	4.76
Amarela	0	1	1.28	0.00
Branquinha	0	4	5.13	0.00
Cacau	0	1	1.28	0.00
Funasa	0	7	8.97	0.00
Maniatata kamirang	0	1	1.28	0.00
Maniatata pepirang	0	2	2.56	0.00
Maniatata piawuu	0	2	2.56	0.00
Maniatata poi	0	1	1.28	0.00
Maniatata una mae	0	1	1.28	0.00
Maniatata wesing	0	1	1.28	0.00
Maniatata ysing mae	0	1	1.28	0.00
Maniatata ywypirangi	0	1	1.28	0.00
Maniatata op pirangu mae	0	1	1.28	0.00
Maniatata ywoni mae	0	1	1.28	0.00
Marcelândia	0	1	1.28	0.00
Oosimae	0	1	1.28	0.00
Paraiba	0	1	1.28	0.00
Rosa	0	1	1.28	0.00

Cap NF = nuclear families in Capivara village; K NF = nuclear families in all remaining Kaiabi villages.

Table 3-9. Number of manioc varieties grouped by broad types cultivated by less than 20 % of the farmers, those cultivated by only one farmer, and varieties not in cultivation by nuclear families in Capivara and in all remaining Kaiabi villages. Xingu Park, 2006.

Manioc	Cap NF (n=21)			K NF (n= 77)		
broad types	< 20 %	1 farmer	no cult	< 20 %	1 farmer	no cult
Maniyakap	2	1	4	6	2	0
Typyak	0	0	0	1	0	0
Maniy op	3	1	7	9	3	0
Maniatata	6	1	18	25	15	1
Total	11	3	29	41	20	1
%	21.15	5.77	55.77	78.85	38.46	1.92

Cap NF = nuclear families in Capivara village; K NF = nuclear families in all remaining Kaiabi villages.
<20% = less than 20 % of all nuclear families
no cult = number of varieties not in cultivation by nuclear families.

CHAPTER 4
PEANUT DIVERSITY MANAGEMENT AND RECOVERY

Introduction

The previous chapters presented the historical and socio-cultural context for the current practice of Kaiabi agriculture. General characteristics were discussed in chapter three, in which crop diversity management was introduced using manioc as a case study. Earlier I presented general information on peanut management, whenever possible taking into account historical and geographical specificities. The present chapter discusses specifically Kaiabi peanut diversity management, including a close look at an initiative for recovering and delivering varieties of the crop. It contributes information for discussing two hypotheses:

H2: There are differences in variety repertoire among Kaiabi families and villages. I hypothesize that the history of each specific variety (whether traditional or newly-created) is differently appropriated by individuals and families from different villages.

H3: After migration and intensification of inter-ethnic interactions, cultural revival efforts can reshape seed circulation systems. I hypothesize that old mechanisms were partially replaced by new ways of exchanging seed among Kaiabi families and villages.

Related to these hypotheses, this chapter seeks answers for the following research questions: how is indigenous peanut diversity generated and managed? How do varietal movements work for the Kaiabi, and what are the factors influencing crop variety movements among families and villages? When facing threats of loss of diversity, how can it be recovered? What is the contribution of a historic event, as represented by a cultural revival project, to this process?

The chapter opens with a section devoted to analyze the Kaiabi as peanut cultivators, followed by a section on how the Kaiabi distinguish peanut varieties including a discussion on how varieties can be created or lost in light of their spiritual perspective. Then, I present "traditional" peanut varieties managed by people, when I briefly touch on the issue of naming varieties, which is further explored later in this chapter. I then deal with peanut uses by the Kaiabi and general consumption restrictions related to the product, as well as to specific varieties. The following sections address agronomic and social practices related to peanut cultivation, the seed management systems operated by the Kaiabi, and the strategies applied for peanut varieties selection, including its rationale and variations. Finally, to synthesize several elements previously discussed, I present the geography of peanut seed management systems currently performed in Kaiabi villages in Xingu Park.

The following section deals with a historic initiative for peanut diversity management designed and implemented in the context of the general Kaiabi cultural revival, partially in the form a community based project. I present historical information about Jepepyri Kaiabi, a deceased shaman and political leader who founded Kwaryja village, and then I outline the main characteristics of his sons, and the duties their father left to them. Having set up the historical context for the initiative, I analyze the revival of peanut diversity in Kwaryja and its relation to other Kaiabi villages. I start by discussing the relationships between shamanism, the renewed interpretation of the myth of origin of crops, and crop seed management, as conceptualized by Jepepyri's youngest son, the shaman Tuiarajup. His approach includes the creation of new peanut varieties, a practice not uncommon for other Kaiabi farmers. However, the process of naming peanut varieties applied by the shaman has specificities, which are the subject of the next of section of this chapter. I then present the establishment of multiplication plots for peanut varieties, including observations on old and new modes of social work organization. Then, I present data about the current Kaiabi seed circulation system, highlighting the mechanisms employed for seed exchanges among families and villages. Following, I discuss strategies designed to disseminate the spiritual foundations and agricultural practices associated with peanut diversity management. I also comment on the impact of this initiative by demonstrating the intentions of other Kaiabi villages to carry out similar work. Finally, I briefly point to issues about the evaluation of the Kwaryja experience from the Kaiabi perspective.

The Kaiabi as Peanut Cultivators

Peanut and History

Peanut is culturally the most important crop for the Kaiabi. When I asked my informants why the Kaiabi cultivate peanuts, elders, young people, women and men all told me that true Kaiabi people plant a field of peanuts (*munuwi ko*) every year, and always have peanuts at home to offer visitors. They said that this old rule is still valid today.

The Kaiabi benefited from both peaceful interactions and war with other ethnic groups to shape their peanut cultivation system in an area close to one center of domestication for the crop. There are records of such interactions with Tupi and groups of other linguistic affiliation (Grünberg, 2004). Among the Tupi, the most intense relations likely happened with the Munduruku and Apiaka. The Munduruku were among their most feared enemies. The Apiaka were close neighbors and considered close relatives, sharing many cultural features, with whom the Kaiabi alternated periods of peaceful conviviality and war. In such a context, it is plausible to imagine a flow of agricultural technology, including peanut seeds, between the groups, which my Kaiabi informants confirmed in regards to the Apiaka.

During the 20th century, contact with non-indigenous nationals intensified throughout the Kaiabi territory (Figure 2-1), which culminated with their migration to the Xingu area. The three Kaiabi groups at Xingu, Tatuy river and Kururuzinho entered into a period of relatively little communication for almost 20 years. Remarkably, during this time, the groups in each place took different pathways (Athayde et al, 2009), including distinct development for their agricultural systems. The diversity of crop varieties outside Xingu decreased quickly, mainly at Tatuy. Opportunities for seed exchanges and agricultural technologies re-intensified when travels to visit relatives resumed in the early 1980s. A key informant told me that around the late 1980s / early 1990s, crop diversity and associated knowledge also started to decline in Xingu.

Discerning, Creating and Losing Peanut Varieties among the Kaiabi

The distinction of peanut varieties by the Kaiabi is based primarily on morphological features related to seeds and shells. The most important, extensively used characters for discriminating peanut varieties are shell shape (including the pattern of reticule, and the presence and expression of pod constraint and beak) and size. Occasionally shell hardness might be used as a subsidiary parameter. Regarding the seeds, the parameters include size and color (including the pattern of spots); the number of grains per fruit; and grain shape and arrangement in the shell. In most cases, the Kaiabi are able to separate varieties applying these criteria. However, when available through direct examination or conversation, the Kaiabi might employ a third set of plant characteristics as secondary criteria, including growth habit and length of the branches. If doubting the identity of a given variety, experienced farmers may also observe the shape and color of leaves to help identify varieties. In addition, there are other criteria considered suitable for recognizing specific peanut varieties. For example, the length of the cropping cycle is about 6-7 months (October-May/June) for all varieties except for one (*munuwi myãpe'ĩ*), which takes approximately 5 months to complete its cycle. Other potential agronomic criteria for discriminating peanut varieties are not used by the Kaiabi. For instance, they say that once sowing is performed at an appropriate depth and followed by sufficient rain, seeds of all varieties emerge uniformly within 4-5 days of sowing. Thus, emergence is not a discriminatory parameter. Nevertheless, in addition to post-harvest morphological criteria used in helping to distinguish peanut varieties include taste, cooking characteristics, and oil content. For this research I did not apply full plant descriptors to Kaiabi peanut varieties because, although having been formally authorized to do so, my informants were visibly uncomfortable every time I asked them to go to the fields to perform the activity. However, I did a partial morphological characterization of selected peanut varieties[1] (Table 4-1).

The western scientific distinction of peanut varieties contrasts with the indigenous perspective, as the former is based on a more numerous set of morphological parameters and genetic features (IBPGRI / ICRISAT, 1992; Williams, 2006). Two biological facts related to peanut ecology deserve attention: 1) peanut breeding behavior is self-pollination, with a small but important rate of cross-pollination (Norden, 1980); and 2) the expression of peanut morphological traits is controlled by several pairs of genes (Moretzsohn and Valls, 2001). Although relatively familiar with the western scientific explanation for plant reproduction in general, reliable informants - among them the shaman, Tuiarajup - told me that according to the Kaiabi, plants do not cross-pollinate. Instead, reproduction is guided and controlled by *Kupeirup*, the spirit of an old lady who gave the Kaiabi all the cultivated plants (Appendix D). As one informant told me,

> Os velhos sempre diziam que porque você tá sofrendo de comida, então (esses tipos novos) estão vindo (do mundo espiritual) prá você (...) Se plantar amendoim junto, o dono pode levar, pode vir outra (variedade) no lugar.[2]

[1] I selected peanut varieties were selected based on availability of material for study them without diminishing the seed supply for Kaiabi farmers to sown them.

[2] "The elders always said that because you suffer from lack of food [new varieties] are coming [from the spiritual world] for you (...) If you plant peanuts together, the owner can take one variety away and another one (variety) can replace what was sowed." Myao Kaiabi, Diauarum. My translation from Portuguese.

More directly, another informant showed awareness of the product of peanut cross-pollination when, referring to the appearance of new materials only in some reproductive branches, and said that

> *Kupeirup* vem e cola um galhinho (na planta) do amendoim. Só vai dar daquele tipo novo ali. Tem que prestar atenção para poder saber a diferença e encontrar tipos novos.[3]

This way, there is no human agency on the creation or loss of crop diversity. Both actions are performed by direct intervention of *Kupeirup*, according to how Kaiabi farmers take care of the resources. If humans treat crops respectfully, performing good agronomic, social and cultural practices, the appearance of off-types are understood as a gift from *Kupeirup*. Conversely, she can take varieties back, keeping them in her fields in case of human misbehavior. That explains why new peanut varieties can be identified by the Kaiabi, along with the disappearance of old ones whose names are still conserved in the memory of the elders. In this context, human beings are supposed to translate the spiritual intervention into agronomic practices.

Many Kaiabi told me about a variety selection practice involving the identification of off-types, through growing them in separated plots. The operative rationale behind this practice is that mainly during shelling and occasionally during harvest, women pay careful attention to the peanut varieties, and any perceived morphological difference leads them to separate the material. In a subsequent section in this chapter, I will return to the relationship between the supernatural and Kaiabi peanut selection practices when focusing on the experience of the Kwaryja village.

Traditional Peanut Varieties

Kaiabi peanut varieties have a long history, according to elders' narratives. Therefore, I conceptualized traditional varieties as those the Kaiabi reported that were under cultivation for a

---

[3] "*Kupeirup* comes and sticks a little branch in the peanut plant. Only there you can find new types. You need to pay attention in order to recognize the differences and find the new types." Arupajup Kaiabi, Kwaryja village. My translation from Portuguese.

long time, usually meaning several generations. A practical criterion for listing traditional varieties was relying on elders' memory accounting for their presence in the fields. Earlier records about the crop say nothing about varieties. More recently, the names of at least fourteen varieties were recorded. Berta Ribeiro (1979) mentioned the name of seven peanut varieties; the Villas Boas brothers reported ten varieties without providing names for them (Villas Boas and Vilas Boas, 1989); and Arlindo Rodrigues (1993) listed eleven varieties he had direct access to, in addition to two others he was only told about (Table 4-2). However, based on samples he collected in 1991, Rodrigues estimated that the Kaiabi in Capivara village had 8 or 9 different peanut varieties. In addition, at the time of his research, one variety (*munuwíkupêàwe*) apparently was already extinct, and another (*murunú*) was mentioned as coming from the city[4]. Yet, it was not possible to identify a third variety name (*munuwíeô*) mentioned by Rodrigues according to my current knowledge. Also, it is noteworthy that he found more than one name for some varieties, which will be discussed in detail below. Rodrigues (1993) also reported that he heard from Helga Weiss[5] an account of eighteen varieties at Capivara village 10 years earlier, but the names of these varieties were not provided.

During my fieldwork, I collected names for twenty-one traditional peanut varieties apparently still in cultivation by the Kaiabi in Xingu, of which four have acceptable synonymous (Table 4-3). Nevertheless, I could document the cultivation of only twenty traditional peanut varieties. Six peanut varieties are already extinct, of which three (*munuwi jure'em, m. pyreren*, and *m. takapejuwuu*) were lost before the migration to Xingu Park, and the others became extinct in the new area: *munuwi apat*, *m. kupeowy*, and *munuwi kanaun*. The last one is sometimes

[4] Rodrigues (1993) did not mention from which city this variety came.

[5] Weiss is a linguist who worked with the Summer Institute of Linguistics, SIL.

confused with *m. takapeun*, and both are also referred to as *munuwiuu*, the general name for varieties with large shells and grains. Two informants told me independently that *m. kanaun* was still in cultivation in the Tatuy river area in 2006, but I could not confirm the information. On the other hand, some relatively new varieties were also considered to be traditional: *m. wyrauna*, which existed in Teles Pires, according to the elder Tewit, was re-created in Capivara village after the arrival of the Kaiabi from Tatuy area. Similarly, *munuwi takapesingĩ uu* was recently re-created in Caiçara village.

The Apiaka Indians were cited as an important historical source for peanut varieties which now are considered as truly "traditional" by the Kaiabi. After the migration to Xingu, the Kaiabi provided peanut to other groups such as the Panara, Yudja, Kĩsẽdjẽ, Ikpeng, Metyktire, and people of the Upper Xingu Park.

I was informed of only one or two varieties that the Kaiabi repute as recently arriving from external sources. Their identity and respective names are ambiguous, occasionally being called *murunu* and *munuwijũ (*meaning literally peanut of the field), both of which are considered to have come from the Kĩsẽdjẽ Indians (the only group reportedly providing peanut seeds for the Kaiabi in recent times). These names occasionally are used as synonymous. Furthermore, the name *munuwijũ* is also applied to a variety that came from the city, and thus probably represents more than one material. Adding to the confusion, both cases duplicate names of varieties also considered traditional by the Kaiabi. In 2005, Kwaryja village received seeds of *murunu* from a Kĩsẽdjẽ village believing that it was the old Kaiabi variety. However, they were disappointed with this variety because, although the plant morphology and the shells and seeds were very similar to the Kaiabi *murunu*, the material received was not the *true* variety they were looking for. The true *murunu* has its production concentrated close to the hole where it was sown; this is opposite to the Kĩsẽdjẽ variety, which Kwaryja residents claimed to have far reaching lateral roots. For this reason, it is difficult to harvest the entire production of the plants, which the Kaiabi regard as semi-perennial. I could not verify whether this variety is really semi-perennial, or if its seeds germinate in abundance and a renewed population is established early each season.

Two main points emerge from the preceding discussion: 1) it is clear that there are discrepancies in naming varieties, based on an individual's knowledge and ability to properly recognize and name each variety; 2) it is somewhat difficult to separate what the Kaiabi consider to be traditional varieties from more recent ones[6]. I will return to this point later in this chapter.

Peanut Uses and Consumption Restrictions

Peanut is used by the Kaiabi mainly as a human food. A list of uses includes:

Peanut-only uses:

Munuwia ywyt (raw peanut)

Munuwia ewat (roasted peanut)

Munuwi'om (peanut fudge)

Munuwi ku'i (peanut flour)

Munuwiy (peanut-only boiled beverage)

Munuwiy (ground raw peanut-only beverage, cold water added)

Mixed beverages:

Karajayfet (beverage of boiled ground peanut mixed with sweet manioc)

Awasi kawĩa munuwia re (boiled beverage mixing peanut and maize flour)

Awasi akyt kawĩa munuwia re (boiled beverage mixing peanut and ground green maize)

Arusi kawĩa munuwia re (boiled beverage mixing peanut and rice)

[6] Extensive systematic genetic analysis could shed light on this issue, but it is beyond the scope of this study.

Breads and other mixed uses:

Munuwia mani'oko'o ewat (ground roasted peanut mixed in the beiju dough)

Munuwia mimosek (a kind of bread with roasted ground peanut mixed with manioc dough, wrapped with banana leaves and baked buried)

Kanape monouriare (a kind of bread with roasted ground peanut mixed with manioc dough filled with fish fillets wrapped with banana leaves, baked buried and later roasted by the edge close to a live fire. One slice is taken at a time, repeating the process as many times as needed)

Munuwia mutap (a kind of manioc meal including peanut and boiled fish or game meat, seasoned with hot pepper)

Munuwia kutap mutap (a kind of manioc meal made with boiled kutap frog and peanut)

Awasi ku'i jopypea monouriare (mixed flour of peanut and maize, eaten raw)

Munuwia janyra (peanut oil, for cooking and hair beauty)

Muang (medicine)

Boiled beverages are the most common and appreciated use of peanuts for the Kaiabi. They are drunk on a daily basis from the beginning of the harvest time, from late April or May, as long as the stocks of peanut lasts. Depending on the size of the village, several houses in the same village alternate in preparing these beverages. However, raw peanut-only beverage is no longer prepared. As mentioned before, the abundance of food and number of peanut dishes served to visitors as a welcome meal (and subsequent meals, depending on how long the visitor stays in the village) is a symbol of social prestige for a family.

According to Kwaryja residents, there is no variety specificity for any peanut use. Therefore, the consumption of single or mixed varieties is conditioned by the way peanut is harvested and stored: "quando se colhe tudo junto (todas as variedades), pode ser usado junto.

Agora, se for colher separado, vai consumir separado". [7] Nevertheless, peanut is a potentially dangerous product for the Kaiabi. There are restrictions for its consumption depending on life particularities of the consumers, and some varieties are regarded as more hazardous than others. However, there are variations on the perceptions of which are the more dangerous varieties; and there is no consensus on their respective names as we will see later in this text. The best list of dangerous varieties I could gather includes *munuwiuu* (meaning all peanuts with big seeds), *munuwi kupeowy, munuwi takapejuwuu, munuwi kanaun, munuwi takapeun, munuwijũ,* and *murunu*. To avoid accidents and protect their relatives, some families living in Xingu regarded as good farmers decided to stop cultivating dangerous peanut varieties, which contributed to their abandonment of these varieties.

Rodrigues (1993) viewed the level of risk of peanuts put to the consumers as linked to the relationships between body and society, according to Viveiros de Castro (1987). While commenting on the Upper Xingu's peoples, Viveiros de Castro exposed the logic of incorporation / excorporation of critical substances from birth to death. Peanut is associated with blood by the Kaiabi and is regarded as having a strong smell. Hence, it can be a dangerous substance, which poses restrictions for its consumption. Those who do not follow the food avoidance rules can fall seriously sick, because of the accumulation of blood in their bodies. The main effects are pain in the body and arthritis (*kana*). In the most severe cases, the person can be paralyzed and die. If treated (through shamanic intervention, along with using the medicine from certain plants) as soon as the first symptoms appear, the person can recover to a healthy condition.

[7] "When you harvest everything together [all the varieties], they can be used together. However if you harvest them separately, they are consumed separately." Interview with Tuiarajup and his wife Wisi'o in 2003. Translated into Portuguese by Jowosipep Kaiabi. My translation from Portuguese.

In former times, those who had killed an enemy in war, manipulated their human bones (mainly a skull), or touched human blood of those other than the Kaiabi, should not eat peanuts for a long time. Indeed, if it was his first opportunity in this kind of encounter, the individual was required to enter into seclusion with a more restricted diet. I was told of a warrior who walked close to a peanut field when returning from war and fell sick immediately. Although the Kaiabi ceased to engage in warfare, cultural taboos still prevent certain interactions with peanuts. Examples of situations in which people are not allowed to consume peanut, to approach a peanut field, or deal with the product include (but are not restricted to): the period of women's' seclusion and its aftermath; menstruating women; and men who engaged in sexual intercourse with woman of other ethnic affiliations. Also, food taboos still prevent the consumption of peanut by couples with newborn children. This restriction is stronger with the first-born child and lasts 10-12 months, until the infant starts to walk. However, today some persons do not follow this rule:

> Amendoim é comida que precisa saber consumir, não é qualquer momento que você pode comer, se a pessoa tem uma criança nova não pode comer qualquer tipo de amendoim. Tem um tipo de mingau, só milho puro, é mingau de pai novo. A mulher também, no primeiro filho, fica sem comer. A mulher de hoje é muito teimosa, não acredita, aí acaba consumindo. Aí, com o tempo ela vai sentindo o corpo doído, porque elas comem esse tipo de amendoim. Antigamente não comia, evitava. Depois vai diminuindo o tempo, só no primeiro filho que você tem bastante tempo para não comer. Agora, a pessoa que já é acostumada, que já teve criança várias vezes, fica só dois, três meses (sem comer amendoim).[8]

Nevertheless, even people with an older child can suffer consequences from eating peanuts. I was told about a woman in the Teles Pires area whose son was already 5 years old, and

[8] "Peanut is a food that you have to know how to consume. You cannot eat it anytime; if you have a newborn child you cannot eat any kind of peanut. We have a maize beverage, pure maize that is food for a new father. A woman also does not eat (peanuts) when she has her first child. Women of today are stubborn, they do not believe, and so they end up consuming (peanuts). After a while she starts to feel body ache, because she ate these kinds of peanuts. In old times they never used to eat them, they avoided (peanuts). Afterwards the period without eating peanuts decreases; only when you have your first child you cannot eat peanuts for a long time. When you are already used to (eating peanuts), those who already have many children, can avoid eating peanuts for just two, three months." Tuiarajup Kaiabi. Translated into Portuguese by Jowosipep Kaiabi. My translation from Portuguese.

she fell sick from eating *munuwijũ.* As the news about her case spread among the Kaiabi, this variety was included among those restricted for general consumption.

Dangerous varieties are most suitable to elders' consumption, who are free to eat them when no other restriction applies. I heard many men saying that they could eat any peanut variety they wanted without problems. Tuiarajup explained that the elders already had succeeded in testing those varieties and learned everything about eating peanut by experience. However, he stressed that youngsters must carefully test each variety before extensively eating them. Tuiarajup told me that his son, who at that time had an infant six months old, should not eat peanuts for a while. One month or so later, he would resume eating peanuts in a specialized sequence of varieties. The first are the smallest ones, *m. myãpe'ĩ*, then *m. py'wi*, *m. ayjmirangĩ*, and so on. He would need to wait some three months to eat the biggest ones such as *m. emyamuku*, *m. takapeun*, and *m. wyrauna*. Referring to his deceased father Jepepyri, Tuiarajup concluded saying that "this is the rule that our old one taught us, his lesson for us". Kupeap, an elder from Capivara village, confirmed this sequence of varieties, adding that *m. ayjsing* is the last one to be eaten. The parents are expected to guide their children throughout this sequence, monitoring their well being.

Peanut is potentially more dangerous when not adequately prepared. According to several informants, the most striking case involved the variety *m. kupeowy*. I heard that Jepepyri, based on his political and shamanic power, demanded that people throw this variety away because it was being deliberately used to cause harm to others. His sons denied this account, telling me that the elder had asked somebody to take care of the variety in his field, but this person failed to keep the variety. However, they confirmed the use of *m. kupeowy* to attack a person.

> O Amati (Trumai) teve esse problema (uma severa artrite progressiva), foi briga de mulheres por causa dele. Porque ele era homem bonito, a outra ficou com inveja e deu

> amendoim (mingau de *munuwi kupeowy*) para ele e deu problema. Elas brigavam, ficavam com ciúme dele, aí o namorado não deixava, ficava bravo, por isso deram amendoim para ele. Então esse é o alimento que é o mais forte mesmo, monowi kanauu não é tão forte assim, eu já comi muito e até agora estou bom.[9]

A final point that deserves attention concerns the relationships between peanut and Brazil nut (*Bertholletia excelsa*) consumption[10], which in old times were combined as ingredients in some dishes. According to Kupeap, Brazil nut is a dangerous food when the family has a newborn. Consumption of the nut was forbidden to avoid the chest of the child being smashed like the mark the large fruit leaves on the ground when it falls from the tree. The father could work with the nut, but not blow on it because it could make a dent in the soft spot of the child's skull. Regarding food, both peanuts and Brazil nuts were used to prepare *kawĩ*, *mimosek* and *kanape*, as single or mixed ingredients. According to Kupeap, when the Kaiabi moved to Xingu, there was a lack of Brazil nuts in the Xingu area, and the same dishes were prepared with just peanut. Thus, it was not a substitution of Brazil nuts by peanut, but the crop product reached a position of exclusivity due to the lack of the former ingredient. Arupajup, son of Jepepyri, gave me a similar explanation.

Kaiabi Peanut Crop Management Systems

The Kaiabi cultivate peanut in the center of a new diversified field, preferably on fertile, *terra preta* soils (*ywy on*), but also performing well in some transitional soils between *terra preta* and red soils (*ywypirang on*). There is a special date for sowing peanuts, in general around October 15th, when the *api* fruit (*Naucleopsis* spp) is ripe and falls for a short period.

[9] "Amati Trumai faced this trouble (a severe arthritis); there were women fighting because of him. Because he was a handsome man, they got jealous and gave him peanut (*m. kupeowy* porridge) and he felt sick. They fought because they were jealous, their boyfriend did not like it, and got mad at them, and so gave peanut to him. Hence, this kind of food is really the strongest; *m. kanauu* is not as strong, I ate a lot of it and I am still ok." Tuiarajup Kaiabi. Kwaryja village. My translation from Portuguese.
[10] I thank Lea Tomaz for bringing this point to my attention.

Previously, peanuts were cultivated in a “relay array” where they were sown after manioc and before maize, split into smaller plots in order to separate varieties[11]. The plots were located side by side, separated by burned trunks or rows of manioc, maize, or cotton. Occasionally, a slightly larger space between plant rows marked the boundary between varieties. Currently, most farmers plant peanuts as small paths of monoculture, and in the Kwaryja village, bananas are planted in addition to the other crops to separate varieties. Although flexible in size, most single-variety plots in regular fields are smaller than 100 m^2. The area a nuclear family plants to peanuts generally varies from 600 to 900 m^2; however a peanut field can be larger as other members of the same expanded family grow the crop in a contiguous area, or as a shared field.

The crop is planted in a place cleared of debris from the fallen vegetation where emerging sprouts or weeds are removed. Depending on family size and composition, the harder work is done by young or adult men before the planting date. At the time of sowing, light cleaning and weeding by hand or with the help of machetes can be performed by any family member. Men usually dig the holes, and everybody, regardless of gender and age, can sow depending on her/his previously tested performance as a specialist. The seeds are prepared before the sowing day, each variety brought to the field in separate gourds or plastic containers. A planting stick[12] is still used occasionally, in which 5cm depth cylindrical holes are dug at a vertical angle of 35-40º in two varying systems. In the first, called *tapi'ira py* (tapir foot), three holes are opened, two side by side and a third one in an intermediary position a bit far from the other two. The second type, called *tajaju py* (peccary foot), receives two parallel holes only. However, most sowing work I witnessed was performed using a hoe, with two to three seeds added per hole, covered by the

[11] Recently, I saw this array only in one field in Paranaita village.

[12] See section ‘Timing and Agronomic Features’ in chapter 3.

foot, without pressing the ground. The space between holes is 1-1.1m, which do not follow a strict straight line. Normally, all work is done on the same day, ensuring uniform germination and a consequent homogeneous stand for the crop. This also allows for replanting to be done as soon as possible, when necessary.

When the plants have reached approximately one foot in height, the Kaiabi carefully step on them to lay down the branches in order to facilitate the penetration of the pegs[13] in the ground. Both spreading and erect peanut types require the treatment, but in the second case, branches are curved by hand instead of stepping on the plant. This operation is performed after a rainy day, stepping in a centrifugal movement bending the branches to opposite sides. Usually, this is a onetime practice in a crop cycle, but it can be repeated two weeks later if the results were not satisfactory. All family members can participate. The Kaiabi regard this practice as a very important one, which directly influences productivity:

> Se deixar crescer assim mesmo ele nunca vai dar (frutos); tem que pisar nela, não pisar com força, no máximo para ela deitar no chão, pegar na terra. Tem que encostar o galho dele no chão. Depois que a planta deita, começa a dar flor.[14]

Loss of peanut production can occur due to poor land quality assessment, unexpected climatic variation, weed infestation, diseases, pests, or predation by wild animals, and non-material aspects (sorcery). I saw some fields yielding very poor harvests due to a combination of poor soils and drought. In this case, seasoned farmers blamed the field's owner for making the wrong decisions regarding environmental risks.

[13] Pegs are a stalk-like botanical structure that, after the above ground fertilization of the flowers, carries the fertilized ovules at its tip, penetrating the soil to a depth of 5-7cm. After this phase, the tip takes an almost horizontal position in which peanut fruits develop (Ramanatha Rao and Murty, 1994).

[14] "If you let the plant grow on its own it will never produce (fruits); you need to step on it. I am not saying that you need to step strongly; at the most so that it is flat on the ground, touching the ground. You need to put the branches close to the ground. After the plant touches the ground, it starts to bloom." Tuiarajup Kaiabi, Kwaryja village. Translated into Portuguese by Jowosipep Kaiabi. My translation from Portuguese.

Weeding is an important issue, and peanut plots are kept clear until the plant completely covers the ground. If necessary, the plots are weeded once again before harvesting. The work is done by hand, with a machete or a hoe, depending on the degree of weed infestation and growth. Besides eliminating plant competition, the Kaiabi say that this practice helps to avoid the establishment of pest insects, rats and snakes. Weed infestation is also considered to be the result of a farmer's faulty behavior.

Anytime a farmer perceives symptoms of a disease, the leaves are clipped and thrown in a creek to be carried away. Occasionally, whole plants can be taken away to avoid the spread of a disease. To control for pests, the Kaiabi apply agronomic and magical/ritual practices, as explained in chapter three. Predation by wild animals[15] can bring varying levels of damage to the crop. Normally it does not compromise great proportions of production of a field. According to my Kaiabi informants, their main concern is with fox (*arapy*), which eats the grains just before the harvest time. Usually, the damage is low, but occasionally this animal can cause severe loss to the harvest. Nevertheless, regular practices of crop management cannot always solve the emerging problems; in those cases, the causal explanation falls on the supernatural domain. Occasionally, a powerful shaman from another ethnic affiliation is called to intervene and save the field, with varying success. In recent years, I witnessed partial loss (at least 30%) of peanut production in one field, probably due to a soil fungus. The Kaiabi blamed witchcraft as the source for the problem: in this case, a curse that could not be reverted.

Peanut harvest is mainly performed by women of all ages. Depending on the size of the family/village, it is a slow operation that can last for two weeks of daily work for a regular size field. However, when arrangements are made to invite people from outside the village, peanuts

[15] Krapovickas (1969) mentioned local peanut names associated with wild animals that feed on peanut, such as hawk.

can be picked quickly. Harvesting is done by folding half of the branches over the second half and then vigorously pulling the plant upward, in order to free the roots from the ground. The whole plant is deposited upside down, and later all the production is gathered at a clean site in the field[16] for drying in the sun for 3-7 days, until the shells harden and take on a dark color. After pulling whole plants, the area around each of them is searched with a pointed wood stick, or machete, looking for loose fruits, which are stored in a gourd or a washbasin. This peanut will be the first to be consumed. Nevertheless, the harvest is never complete; the amount remaining on the ground depends on soil conditions (texture, moisture) and on the harvesters' abilities. Thus, in the following season, these seeds will germinate with the first rains and a secondary field will form. Although it will have a low plant density and receives almost no care, this field provides an early harvest (March/April), which is valued as a source for preparing the first *kawĩ*.

Ideally, each variety should be harvested and stored separately. If a farmer is not sure about the boundaries between varieties plots, or when doubting the identity of the plants in a plot, she/he can pull some plants out and observe the fruits and grains before the harvest. Peanuts are stored unshelled. This is usually done in vertical baskets (*munuwiyrũ*) made with the rachis of inajá palm leaves, which vary in size according to intended capacity. The baskets are kept inside the house in a well ventilated place without direct contact with the ground. I was told that it was common to see huge (*munuwiyrũ*) in the house of old *wyriats*[17], a practice kept well after the Kaiabi transfer to Xingu. My informants told me that the larger the *munuwiyrũ* exposed to visitors, the bigger the prestige of a family as food producers, and of its headman for his ability to promote such production. In 1996 I saw two *munuwiyrũ* in a house in Capivara village with a

[16] Alternatively, the production is hauled to the village and sun dried directly on the ground or on a canvas.

[17] *Wyriat* is the Kaiabi name for the headman of an expanded family.

diameter greater than 1m and about 4m high. Later, I saw a few small ones, measuring some 0.60m x 1.5m. Today these baskets are becoming uncommon, being replaced mostly by polyethylene bags. Currently most Kaiabi farmers do not separate varieties during the harvest and store them mixed, which will be separated only during shelling while preparing seeds for the next cropping season.

Seed Management Systems

As stated before, the Kaiabi display weak linkages with agricultural markets. Although historically there is a flow of seeds and planting materials from and to other indigenous groups, and occasionally from non-indigenous fields or markets, the management of their seeds can be considered primarily as part of their subsistence strategy. Similar to other crops, after marriage, peanut seeds are obtained mainly from either fiancé's parents, or close relatives in their absence. Only in exceptional cases did seeds arrive from other sources. In other words, the Kaiabi seeds are managed as part of what is called the informal seed system (Silva, 2002).

However, peanut varieties are not considered to be a family patrimony. If a Kaiabi farmer found herself/himself in need of seeds for any reason, she/he would first search for them within the extended family and among closer relatives, then the material was procured among other families in the same village, and finally in other villages. This includes opportunities when the farmer has no seeds left, or when she/he is looking for a specific variety.

However, besides through the parents, peanut seeds also can be obtained by the Kaiabi through other mechanisms, such as gifts during visits or as retribution for helping in the harvest of other villages' fields; direct requests for non-relative persons from other villages, and occasionally from other ethnic groups (primarily based on kinship relations through interethnic marriages); bringing seeds from farms and cities; and taking home samples of the product during work in the kitchen for events at the Diauarum Post. Peanut varieties from the non-indigenous are considered to be dangerous, making them a very limited source of seeds. Although in 2006 I saw only one field sown to a variety from the city (which the farmer called *munuwijũ*), this variety was acquired a long time ago, and this mechanism for obtaining peanut varieties seems to no longer be operative, or at least today it is very uncommon.

In general, seed exchanges involve a small quantity of seeds, which are sown in a small plot in the field with the exclusive purpose of multiplying them. According to Tuiarajup, in normal years and with the contribution of a specialist with good hand for sowing peanuts, a single hole (2-3 seeds) usually provides seeds for sowing between 16 to 20 new holes in the next season. Hence, at the end of the second year, there is seed enough to sow a regular size plot for the variety. This strategy is concordant with the occasional exchange for replacing specific manioc varieties locally lost (Elias et al, 2000). Nevertheless, other opportunities may involve the movement of a more generous amount of peanut seeds, as will be seen later in this text.

Rationale and Variations for Peanut Selection Strategies

Seed selection strategies need to be considered from a multi-perspective standpoint, including historical, geographical, cultural, and spiritual perspectives (Zimmerer, 1996; Thrupp, 1998; Emperaire et al, 2001; Howard, 2003; Brush, 2004). Since ancient times, the adoption of specific components of the selection process differed depending on family and place preferences, and varied over time. The main features of the Kaiabi peanut seed selection process encompass a set of practices that involve: 1) the discrimination of regularly known varieties; 2) cultivation of regular varieties; 3) the identification of off types as new varieties; 4) whether newly identified varieties are consumed or not; 5) naming new varieties; 6) multiplication of seeds of newly-created varieties; and 7) cultivation of new varieties in regular plots.

As explained above, peanut varieties are mainly discriminated based on morphological parameters. Moreover, like any other crop, peanuts are considered to be sent to Kaiabi fields by

Kupeirup[18], the spirit that is owner of all cultivated plants. Keeping in mind that for the Kaiabi cosmology plays a critical role as a basis for peanut varieties selection practices (and also for governing food taboos), here I will concentrate on the selection process and its variations performed by the Kaiabi as farmers. In order to discuss the identification of new varieties as explained by the Kaiabi perspective, I make parallels to western science.

From a western science point of view, the possible sources for morphological variation in peanut might be associated with physical mixtures of varieties (while sowing, harvesting or storage), environmental influence, and gene recombination through mutation and cross-pollination (Krapovickas and Gregory 1994). Although many Kaiabi families open a new peanut field adjacent to an old one, variation in environmental factors may influence the expression of morphological traits. However, the identification of off-types is performed independently every year, in different places, lowering the probability that the interaction between genetics and environment is the only issue at stake. Natural mutations are very uncommon (Norden, 1980). Physical mixtures of varieties may occur, depending on a farmer's decision regarding the management of crop varieties, but again it would only partially explain the systematic appearance of off-types in different places and years. Furthermore, along with physical mixtures the dynamics of naming varieties also influence the genetic makeup of peanut varieties, as will be seen later in this chapter. The low rate of cross-pollination found in peanut (0.25 to 6%, cf Norden, 1980) may also play an important role here. Assuming the average crop area of $100m^2$ for a single variety and a density around 2-3plants/m^2, it is plausible to find differences in plant and pod morphology due to cross-pollination in a peanut field. Although not all the flowers of

[18] Arupajup explained to me that in addition to *Kupeirup* intervention, in old times powerful shamans interacted with Maits who then dropped baskets (*urupem*) full of food products and seeds from the sky to the humans on the ground.

the same plant are cross-pollinated, fruits generated by this process would not pass unnoticed to seasoned farmers. This fact highlights the great knowledge of the cultivated varieties required for the women to identify off-types, and an extreme attention to find them. Yet, here persistence matters. Morphological traits potentially may reverse to their previous makeup, depending on whether the genetic combination involves dominant or recessive characters, and less on the repetition of cross-pollination involving the same biological material. Thus, new varieties as locally perceived, can disappear during the cropping season following harvest. Probably, a combination of physical mixtures, the process of naming varieties, and out crossing is responsible for the appearance of new peanut varieties in Kaiabi fields.

Usually, women choose the varieties to be planted in a family's field, generally in close consultation with their husbands and other women of different ages. Most Kaiabi perform peanut seed selection during the shelling operation at the end of the dry season, while preparing them for sowing. Although men may take part in shelling, most work is performed by a group of women of all ages. During this time, damaged or undersized seeds are separated for consumption, and are used as seeds only in cases of extreme necessity. Varieties are discriminated primarily based on the size and shape of the shells, and the size, color and shape of the grains. After exposing the seeds to direct sunlight, known varieties are then kept in individualized containers (gourds or, more commonly, plastic recipients), until it is time to plant them. During shelling, expert farmers are able to identify off-types of regular varieties, which are considered by most Kaiabi to be new varieties, and might be separated for sowing in a small plot for observation and seed multiplication (generally two to three years, depending on the amount of seed obtained). In a few cases, seeds of new types were sown along with the original variety in which they were found, depending on family-based decisions.

A more complex system involves selection of peanut varieties during harvest, as well as that one performed during shelling. Women harvest each variety separately, and if off-types are identified, they are stored in a distinct container. If only a few pods are found, they are usually tied to each other in a string, which is kept until the next cropping season hanging from the roof of the kitchen. This practice is now uncommon. If more abundant material is available, unshelled peanut is generally stored using any kind of container on hand. This system ensures two opportunities for scrutinizing peanut varieties and searching for variations. Furthermore, it provides chances for observing the production of specific varieties.

Both peanut shelling and harvest are times for learning, when parents and relatives teach children and youngsters about varieties and their associated knowledge, and doubts may be checked with elders. Cooking is also an opportunity for learning, including the passing on of practical lessons about recipes and cultural rules. New varieties tend to be consumed by everybody without other restrictions than those regularly applied to known varieties. However, some informants told me that only elders could eat them, and some families used to throw new types away without eating them. The reason for this restriction is linked to the belief that new peanut types sent from the spiritual world are dangerous to humans, and their consumption should be avoided or at least regulated by food taboos. Although acknowledging the existence of new types and consuming them, others used to discard their seeds. For example, Kupeap, a son of Captain Temeoni, who lived as a young adult at Tatuy river and now is a very old man, told me that his family used to identify new types but “os antigos não gostavam deles, então quando eles encontravam (tipos novos), eles comiam e não plantavam de novo”.[19]

[19] “In old times people used to find (new types in their fields) but they did not like them, so they just ate them and did not plant them again”. Kupeap Kaiabi, Capivara village. Translated into Portuguese by Pã. My translation from Portuguese.

According to my informants, in recent times most new varieties did not receive different names, but usually adopted the name of or were referred to as associated with the variety of origin. This morphologically-based naming practice potentially may alter the genetic makeup of known varieties, hiding peanut diversity managed in different villages, due to genetic differences in varieties labeled under the same name. Nevertheless, while a few informants reported that only the general name for the crop, *munuwi*, was applied to off types, assigning a different name for newly-created varieties was not uncommon. In such cases, varieties were commonly named by one of the spouses' heads of the family, who might consult with an elder in case of doubt. Independent of their genetic makeup, the Kaiabi manage peanut diversity through the names given to varieties.

Perceptions about Selection Practices and the Identification of New Varieties

In order to gauge the dimension of selection management practices used in the villages, I interviewed 122 individuals (53% female, 47% male) from 12 (55%) villages (south of Diauarum, excluding Kwaryja village) to ask about the identification and cultivation of new peanut types (Tables 4-4 and 4-5). The interviews involved 67 (47% of the total) nuclear families belonging to 21 (55% of the total) expanded families, including people from different age categories and from the four Kaiabi areas of origin (Xingu, Teles Pires, Tatuy, and Kururuzinho). To ensure representativeness, I sampled a minimum proportion of 33% of all informants in any given category, the exception being the place of origin of the informants in which only four (17%) of those that came from Tatuy area were interviewed. Significance of comparison for the means for both variables discussed, and strength of the association of these variables and subgroups of individuals is provided. In addition to these interviews covering most potential informants in 12 villages, I interviewed a selected second group of 55 informants in another eight (38%) villages (north of Diauarum), including 38 (26%) nuclear families belonging to 16 (42%)

expanded families. Kwaryja was put apart because I knew previously that the three expanded families from the village were the only ones to systematically keep identifying new peanut varieties. All informants from the village already participated in events related to the practice in the past, and twenty individuals were still involved with it as of 2006.

About half of the informants from the core group (61 individuals, 51% of the total, from eight villages) told me that they had taken part in events in the past in which their families performed the identification and separation of peanut off-types. However, as of 2006, only 12 people (10% of the total of informants, eight women and four men) declared they still practice this kind of selection. These individuals came from nine (13% of the total) nuclear families, including three couples, belonging to six (28% of the total) expanded families, who were living in four villages. Eight additional informants from the second group of selected interviewees declared that they still identified new peanut varieties (Table 4-5). These people live in five villages belong to 6 nuclear families, including two couples from six expanded families. Overall, those still performing the identification of new peanut types include 15 nuclear families that belong to 12 expanded families, living in nine villages.

Village of residence, expanded and nuclear families were significantly different regarding both participation in past and current events for selecting new peanut varieties. The four Kaiabi areas (middle Teles Pires, Tatuy, Kururuzinho, and Xingu) were represented by those still performing the selection. Their villages are scattered throughout the landscape, interspersed with others where the practice was not found today. More importantly, age status (with a weak strength in the association of variables) and mainly gender are relevant issues in keeping the selection practice. The average age increases when comparing the entire set of informants for this survey to those who stated that they took part in events for identifying new peanut types in the past. This group includes both experienced adults and young adults who were children when they witnessed their parents or relatives performing the practice. Those who still perform the separation of new peanut varieties have the highest average age. Although there is no statistical difference between gender alone and the performance of the practice in the past, the analysis of Kaiabi age categories, which combine age and gender, is highly significant for those who were involved with the practice in the past and present, namely elders of both sexes. In turn, whether individuals were shaman, political leader or engaged in paid job mostly did not show statistical difference, and the association between pairs of variables was very weak.

The group who still identify new peanut varieties includes five couples, among other individuals (Table 4-5). One of these couples came from middle Teles Pires, the same place that an old widow and her daughter-in-law also came from. Two other couples were born in Kururuzinho and one in Tatuy, the place of origin of one of the old men who still performed the practice. The last couple is comprised of a man from Teles Pires and his wife from Kururuzinho. Only one relatively young man (36yr) from Xingu declared that he identified new peanut types. Among those performing the practice were two shamans[20] who were born in Teles Pires and Kururuzinho, and four political leaders: two men from middle Teles Pires and a couple from Tatuy. Finally, four men earned money from paid jobs (14% of the category), two of them as FUNAI staff, a retired man, and a young village teacher. It is remarkable that five nuclear families that declared to still perform the identification of new varieties did not have peanut fields in 2006. Two sisters, 20 and 26 years old, declared that they actively perform the selection practice along with their mother in Kwaryja village, but the younger never had a peanut field

[20] Both were regarded as being minor, not powerful shamans.

cultivated by her nuclear family. A third family is composed of an old couple[21], who also participate in selection in Kwaryja. Two other families were facing health problems but were able to save seeds for the next crop season[22]. Indeed, a couple from Capivara, who are regarded as good farmers, showed me seeds of three varieties adding that this number is small because their children had eaten seeds of other varieties. They said they will recover diversity as they resume peanut cultivation.

Tuiarajup told me that a long time ago outstanding Kaiabi farmers used to hang in a site in the house a small piece of cotton cord, to which other pieces containing knots were attached. Each secondary cord corresponded to a year, and each knot represented one new peanut variety the farmer had identified. Upon requesting it, visitors received explanations about peanut diversity the host was holding, and an opportunity to exchange ideas and seeds opened up. Currently, the farmers' lack of involvement with identifying and cultivating new peanut varieties might have contributed to the relatively recent abandonment of the practice by many families, and the loss of associated knowledge. Although older women have a prominent role in identifying new peanut types through selection, it is contradictory that young females, who usually participate in peanut shelling and harvesting along with the elders, did not mention that the practice is still being performed by their families. Given the age structure of the Kaiabi population, this is an important issue. I speculate that maybe later, when they will assume the role of elders, at least a few of them will assume the role of selecting new peanut types. Whether

---

[21] The old man complained to me that he worked his entire life and is now tired and cannot work anymore. In this situation, his in-laws were supposed to open and cultivate a field for him, but the youngsters are not concerned about their duties to the elders.

[22] Other Kaiabi farmers also reported having saved seeds despite not cultivating fields in 2006, regardless of not performing the identification of new peanut types.

this will happen or not is uncertain. For now, the data show a tendency to the gradual abandonment of the practice by most Kaiabi farmers.

The Geography of Seed Management Systems

The specific selection practices described above are embedded in the social organization of agricultural activities currently carried out in the fields, with important consequences for the present Kaiabi seed management system. Although in the past every nuclear family ideally was supposed to care for their own fields, today the role of the expanded family as the social unit for peanut production and seed management seems to have augmented.

With only one exception[23] all expanded families declared to already have cultivated peanuts of their own, encompassing 107 out of 143 (75%) interviewed nuclear families (Table 4-6) [24]. All the elders already cultivated a garden in at least one opportunity. In contrast, young families do not plant the crop regularly; among those that never cultivated peanuts were four very young couples. Those who had a peanut field in 2006 represented 39% of the nuclear families belonging to 36 (75%) of the expanded families. Counting another five elder families that managed to save seeds without having a field, the total number of nuclear families in the same cropping season increased to 61 (43%), involving 29 (76%) EF. Elders were responsible for 37 (66%) out of 56 peanut fields in cultivation, compared to 19 (34%) youngsters.

The most common explanations for not planting a peanut field include very advanced age, health problems or death in the family, and competing time with occupations related to health

[23] The exception refers to an expanded family of which most members were in the city at the time of the interviews. The headman and his wife had left for health treatment, and a middle aged couple went out of the village because of a risky pregnancy. Therefore, I could interview only a young couple belonging to this family, who did not have a peanut field in 2006.

[24] In Table 4-5 I opted to show male's age categories for the owner of agricultural fields instead of female's because the Kaiabi also refer to fields using the name of the male head of a household. Also, male age categories discriminate better than female's categories between elders and youngsters.

care, education, working for FUNAI, and administration of indigenous organizations. In addition, I identified two other reasons why many nuclear families do not regularly cultivate a peanut field. First, some young families rely on elder farmers' production, usually their parents or other relatives within the expanded family. This situation reveal either a relationship of mutual support or explicit dependence; while some of these nuclear families provide money or goods (through paid jobs) for the expanded family, others are recurrently dependent on their relatives for food without contributing at all to its production. While this explanation is valid for some villages, in others I identified an explicit array of ways to ensure that all the members of an expanded family can benefit from peanut production, for which they are expected to contribute labor. In this case, one or a few families are held responsible for peanut production for the entire village, not necessarily in the elders' fields. In such a cooperative scheme, most involved nuclear families can direct their time to other competing occupations, while still being able to enjoy a share in the production of peanut.

I found different combinations of peanut field ownership (or responsibility for), work for preparation of gardens (cleaning, chopping and burning), tending fields, and the primary social unit in charge of the peanut seed management in distinct villages of the Xingu Park. Based on these elements, I propose four different management systems for peanut production and two intermediate systems. Table 4-7 summarizes the main features of these systems, including the villages and the proximate number of nuclear and expanded families involved in each system. Although additional variation might be found within villages and expanded families, I did not search for such details.

Regarding ownership, in Table 4-7 ***EF*** (expanded family) indicates a peanut field that belongs to all members of an expanded family in a given village. Conversely, ***NF*** shows fields belonging to nuclear families. ***Shared EF*** means that separate plots within the same field are cultivated by nuclear families belonging to a same EF. Similarly, garden preparation and care performed by members of an expanded family are expressed as ***EF***, while ***NF*** points to the work performed primarily by members of a nuclear family. ***NF / EF*** indicates that activities are performed mainly by members of a nuclear family with help from members of the expanded family. Finally, the social unit for seed management is designated as ***EF*** when seeds are managed by the expanded family as a whole, usually centralized by one or more elders. ***NF*** indicates that each nuclear family is responsible for its own seeds, and ***NF resp*** reveals that a single (or a few) nuclear family is responsible for peanut production in the village.

Management system A includes the closest approach to the system predominant in former times in small villages, as described by my informants. Only one expanded family lives, mostly single children and/or young couples, in the three villages currently performing this system. In general, members of the family work together in one peanut field. Seeds are managed under the guidance of elders. This system was active in Iguaçu, Muitara, and Mupada villages. In addition, Onze village is the place where an important Kaiabi leader is the headman, who is married to a Kĩsẽdjẽ woman; hence, the village is considered as belonging to both groups. Structurally, the village would be framed in the management A, but it was not growing peanuts in 2006.

Management system B encompasses two subgroups. Subgroup Ba is also performed in small villages but differs from category A by housing more independent nuclear families, with older couples rather than recently married people. Peanut fields are either opened in the same place and plots assigned to each nuclear family (shared fields) or placed in separate fields. Nuclear families might keep some peanut varieties that are not cultivated by all the members of the expanded family. However, it also includes nuclear families that do not cultivate peanuts regularly. The villages in subgroup Ba are Caiçara, Ipore, Itai, Maraka Novo, Pequizal, and Samauma. Pequizal, however, is an atypical village where a Kaiabi headman is the current leader of an old Yudja place.

Subgroup Bb, present in larger villages, shows broader composition of expanded families, which may have members at different ages. Each expanded family may work as if it was a small village. Thus, category Bb includes elements of the management system A mixed with those of the subgroup Ba. This system was present at Diauarum Post, and Capivara and Tuiarare villages.

Management system A/B includes villages in which peanut is cultivated mainly in shared fields by more independent nuclear families, which along with elder members of the expanded family make decisions about peanut seed management. The system includes the villages Três Buritis, Fazenda Kaiabi, Paranaita, and Três Patos. It is important to note that, except for Três Buritis, the other villages were split from Ipore (formerly called Kururu) and are located very near each other. Agricultural activities in the last village are still developed in strong cooperation with Ipore, including seed management, which alters the picture of a village with the smallest Kaiabi population in Xingu Park.

Management system C displays a remarkable difference from preceding systems: a nuclear family is responsible for peanut cultivation in its field. Most members of the expanded family contribute to preparing and harvesting the field, but it is generally tendred only by the nuclear family. Although elders voice opinions about management of varieties, such decisions are left mainly to the family responsible for the field. Currently, this system is operating in two medium sized villages, Ilha Grande and Três Irmãos, and a small one, Barranco Alto.

Management system D differs from system C in several features. It is found only in the middle sized Kwaryja village, where residents are deeply involved in bolstering peanut diversity.

The shaman, a middle aged man, guides the process. Until 2001, most nuclear families had their own peanut fields, but from 2002 through 2005, they decided to centralize the cultivation in one large field, located within the shaman's poli-cropping garden, to multiply rare old varieties and to select and reproduce new ones. Members of all nuclear families contributed labor for production activities, in addition to the practice of *mosirup* for harvesting the field. Although the production was directed at providing peanuts for all villagers, occasionally other expanded families cultivated small fields for their own consumption. In the 2006-2007 cropping season, the village returned to cultivating peanut in fields belonging to expanded families, in which the varieties to be sown were chosen by elders. In a following section, I analyze this experience in detail.

In management system B/D, peanut cultivation was performed mainly in a major shared agricultural plot, under the responsibility of a nuclear family of middle aged spouses. The only place where this management system is performed is the medium sized Sobradinho village. Labor came from the village's nuclear families, with about two thirds of them cultivating small adjacent fields in the same site. Due to failure to cultivate enough land to provide food for all the residents in recent years, in 2006 the villagers committed themselves to recover peanut production. Since then peanut varieties seeds were being managed by the couple responsible for the field along with the nuclear family of the village's headman (the brother of the woman who cultivated the peanuts), and his son.

The Revival of Crop Diversity at Kwaryja Village

Jepepyri and the Kwaryja Village History

Georg Grünberg (2004) described Jepepyri as a mixed-blood man born to a Kaiabi mother in the 1920s in a village in the Upper Teles Pires area. He grew up at the Post José Bezerra and soon learned and began to despise the way the Kaiabi were treated by the rubber tappers. Later, he worked for the Serviço de Serviço de Proteção aos Índios (SPI), which included traveling for long periods, and permanence in Cuiaba.

After his escape from the Post and subsequent encounter with the Roncador-Xingu Expedition around 1948, he was pursued by the rubber tappers and a prize offered for his head (Grünberg, 2004, pers. comm.). During the following years, Jepepyri traveled extensively throughout the Kaiabi territory suggesting that his people move to the Xingu Park, a safer place where they could regain freedom. Besides performing as a charismatic political leader, he also developed shamanistic skills. In the middle 1960s, however, Georg Grünberg (2004) described Jepepyri as a minor shaman, explaining that

> Jepepyri falava bem o português, apresentava-se muito cônscio de si mesmo e manifestava em relação a mim o comportamento típico de um brasileiro. (…) Parecia adotar diversos elementos dos brasileiros e dos Kamajura, principalmente na narração de mitos, designando-os de maneira sincrética como 'realmente pertencentes aos Kaiabi'. Por isso suas informações devem ser consideradas criticamente. (…) O mesmo vale para seu filho Meau'ap / Chico"[25] (Grünberg, 2004, p. 23).

Berta Ribeiro held a similar position about his mixed blood condition and syncretism (Ribeiro, 1979). In turn, the Villas Boas brothers considered Jepepyri a serious shaman and a practical man with political skills. Later, during her stay in the Xingu Park anthropologist Suzanne Oakdale (1996) referred to Jepepyri as being a respected headmen and a powerful shaman, one of only two true great Kaiabi *pajerete* (elderly and experienced shamans, or *pajes*)[26]. According to his sons, Jepepyri developed his abilities to benefit his own people. He

[25]"Jepepyri comunicated well in Portuguese, showed up always very self confident and demonstrated to me the behavior of a typical Brazilian (..) He seemed to adopt several features from the Brazilians and Kamajura mainly when telling myths, claiming in a syncretic way that as they really belong to the Kaiabi. Hence, the information he provided should be taken critically (...). The same applies to his son Meau'ap / Chico" (Grünberg, 2004). My translation from Portuguese.

[26] The other shaman was Tymãka'i, whom Grünberg watched performing at the Tatuy river in 1966. Since the migration to Xingu Park this *pajerete* lived at Capivara Village where Oakdale witnessed one of his healing sessions in 1992. When Tymãka'i died in 1997 (during a visit to his old place, the Tatuy river), Jepepyri became the "last great shaman" alive until 2000, when he passed away.

also acted as an intermediary between the Kaiabi and the non-indigenous, and helped to consolidate peace among the tribes living in the Xingu Park. Since his first trip to Xingu, Jepepyri built strong relationship with leaders of other ethnic groups such as Daa and Karandindi Yudja, Raoni Metyktire, Takumã Kamajura (who was considered to be his brother, thus linking him to Aritana Yawalapiti, the great Upper Xingu leader), among others including Trumai, Kĩsẽdjẽ , and Ikpeng leaders.

Jepepyri oldest son's, Anísio (or Chico, as Grünberg referred to him), was left behind when they escaped from the Pedro Dantas Post in the late 1940s, and he never met his family again. His other surviving son, Arupajup, was around age fourteen when the family marched to the Xingu. He is a historian connected with nature, famous for his skills as fisherman and hunter. Tuiarajup, his young brother, was the first Kaiabi to be born in Xingu, at 'Okang village. During his adolescence, he got sick when feeding on a bottom-river fish. Suggested by his older son, the father trained him in the practice of shamanism. However, Tuiarajup told me that he never completed his studies, because of his father's death. He also learned the art of politics, and now Tuiarajup is the leader of the Kwaryja village, and serves as a member of ATIX's political council and of the Health Service Council. Before dying, Jepepyri left two tasks for Tuiarajup: to take care of the patrimony of crops of Kaiabi, and to carry on his work as a shaman.

After moving permanently to Xingu, Jepepyri's family was living at the Leonardo Post. At this time, he already had learned about the agricultural system of the groups living in the area, which is heavily based on manioc cultivation and contrasts with the diversified Kaiabi poli-cropping system. Until this point, he was planting fields only with seeds obtained from other groups living in the area. Thus, he decided to ask for Kaiabi crop seeds and cuttings from his relatives still living in Teles Pires area. He dispatched a messenger, Tymãkang, to request that his cousin Juporajup (also known as Karapep) send him a little bit of everything. Tymãkang prepared the material with products from Jatyta village and from Jakunaap, Jepepyri's agricultural site. One year later, when the seeds and cuttings arrived at 'Okang site (at the mouth of Arraias river, in the Northwest corner of the Xingu Park), Tymãkang went to Leonardo Post to tell Jepepyri the news. It was1954, when an epidemic of chicken pox began. Several Kaiabi felt sick, including Jepepyri. He survived but two of his close relatives died (Hemming, 2003). This, along with the disappointment for their fields being constantly pillaged, and the need to receive the Kaiabi families arriving from Teles Pires, contributed to Jepepyri's decision to move back to the 'Okang village. According to Arupajup they lived in this village for about five years, where his father received and multiplied all the Kaiabi crops and most of their varieties, including peanuts. The crops were cultivated in an unnamed *terra preta* spot close to 'Okang, where the Panara Indians had their last village before moving back to their land, and the current location of Três Patos village. Due to the small amount of seeds and cuttings that were possible to bring from Teles Pires, the crops were multiplied for three years before being distributed to the incoming Kaiabi families, among them Jurumuk's, Ari's, Aukusing's, and other families. The families who brought seeds also shared them with Jepepyri, allowing him to improve his collection.

Having established an infrastructure to support those moving in, Jepepyri attended Cláudio Villas Boas calls to move closer to him, and opened a village called Awapey'i in the vicinity of Diauarum Post, a little south of the current place of Capivara village. About five years later, he decided to move to a more distant place from the Post and opened a new village, Pirakwara, the site of the current Três Buritis village. When the Panara Indians arrived at the Xingu Park (1975), Jepepyri gave them his place, moving to Itauu (presently Tuiarare village). Because of issues related to political leadership, pillage of fields and inter-family conflicts, about a year and a half later, his family moved to Pirãinani, best known as Krukisa, close to the place of the contemporary Três Irmãos village. They lived there until 1988, when Jepepyri accepted to return to Tuiarare, because of an effort to gather many families in the same village. However, conflicts arose again. Xupé, a relative of Jepepyri's family, had opened an agricultural site in the current Kwaryja village, but abandoned it because of problems with transportation by water during the dry season. In 1992, Parisum, Jepepyri's adoptive Parana son, opened a field in a *terra preta* spot in this location, where he built a house. In January 1995, Jepepyri moved with his family to this place, called Kwaryja (meaning the place for the sun and moon). Jepepyri's family delivered seeds and cuttings to families in all the places where he lived, and also to other villages. Under the guidance of elders, during the last year of Jepepyri's life, youngsters designed a map showing the trajectory of crop seeds from Teles Pires through Kwaryja village (Figure 2-2).

The Kwaryja Village Today

Kwaryja village is located in the central-north portion of the Xingu Park (Figure FFF), at the mouth of a creek that drains into a branch of the Xingu river behind a big island (Ilha Grande). In February 2007, 93 people were living there, 46 females and 47 males (Figure 4-1). About 42% of the population was under 10 years old, while those older than 20 and 35 years represented respectively 28 and 10%. There were seven houses (and two more under construction) in which three expanded families within Jepepyri's family lived, headed by Arupajup, Tuiarajup, and Parisum. The three are considered to be brothers, and Parisum is Arupajup's son-in-law. All of them had married children and grandchildren, and Arupajup had great grandchildren. The three EF account for respectively 53, 28, and 12 family members living in the village.

Young men run a small honeybee business, which provides some money for village level expenses (battery for the radio, bar soaps, salt, etc), besides providing a small revenue for the honey keepers. Tuiarajup is the only one who does not have a direct family member who earns money from a paid job. However, he has close relatives receiving money. As far as I observed, most retributions for his shamanic work was distributed almost immediately, and he usually did not accumulate goods in his house.

Industrialized food is praised by the villagers, although its use and frequency varies among households. However, in general it is consumed irregularly in Kwaryja, mainly when there are many visitors to feed, or on days when there is not enough fish or game for all residents.

The first TV set arrived in the village in 2004, because of its fame as a repository of crop diversity. The powerful Rede Globo, the largest Brazilian TV broadcast network, had asked to record two programs in Kwaryja in 2003, respectively about manioc cultivation and "traditional" diet, and peanut management for Globo Rural[27], a show devoted to agricultural issues. Upon their request, Kwaryja residents received their TV set as a retribution for allowing the recording and broadcasting of the shows. On that occasion, the villagers painted their bodies, and Tuiarajup sang and danced for *Kupeirup*, celebrating the good peanut harvest and giving thanks for her acceptance of his constant requests for new varieties. The TV was first placed in his house, powered by batteries fed by solar panels intended primarily for radio communication. As expected, nocturnal conversations diminished in intensity, but did not cease completely. Later this TV broke, and for the 2006 World Soccer Cup, the village teacher used his salary and honeybee money to buy a new one, which was placed in his father's house (Arupajup). Young

[27] Both shows were aired in open TV broadcast, the first in May (about manioc and diet) and the second on July 13th, 2003 (peanut diversity management).

people and children are particularly devoted to the new habit but since 2005, I never saw Tuiarajup watching TV again.

The two natural brothers Arupajup and Tuiarajup have most of their close relatives living in Tuiarare village, and Parisum has his own family connections with Nacepotiti Panara village. Each family is politically and economically independent, but they are tied by strong cooperative ties, besides kinship. Yet, occasionally some social tension among the brothers is visible, but by no means has it pointed to a village split in the foreseeable future. Agricultural work is performed independently by each EF, including peanut cultivation. However, actions related to peanut diversity management are coordinated by Tuiarajup, in close consultation with Arupajup, and secondarily with Parisum's family.

The village is located in a privileged site in which there are seven nearby known *terra preta* spots (*kofet* or *capoeiras*), as can be seen in Figure 4-2. Two *kofet* areas are currently under use, one at the village site, which is estimated to be able to receive crops for at least more five years, and the other at a short distance reachable by foot and by canoe, which was put in use recently. There are four remaining *kofet rarete* (true *terra preta* spots) and one *koferãn* (an intergrade between upland forest and *terra preta*), which are reserved for future agricultural activities. Given the favorable availability of good soils at Kwaryja, residents told me that individuals from other villages (who suffer from a lack of land suitable for diversified agriculture) might use *terra preta* spots in their area. However, they are required to ask the approval from the residents prior to opening a field in their area. Normally, this would be possible in the case of a marriage involving a resident of the village. In fact, this situation applies to some close relatives to Arupajup and Tuiarajup who live in Tuiarare village, but have active fields in Kwaryja.

Still, regarding the use of *terra preta* spots, I heard young men saying that the Kaiabi do not realize that *kofet*s are about to be exploited. At the same time that the Kaiabi seem to lack a planning tool to accommodate the use of prime agricultural land, the not uncommon accidental fires (which escape when burning new fields, or from other origins) are well known. They clearly associate fire with damages to vegetation and to the delay in its recovery after the abandonment of the fields. Furthermore, they consider it a bad practice to open isolated fields, far from the border of old ones. However, they say that people do not always listen to advice from the village chief or other advisers, indicating that the freedom of choice everyone enjoys prevails against the contrasting view of centralized leaders. Despite these disputes, population pressure on fertile soils is not a problem in Kwaryja village. Hence, there is a marked contrast among this and other villages, in which residents suffer from a lack of soils adequate for cultivating diversified fields, with important implications for the maintenance of crop diversity.

The Revival of Peanut Diversity in Kwaryja Village

The Kwaryja village initiative dealing with crop diversity has historical roots. According to Jepepory's sons, in 1993, as the old shaman was getting older, he asked for support from FUNAI to protect and conserve their crop patrimony. However, to his disappointment, FUNAI told him that it would not be possible to promote crop diversity conservation. Hence, the family decided to work by themselves, slowly maintaining a collection of varieties for most crops. In 1997, the request for support was presented to Instituto Socioambiental (ISA), who in 1998, began to discuss their proposal in the village. In 1999, I conducted workshops[28] exploring themes on crop diversity management, with one of them conducted at Kwaryja with Jepepyri present. Further,

[28] The workshops were planned and carried out with the collaboration of Simone F. Athayde, in the context of the Educational Program Ecology, Economy, and Culture, developed jointly by ATIX and ISA. Besides Kwaryja village, other workshops about indigenous crop science were conducted in Capivara village and Diauarum Post.

during the 1999-2000 cropping season, in order to gather baseline data, a census of crop varieties held by Kaiabi families was performed in all villages in Xingu Park and Kururuzinho village, Pará[29]. With these results, people in Kwaryja village talked about taking action to gather and multiply seeds of crop varieties revealed to be rare for further distribution to other villages. However, Jepepyri passed away in March 2000, and his village was in mourning for more than one year. In the second semester of 2001, they slowly resumed public activities, and another workshop was carried out in 2002 in the village, focusing on an assessment of the status of agrodiversity in general in Kaiabi villages of the Xingu Park, when tropical roots (mainly yams) were the subject of special attention[30] (Silva, 2002; Kaiabi et al, 2004).

Given the importance of peanut as a symbol of ethnic identity, the residents of Kwaryja village decided to concentrate a systematic effort to recover diversity within this crop, while paying attention to other crops. After Jepepyri's death, what until then had been a diffuse process, took the shape of a specific endeavor. The main driving forces for this initiative are three-fold. First, it was conceived as a way to honor Jepepyri's memory, because of his dedication to initiate and maintain crop diversity in the Xingu area. It was recognition that his work on the crops was linked to his connections with the supernatural world, too. It also aimed to counteract those who were blaming him for the abandonment of the old Kaiabi territory, sending a strong message that Jepepyri helped to improve his peoples' way of life when he decided to accept the invitation of the Villas Boas brothers to move to the Xingu Park. Second, the initiative in Kwaryja village was intended to address Tuiarajup's own concerns with conserving crop diversity, as requested by his father, but now in the context of a broader Kaiabi cultural revival

[29] Tatuy residents agreed to carry out a survey in their village but it was not performed. The Xinguan Kaiabi claimed that their relatives did not execute the survey, because they already had lost most crop varieties. The results of the survey, they added, would highlight this and bring shame to the Kaiabi from Tatuy area.

[30] Angela Cordeiro was in charge of planning and executing this workshop.

experience. After the census of crop varieties carried out in the villages, the Kaiabi manifested feelings that they were facing an irreparable loss of a part of their cultural patrimony. In that opportunity, many people expressed concern that the elders were dying, and hence seeds and associated knowledge would be lost. However, beyond that dramatic cry was the hope to recover their patrimony through a movement of resistance in the context of the cultural revival the group was experiencing (Senra et al, 2004). Thus, the results of the census helped to fortify the aspiration of Kwaryja village for the initiative as an endeavor aimed to strengthen links between culture and ethnic identity, which also relates to the Kaiabi political power inside Xingu Park. Yet, it emphasized Tuiarajup's personal connections with the spiritual world, including his association with *Kupeirup*. The third driving force relates to the opportunity for Tuiarajup to take advantage of the situation to gain social prestige, by channeling money and other resources from external sources into his village in particular, and to the Kaiabi in general. Therefore, it also relates to his growing personal political power among his people and to the prestige of Kwaryja as a village that effectively has something to show to others – a valued achievement among the Kaiabi.

Two years after beginning to systematically grow rare peanut varieties, in 2003, the leaders of Kwaryja village were offered the opportunity to apply for federal funds[31] to boost their work with peanut varieties. I was personally involved in helping them to design[32] and submit a community based project, which was approved for funding in 2004. ATIX was in charge of the administrative and financial management, and the villagers assumed responsibility for the

[31] The source was the Projetos Demonstrativos para Povos Indígenas (PD-PI, Demonstrative Projects for Indigenous Peoples), managed by the Brazilian Ministry of Environment under the Program for Protection of Tropical Forests (PPG7), operated with funds provided by the world's seven richest countries.

[32] Each question of the official form was read to the villagers, in Portuguese, and then translated to Kaiabi. After deliberating about each specific question, the answer was translated back to Portuguese by Sirawan, summarized and written down on the form. It took eight days to complete the five page long form.

execution of the project. The money was used to buy a new 8m boat and a 40 HP outboard motor, and covered fuel, food for meetings, and general supplies. A seed bank was built on the top of Jepepyri's tomb. Also, a small house was built in which girls were taught how to prepare traditional Kaiabi dishes, and boys were initiated in the ritual of serving guests. In addition, the project also included a training component for the young adults, planned to be partially developed through the village school, and short-term village-level workshops. Responding to their demand, these workshops were designed as collaborative tools in which I helped the villagers to build local capacity, as partial compensation for their kind acceptance for me to develop my research. Tuiarajup guided the process along with his older brother, and helped to set up training events for young people. Their wives, Wisi'o and Jepoi'i, performed an essential role dealing with peanut seeds, along with Karulina, Jepepyri's widow, and other women in the village. Young men participated as a work force to prepare and care for the fields. In all the discussions about recovering peanut varieties, Tuiarajup delivered historical narratives and gave explanations about his connections with *Kupeirup* and the linkages between agriculture and the spiritual world. The village teacher, Sirawan, was responsible for dealing with paper work, and three youngsters (two men and one woman) took notes of daily activities for memory recording. Two internal evaluations were performed per year, the main one just after harvesting time and the second after sowing the fields. The project received external administrative support from ISA. Although I left Xingu for graduate school in 2003, during my field work I assisted them in planning activities, recording their achievements, and preparing reports.

Shamanism, myth and crop seeds

Honoring the memory of Jepepyri, Tuiarajup turned into a keeper of crop diversity, cultivating every variety he had access to in the fields of his family in Kwaryja village. Hence, he assumed the responsibility of recovering rare varieties, to multiply and distribute them to other Kaiabi families. Parallel to conserving traditional varieties, he also strengthened a bridge built between agricultural practices and his connections with the spirit owner of crops, *Kupeirup*, and her sons[33], to which he was introduced by his father. Tuiarajup told me that occasionally, the spirit of Jepepyri[34] accompanied him in his dream travels.

After Jepepyri passed away, Tuiarajup started to more frequently visit *Kupeirup*'s house, fields and granaries in his dreams. He sought to get closer to her in order to respectfully take advantage of her relationships with crops in general and peanut in particular.[35] Conversely, *Kupeirup* and her sons also paid back visits to Kwaryja village. On several occasions Tuiarajup asked women to instruct their children to restrain from certain behavior and to stay at home after dusk[36]. He also kindly warned me that the spirits were coming, and said not to be afraid in case I noticed something different.

Although several Kaiabi myths mention crops (Pereira, 1995), the Myth of *Kupeirup* deals specifically with the origins of these plants (Appendix D). In short, the myth relates that in a time when the Kaiabi were suffering from a lack of food, this woman proposed to her sons to fell trees and prepare a field. When the felled vegetation was dry, she requested them to put her hammock in the center of the place and burn it. Initially, they refused to burn the mother, however she insisted, telling them that she would be transformed into an agouti. Thus, they should capture the animal. Against their will, they burned the field and their mother. *Kupeirup*'s body exploded and

---

[33] *Kupeirup*'s sons are called *Towairua*, the oldest, and *Kupemairua*, of whom Tuiarajup gave me a physical description, demonstrating his acquaintance with the family. Travassos (1984) pointed out that for the Kaiabi, spirits are not individuals, but families.

[34] The spirit of Jepepyri lives in a huge island, in the middle of a lake located somewhere in the direction of the sunset. Although his father asked him to not search for his spirit, Tuiarajup managed to find him.

[35] Tuiarajup, narrated on May 2003, translated from Kaiabi into Portuguese by Sirawan.

[36] Although these spirits are considered to be relatives, Tuiarajup told me that he is still learning how to interact with them. For this reason, it would be better for the children and adults to keep a respectful attitude because if something happened, he might not have the power to deal with the situation. See also Sullivan (1988) about helper-spirits.

each part gave origin to a food crop the Kaiabi cultivate. When they returned to the spot, her sons were unable to capture the agouti, who escaped. That is why a food taboo prevents the Kaiabi from eating this animal, which is their grandmother[37]. Afterwards, she established residence in a place reserved for the *maits*, and received from the Kaiabi the treatment of a great deceased shaman. Since then, the lessons taught by *Kupeirup* ideally guide the practice of diversified agriculture among the Kaiabi.

Tuiarajup values the narrative of elders, whom he considers to be the guides for the youth. However, he believes that recently narrators have told an incomplete version[38] of the myth of *Kupeirup*. Thus, he engaged himself in a task of expanding this myth, emphasizing his firsthand experience through his spiritual connections. He told me:

> Não tem segredo: eu sou pajé, eu tenho conhecimento pelo sonho. (…) Ninguém pode dizer que é mentira; se isso é mentira, então podem me chamar de mentiroso.[39]

Thus, based on his authoritative knowledge, he claimed to be entitled to tell his complete version of the myth of *Kupeirup*. This way, he would be teaching his people the true myth and contributing to strength Kaiabi culture and identity.

Georg Grünberg (2004) reported that the mountains are the preferred home for the spirits known by the Kaiabi. Narratives of Tuiarajup and Arupajup confirmed this statement. On a hot day at the end of the dry season of 2006, Tuiarajup came alone to the house where I was resting in the hammock just after lunch. Suddenly, he started to ask me questions about mountains, including geomorphologic details such as height, land form, and location. While asking

---

[37] Now this taboo is relaxed, and many Kaiabi eat agouti. Tuiarajup, however, referring to *Kupeirup*, recommends people not eat the animal. He also asked people to not kill the animal in case it was found feeding on crops.

[38] This behavior is in agreement with what Nimuendajú and Riester (1978) found in other Tupian groups in which narrators manifested their preference for telling complete versions of myth and stories.

[39] "There is no secret: I am a shaman; I have access to knowledge through my dreams.(…) ..Nobody can say this is a lie; if it is a lie, then people can call me a liar". Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

questions in a chain about unknown places, for which he did not give me time to answer, he took a wood stick and drew something in the ground. After a pause, he finally said: “That is the place where *Kupeirup* lives. Could you draw it in a piece of paper?” I made a quick draft and suggested to him that the youngster could make the drawing, which was done in poster size, as shown in Figure 4-3. According to his narrative, her house is located on a very high mountain to the east, in the direction of the sunrise. It is surrounded by round crop fields split by radial pathways, at which end there are eight storage facilities. He added that the fields are huge, but it is not a problem for *Kupeirup* family to perform regular farming operations, because they are spirits. Also, they farm the same place indefinitely, without problems. Similarly, in his writing about South American religions, Sullivan (1988) mentions that contemporary agriculture is the laborious version of sacred processes accomplished with ease by divinities in primordial times.

In agreement with what was told by other informants, Tuiarajup told me on different occasions that for the Kaiabi there are no crosses between plants; therefore, pollination does not exist. Contrasting to the biological understanding, he offered an explanation linked to Kaiabi cosmology. Regarding his practices with peanut, and referring to *Kupeirup*, Tuiarajup reasoned that

> Quando se planta munuwi e cuida bem, aparecem alguns tipos (novos), dizem que isso é normal. Misturando nossa ciência com a ciência do branco, diz que cruza, mas pelo nosso conhecimento não é por aí. A gente tá vendo de onde veio. Para os brancos as flores namoram, mas quem manda (tipos diferentes) para nós são os *Mait*. Essa é uma conversa que a gente está tendo sobre as plantas. (...) Então por que é que não aparecem (diferenças morfológicas) em todas as plantas? No caso do amendoim, por que não vêm todas sementes (diferentes) dentro da (mesma) rama, só vem algumas? (...) Tem uns tipos que já foram perdidos, que não vão voltar mais para nós porque a gente deixou eles de lado e a dona pegou de volta. O que está aparecendo (de tipos novos) é porque lutei muito para conseguir de volta da dona. (...) Algumas pessoas também podem falar que a semente nasceu da capoeira. Na verdade não nasceu da capoeira, foram os *Mait* que trouxeram e

> colocaram na roça. (...) Por isso que nossa mente poderia estar trabalhando junto com os pajés também, deve trabalhar com as plantas, para estar explicando para o povo. [40]

Therefore, plant crossings are not controlled by human agency, but can be managed through relations with the supernatural world, which are intermediated by experienced shamans. Kaiabi shamans are entitled to advise ordinary people how to proceed, pointing to socially accepted behavior that pleases the spirits (Travassos, 1984). Human actions can lead either to increase or decrease of plant diversity, according to how people behave. Farmers are supposed to have developed the skills to identify and dispense the appropriate care to old and newly received varieties, otherwise the spirits might take the seeds back to their domains. Hence, extinction as a biological fact does not exist, the loss of crop diversity being a consequence of spiritual intervention due to lack of proper management by human farmers.

While visiting *Kupeirup*, Tuiarajup saw many different peanut varieties in both *Kupeirup*'s fields and storage places, which do not exist in Kaiabi fields. Thus, since 2000 Tuiarajup started to systematically look for new peanut varieties (*ojopype uryauu ma'ea*) that he had seen in dreams in village gardens. In the beginning, *Kupeirup* was not willing to give him new varieties, but he persisted in begging for them. Accordingly, Tuiarajup insistently instructed people in Kwaryja to search for varieties while dealing with peanut in the fields, during shelling, and in any opportunity while managing seeds.

---

[40] "When you grow peanuts with appropriate care (new) types show up; people say that it is normal. Mixing our science with the white man's science, it is said that plants cross, but based on our knowledge it is not this way. We can see where (new types) came from. For the white people flowers make love but those who send them to us are the *Mait*. This is a conversation we are having about the plants. (…) And so why don't such (morphological) differences show up in all the plants? In the case of peanut, why don't all (different) seeds appear in the same branches, but only in some of them? Some types were already lost; they will never come back to us because we did not take care of them and the owner took it back. (…) Some people may also say that seeds sprout in old fallows. But they actually did not sprout there; the *Mait* are the ones who that brought them to the gardens. (…) That is why our mind should be working along with the shaman, working with the plants, to explain to the people (what is happening)." Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese. It is noteworthy that Tuiarajup acknowledges the work of old occupants of *Terra Preta* spots who might have left a legacy of agricultural plants. For example, several times, I witnessed Kaiabi farmers (including his family) recovering yams (*Dioscorea trifida*) from *kofets*, which they clearly associated with other Indians' agency.

Although *Kupeirup*, her family and other spirits of deceased relatives (including Jepepyri) usually show up during storms at any moment of the cropping season, they visited Kwaryja village regularly during harvest and shelling time. Such visits were directed to check whether the humans were taking adequate care of the peanut varieties received from the spiritual world, and to evaluate the work in progress. According to Tuiarajup, they always left the village happy with what they saw. Later, when delivering seeds to other villages, he also stressed their spiritual origins and urged people to cultivate them with respect and proper agricultural practices.

Tuiarajup emphasized that while following the orientation of his deceased father, he carved his own path for working with peanut varieties. Referring to *Kupeirup*, he told me that

> Por isso que tem tipo (novo) que aparece dentro de meu trabalho. Eu venho fazendo isso depois que o finado nos deixou. Isso não tem nada a ver com o finado, é meu próprio trabalho. (...) Hoje a gente vai seguir o que a gente vai querer fazer e mostrar os trabalhos para os nossos filhos, para deixar um exemplo para os nossos filhos e netos. Isso vai sendo repassado (a eles), para um dia quando nós não vivermos mais. [41]

This statement highlights Tuiarajup's respect for the sacred, the lessons from the past, and his concerns with the future, translated into cosmological and practical teachings to the new generations. Although the actions performed by *Kupeirup* are well known by Kaiabi elders, Tuiarajup began to emphasize the pursuit of an active interaction with her and to address farming practices related to these connections. Hence, beyond what he had learned from his father and other elders, while keeping his regular healing sessions, Tuiarajup became a shaman specialized in agricultural issues and succeeded in establishing specific linkages with the corresponding spirits. Travassos (1984) anticipated that each Kaiabi shaman has her/his own repertory, associated with a unique set of spirits. However, the literature does not register any other case of

[41] "That is why (new) types show up in my work. I have been doing this since my father passed away. This has nothing to do with him, it is my own work. (…) Today we are going to follow what we want to do and show the work to our children, to leave an example for our children and grandchildren. It will be passed on (to them) for the day when we will not be alive anymore." Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

a Kaiabi shaman dedicated to agriculture. Tuiarajup was the first one to launch such connections and to explore the practical implications of this relationship for agrodiversity management. Most adult Kaiabi individuals, regardless of gender and age, acknowledge this as a well established fact.

He stressed that traveling in dreams is a solitary endeavor, explaining how dangerous and difficult it is to interact with the spiritual world, requiring specialized knowledge and acquaintance with the spirits in order to succeed. Tuiarajup added that he would like to have other shamans working with him, someone who could understand his connections with the supernatural world and help him to explain the process by which he reached his conclusions. However, while emphasizing the uniqueness of his experience, Tuiarajup opened the door to criticize other Kaiabi shamans. He said that in dreams he met only two other living shamans, Tariwa Kaiabi Suya[42] and João Kaiabi, both his cousins. During such opportunities, shamans do not interfere with the work being performed by the other, they only observe it. Criticizing those shamans whom he considered to be inadequately prepared, Tuiarajup said that he would like to promote a meeting with the presence of all 15 Kaiabi shamans. Then, he would probe each of them, showing the drawing of *Kupeirup*'s house and asking for explanations. In his vision, there would be two teams: the strong team would have three participants; the other team would have many people, but it would not be strong.

> Vou pedir para cada fumante explicar, para mim tirar a dúvida, para ver se eles conhecem melhor do que eu. Se eles não acertam é porque eles não conhecem. A pergunta é fácil, mas se a pessoa não conhece, a pessoa já tá reprovada.[43]

[42] Tariwa was also trained by Jepepyri. She was absent from the Xingu Park for most of 2006; therefore I was unable to interview her.

[43] "I will ask each 'smoker'(shaman) to explain, for me to be with no doubt, to check whether they know (the work of *Kupeirup* with crop diversity) better than me. If they fail it is because they do not know. The question is easy but those who do not know (about *Kupeirup*) are reproved." Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

Although this planned meeting did not happen during my field work, Tuiarajup promoted a meeting to showcase his work at Diauarum Post. During this opportunity, and subsequent visits to Kaiabi villages, I witnessed Tuiarajup probing other shamans and village teachers about their knowledge of *Kupeirup*. Of those whom Tuiarajup probed, nobody was able to tell him the correct myth or to provide a satisfactory explanation for the multiplication of new peanut varieties in Kwaryja fields. The only exception was his cousin João. During a visit to his village, after Tuiarajup provided the usual explanations about *Kupeirup* and peanut seed management, João quickly offered comments rephrasing Tuiarajup's words. Later, Tuiarajup told me that João was the only shaman to fully understand his reasoning.

Naming varieties

Tuiarajup said that he learned the correct names for old peanut varieties from elders, who learned them from the ancestors, who in turn received the names from the owner of the plants. For newly-created varieties, during his visits to *Kupeirup*, Tuiarajup asked her about the correct name for each variety. Later on, he taught these names to other Kaiabi without any special ceremony. Referring to *Kupeirup*, on one opportunity, he told me:

> Não sou eu que dou o nome, o próprio dono dá o nome, eu só conto o nome que ela me contou. Isso não é trabalho de qualquer um, somente pode ser ser feito pelo pajé, o fumante. [44]

On another occasion, in 2005, during the course of a session in which Tuiarajup and Wisi'o were teaching me the names of some new varieties, I noticed the existence of different names than those I had recorded previously. When I asked him about these distinct names, Tuiarajup explained that *Kupeirup* always gives the correct spiritual names to the varieties.

[44] "I do not give the name; the owner herself gives the name. I only tell (the people) the name she told me. This job is not for everybody, it can be done only by the shaman, the 'smoker'." Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

However, there are also mundane, synonymous names for the varieties, for use in daily life, which he teaches people because they are easier to understand and remember. In general, these names are descriptive, evoking shape, color, human anatomy, etc. In contrast, when I interviewed people about the practice of identifying new varieties, most of those who mentioned giving names told me that the names of the newly-created varieties were given by elders, not necessarily a shaman. This fact points to an unvoiced manifestation about the role of shamans. As an analogy to children, to whom shamans still give names, although the practice is somewhat relaxed today, I believe the same is occurring with the names of peanut varieties, which in the past was probably an exclusive part of shamanic activity. Borrowing insights from other native South Americans (Sullivan, 1988), it is possible to identify a gap which Tuiarajup is trying to fill: the shaman places peanuts at the core of relationships with Kaiabi culture and mythology / cosmology, linking farming practices for food production – life, in other words – to *Kupeirup* and her sacrifice for her sons and for all the Kaiabi. At the same time, as *Kupeirup* offered her own substance to feed her sons, she also announced the bounds of family as a model principle for the Kaiabi.

Based on his experience, Tuiarajup criticized those who state any name without knowing the facts. His brother Arupajup echoed his words, adding that those who were born in Xingu do not know the names for crop varieties. Expanding on this, Tuiarajup said that people cannot invent different, fake names for the varieties. Specifically in regards to new varieties, he commented that it is necessary to show the results of his work in order to teach the correct names and to clarify their origins. In 2004, upon his request and under his guidance and from elders from Kwaryja, I assisted with the production of a brochure with pictures and names of all peanut varieties known at that time. While visiting other villages, he presented the poster showing

Kupeirup’s place (based on his dreams), and the brochure with pictures and names of peanut varieties, explaining repeatedly the correct names and their origins to villagers. In his quest for clarification, he suggested that those in doubt, especially the village teachers, could copy the names from the poster, paying attention to the pictures to avoid confusion later. Some of them followed his recommendation, as I personally witnessed.

However, despite Tuiarajup’s efforts to explain and divulgate correct names for peanut varieties, naming varieties in other villages was more problematic. During a workshop in Kwaryja village, when we were identifying the names of new varieties, the issues involved in naming varieties were summarized by the participants. Pirapy said that

> Tem tipos (novos) que aparecem em cada roça nas aldeias mas pessoal não separa, ninguém se preocupa com multiplicação. (Eles) ficam sempre com os mesmos tipos que já tem na aldeia. Eu não sei o nome de cada tipo novo (...) Vou separar na minha roça e trazer para o Tuiarajup ver. O que confunde é que cada um dá um nome diferente. Daí nao sei, como vou confiar no nome certo? Confio mais no cacique daqui, ele que sabe, ele que pode dar o nome (correto).[45]

Going further, Sirawan added:

> O munuwi ayjsingĩ vai para a Ilha Grande, talvez eles vão dar outro nome lá e daqui uns dois ou três anos a gente pode saber o nome que eles vão dar lá. Daí começa a confundir, pessoal não vai usar o nome registrado aqui. Daí não tá valendo mais, dá bagunça. Veja o exemplo da cuia, batata, cará: cada aldeia dá um nome diferente, então você não sabe mais o nome das coisas, vai lá ver e descobre que (o produto deles) é igual ao seu produto. Para mim é perigoso mudar o nome das coisas. Por exemplo, munuwi akapejup já rodou na Capivara e pessoal não concordou (com o nome). Então fica difícil trabalhar assim.”[46]

[45] “There are (new) types that show up in the village fields but people do not separate them; nobody cares for multiplying them. They always keep the same varieties they already have in the village. I do not know the names for each new variety (…) I will separate (new types) in my field and bring them for Tuiarajup to see. What makes a mess is that everyone gives a different name. Then, I do not know, how can I trust in the right name? I trust more in the chief from here, he knows, he can give the (correct) name.” Pirapy Kaiabi, Barranco Alto village. My translation from Portuguese.

[46] “The munuwi ayjsingi goes to Ilha Grande village, maybe they will give another name there. Then, in two or three years we can find out what name they gave. This is confusing, people will not use the name recorded here. It is not worth; we will end up in a mess. See the examples of the sweet potato, gourd, yam: each village gives a different name. Then you do not know the correct names anymore; you go there just to discover that (their product) is the same as yours. For me it is dangerous to change the names (for the crop varieties). For example, munuwi akapejup

I also interviewed residents of Tatuy and Kururuzinho who manifested similar opinions about the way people give names to peanut varieties in different villages.

At the same time that elders and shamans mastering the theme apply the correct names for peanut varieties (including some synonymous), the process of reshaping these names is widespread throughout the Kaiabi villages. Apparently, it is a well established practice that is unlikely will cease in the near future. I believe that there are distinct explanations for this fact, according to whether people know the “correct names” for the varieties, or not. In the first case, despite knowing the “correct name” people opt for using a local name or a synonymous. They feel free to choose whatever names they want not only for peanut varieties, but for virtually anything they have contact with. There is no centralized power to obligate them to act differently. In the second case, there is a lack of knowledge about the correct names for the varieties. In this case, one could claim that there is a double loss of knowledge linking on one hand varieties names and agricultural practices, and on the other, the spiritual connections associated with naming crop varieties. For now, it is hard to anticipate whether variations in naming practices and loss of knowledge will be modified by the cultural revival process in which the Kaiabi are engaged, and particularly, Tuiarajup’s dedication to divulgate the correct names for peanut varieties and their sacred origins.

Kwaryja’s Peanut Plots (2001-2006)

Long before Jepepyri passed away, Kwaryja villagers were already concerned with the maintenance of crop diversity in general, and of peanuts in particular. Having ended the mourning period following Jepepyri’s death in 2000, Kwaryja residents started to systematically sow peanut varieties for multiplication. According to Tuiarajup, his first motivation for

already arrived in Capivara village and people there did not agree with its name. So, it is hard to work this way.” Sirawan Kaiabi, Kwaryja village. My translation from Portuguese.

enhancing peanut diversity was to ensure sufficient seeds to feed his family, and to provide cultural information for them[47]. In the beginning, the shaman contacted other villages looking for seeds of the varieties that were lacking in Kwaryja. However, he got disappointing responses to his request, leading him to privately question whether people in other villages actually did not have the varieties or simply refused to share them.

Peanut fields in Kwaryja village followed a similar design to those cultivated in old times: peanut plots in the center, surrounded by other crops. However, the division of plots with different varieties, formerly done by lines of manioc, maize or cotton, was performed using mostly bananas. From 2002/2003 through 2005/2006, peanut plots were centralized in one large field directly managed by Tuiarajup and his family, which was prepared and harvested by members of all the families. The product was stored in a single place with seeds separated from the produce for consumption. Every family had free access to the product to attend their needs. Nevertheless, the two other expanded families kept a small peanut field for self consumption, and to have the product available to offer to visitors. During the 2006/2007 cropping season, Tuiarajup decided to return to the system of family managed peanut fields. He told me that this shift was an experiment to verify if villagers would be able to manage peanut diversity following his instructions.

There is no record about the varieties sown during the 2000/2001 cropping season. In 2001/2002, peanut varieties in stock in the village were multiplied, since the amount of seeds had dropped because of very small fields cultivated in the previous year. Tuiarajup registered in his notebook that *munuwi tapy'yjã'yt* was sown in only two holes; *m. teikwarapypesingĩ* was sown in four holes with seed saved in the village, in addition to other two holes sown with seeds of the

[47] According to a conversation we had on November 2002.

same variety that came from the Nacepotiti Panara village (through visits of Parisum family). *Munuwi ayjsing* was sown in nine holes. All varieties yielded a good harvest, providing enough seeds for the next cropping season. There was no record of the area under cultivation with other varieties in this season. Three new varieties were identified in 2001: *m. emyamuku ayjmirang*, *m. py'wi uu*, and *m. akapejup*. Finally, *m. jakareape* was not available in the village, but the villagers were looking for it to sow in the following years.

Table 4-8 presents data for the 2002/2003 through 2006/2007 cropping seasons on size of annual crop fields, area and respective number of plots with peanut, and the number of peanut varieties sown each season[48]. The area under cultivation was around 4500 m^2 for the 2002/2003 and 2003/2004 seasons, and more than doubled for the 2004/2005 season. It decreased to 8800m^2 in 2005/2006, but in 2006/2007 season it turned back to 11000m^2, when the plots were spread in different fields belonging to the 3 expanded families. The number of peanut plots increased over time from 35 in 2003/2004 to 111 in 2006/2007 season. Nevertheless, not all plots received a unique variety, with some of them consistently receiving duplicates of peanut varieties. The number of cultivated peanut varieties increased every year, with new varieties being added. Here it is important to emphasize that, although some new varieties were identified during harvest and stored separately, most of them were definitely identified and received names on the occasion of shelling to sow the next field.

Peanut varieties present in Kwaryja village from 1999/2000 through 2006/07 are reported in Table 4-9, which shows their status (whether a variety is old or new), the first record for them, along with data on when each variety was sown. A baseline survey carried out in 1999/2000

[48] The number of varieties after the harvest includes those identified directly in the field and during storage and shelling. I present the pooled data because it was not possible to surely determine when all new varieties appeared. Despite this limitation, it is possible to calculate the number of new varieties identified in the period between two cropping seasons.

cropping season showed that Kwaryja village had sixteen traditional peanut varieties. For the 2002/03 cropping season, the village was able to maintain fifteen traditional varieties, of which one (*m. jakareape'i*) was received from a Tapirapé village outside Xingu Park. In addition, four new varieties identified in 2001 were sowed. After the harvest of 2003/04, two other old varieties (*m. takapesingĩ uu* and *m. ayjsingĩ*) were added, brought from other Kaiabi villages to Kwaryja fields. In 2004, a fourth assumed Kaiabi traditional variety came from a Kĩsẽdjẽ village. It was *murunu*, which, as explained before, proved to not be the actual Kaiabi variety, and afterwards it was no longer sown. Furthermore, in 2005 two other old varieties (*m. siãeko'i* and *m. jakareape ete*) were recovered from other newly-created varieties, and since then put under systematic cultivation. In short, at the end of the 2006/07 season, there were nineteen peanut varieties considered to be truly Kaiabi under cultivation in Kwaryja.

For the new varieties, the situation is more complex. Table 4-9 represents the best record I could gather for the new peanut varieties created in Kwaryja between 2001 and 2006. Nonetheless, there are gaps in the information. In the context of the *Munuwi Project*, the first four new varieties were identified in 2001, followed by three others in 2002. In 2003 this number jumped to twelve. However, for 2004/05 and 2005/06, when Tuiarajup was absent from the village, the records are unclear. Despite my efforts to train three people as note keepers, which would allow them to perform the dual role of field assistants and registrars of the multiplication of peanut varieties for the villagers, problems about taking consistent notes arose. After the harvest of each of these years, it was difficult for me to positively discriminate the identity of several newly-created varieties. Although it was possible to recover a great deal of information for the 2004/2005 cropping season, through working systematically with Tuiarajup, Wisi'o and Arupajup, the same did not happen for the following season. Several reasons contribute to this failure: Tuiarajup was not in the village during peanut shelling, sowing and harvesting, and Wisi'o participated only in the harvest; record keeping was poorly done; varieties were mixed during harvest, and the labels of many containers of varieties were lost, adding more uncertainties to their identity. As a result, only six new varieties were undoubtedly identified in 2004, and seven in 2005. In addition, two traditional varieties, *m. siãeko'i* and *m. jakareape ete*, were recovered from other varieties in 2005. Nevertheless, I did not see two varieties identified in 2004, and four reported for 2005, having been sown in 2006.

In 2006, Tuiarajup was in the village and personally coordinated all the phases of the work. I had the opportunity to arrive in the village just after the harvest and stayed there accompanying the shelling operation and the sowing of the peanut fields, securing the proper data recording. Twenty-three new varieties were positively identified during this season, the vast majority (twenty) during shelling (as highlighted in Table 4-9). When I was in the village, I witnessed Tuiarajup's family sowing five new varieties in subdivisions of small plots. However, for the same season, another four varieties that I had seen in the village, which were stored separately and received distinct names, were not sown. Again, I could not figure out what happened.

Overall, from 2001 through 2006, Kwaryja residents succeeded in increasing the number of traditional varieties from sixteen to nineteen, or close to 16%. Furthermore, they abandoned a twentieth variety, *murunu,* because it did not satisfy their criteria for the ideotype of the variety. During the same period, 55 new peanut varieties were created under the perspective of Kaiabi farmers. Some of them were transformed in other varieties, others were lost. From this total, 39 were kept in distinct plots in the 2006/07 cropping season, representing retention of more than 70% of the newly-created varieties. However, issues about the identity of some new varieties persist.

In addition to the data presented in Table 4-9, there are a number of particularities about the origins of new varieties (Table 4-10). This includes varieties that originated from more than one parental variety, or were found in different years, those that had their name changed, and varieties that disappeared because of natural or human-induced causes. It is my best understanding that other similar events went under-recorded.

Commonly in Kwaryja village, varieties with a very small amount of seeds were sown in a subdivision of a plot, and could pass unreported. Despite my efforts to unveil what happened with the missing varieties reported earlier, I was unable to find out whether these varieties were actually sown, and were transformed into new ones, or had disappeared before sowing. My interpretation of these facts is that, along with occasional problems with the records for new varieties, their identification based solely on morphological criteria may contribute to their disappearance due to either mixing seeds of similar varieties during storage or because of the variation in phenotypic expression over time. Also important, although Kaiabi farmers used to identify and cultivate new peanut varieties since the far past, it was now a less intense task, with fewer varieties involved. Above all, they were never concerned with doing written records of their work. Several times during the course of our examination of the seeds when searching for the new types that were apparently missing in the seed bank, Tuiarajup explained me that the owner of the plants, *Kupeirup*, can take back seeds in the very same way as she provides them to the humans. This is a spiritual consequence for the lack of appropriate care. Yet, he blamed his relatives for mixing seeds during drying, storing, and for messing up varieties' labels.

For sowing peanut plots for the 2006/2007 season in Kwaryja, eight family fields were established (Table 4-11; Appendix F). The total number of peanut varieties cultivated in 2006 reached 58, sown to 111 plots. Arupajup's family cultivated four fields, representing 49% of the total area planted in peanut in the village, and was responsible for more than half of the total number of plots, which presented an average area from 40 to 138 m^2. A fifth field was planned but it did not burn well, and was thus unsuitable for receiving peanuts. These fields received a total of sixteen unique old peanut varieties, and eleven new ones. Tuiarajup's family had the second largest area of peanut (36% of the total area), with three fields encompassing plots with an average area ranging from 21 to 226m^2. The number of old varieties sown by Tuiarajup's family was thirteen, and the new ones summed 28. A point deserving attention refers to Wisi'o, Tuiarajup's wife. She had a field under her direct management in which only new varieties were sown, with an average size of 21m^2, and a range from 11 to 50m^2. Finally, although Parisum's family had three different fields, they opted for concentrating peanut in only one. The peanut field was split in 16 plots of an average size of 103 m^2. In this field nine old varieties were sown, along with seven new ones. The shift from a centralized peanut field back to family gardens revealed distinct strategies applied by each family, translated into similarities and differences in the choice of area sown to specific varieties. It also showed that the family of the shaman kept the responsibility for most of the newly-created varieties.

Peanut varieties were sown in distinct fields, number of plots, and acreage (Table 4-12). Overall, six unique old varieties (*m. emyamuku, m. py'wi, m. takapesingĩ, m. takapeun, m. tapy'yjã'yt,* and *m. wyrauna)* were sown by the three expanded families in the village, and another six (*m. ayjgwasiat, m. ayjmirangĩ, m. jakareape'i, m. myãpe'ĩ, m. teikwarapypepytangĩ*, and *m. uni*) were cultivated by two EF. Despite the greater number of new varieties sown in the village, only two of them (*m. py'wi uu* and *m. akapejup)* were sown by the three expanded families, while another four (*m. ayjapeywet, m. jakareape ayjun, m. py'wi pytun*, and *m. wyraunajup*) were sown by two EF. The remaining old and new varieties were cultivated in only one field each. The data reveal that, even among Kwaryja residents, the preference for old varieties is widespread while the new ones remain more attractive to Tuiarajup and Wisi'o, who in practice coordinate most of the selection work.

There were nineteen (33%) old peanut varieties under cultivation in Kwaryja in 2006 occupying an area of 6300m^2 (57%), split in 57 (51%) plots. Among these varieties, *m. py'wi* occupied six plots, the highest number for a single variety. However, when considering the area, this variety falls into fourth place, with a total of 531m^{2,} and an average of 88m^2/plot. Six other varieties follow, being sown in 5 plots each, with their total area varying from with 658 to 431m^2, and ranging in average from 131 to 86m^2. The variety with the greatest area was *m. takapeun* (658m^2 and average of 131m^2), followed by *m. takapesingĩ* (total of 635m^2 and average of 127m^2), then *m. emyamuku* (total of 538m^2 and average of 107m^2), followed by *m. py'wi*, and then *m. wyrauna* (total of 472m^2 and average of 94m^2), *m. ayjmirangĩ* (total of 449m^2 and average of 90m^2), and *m. jakareape'i* (total of 431m^2 and average of 86m^2). *M. tapy'yjã'yt*, with a total area of 449m^2 and average of 90m^2 was sown in 4 plots, and *m. teikwarapypepirangĩ* occupied 3 plots summing 265m^2 and an average of 88m^2 per plot. Following, four varieties were sown in two plots, with the total area varying from 390 to 159m^2, and the average size ranging from 195 to 80m^2. Finally, six varieties were sown in only one plot, with the area varying from 242 to 59m^2.

The total area for the newly-created peanut varieties was 4761 m^2 (43%), encompassing 39 (67%) varieties distributed in 54 (49%) plots. One new variety was sown to five plots (*m. akapejup)*, representing the second largest acreage for new varieties (618m^2). This variety is much appreciated by women because of its low rate of undersized or damaged seeds. Two other varieties (*m. py'wi uu* and *m. py'wi pytun*) were sown in 4 plots, whose total area varied from

638 to 381m^2, and averages varied from 160 to 95m^2. Only one variety (*m. emyamuku ayjmirang*) was sown in three plots, with a total area of 252 m^2 and an average size of 84m^2. Following, four varieties occupied two plots each, with the total area varying from 294 to 226m^2, and the averages ranging from 147 to 112m^2. At last, 32 new varieties were sown to only one plot, with the area varying from 169 to 11m^2.

It is interesting to note that *m. py'wi*, regarded as the most delicious and innocuous Kaiabi peanut variety, along with its "relatives" *m. py'wi uu* and *m. py'wi pytun,* altogether occupied the largest area (1550m^2), about 10% of the total, and the largest number of plots (14). By contrast, due to the small amount of seeds available, the new varieties with the smallest areas (*m. re'nun*, *m. re'ta*, unnamed 1, unnamed 2, unnamed 3, *m. tapy'yjãyriĩ, m. akapepiren*, and *m. wyrauna ysejan*) were sown to split plots at the border of the peanut area mostly in two fields belonging to Tuiarajup's family.

Despite being impressive, some key informants raised concerns about the numbers of varieties reported above. They said that it is dangerous to concentrate such diversity of peanut in only one place, because if Kwaryja residents face problems in their fields, most varieties could be lost forever. When I questioned Kwaryja leaders about it, they replied that their work aims to recover, recreate and multiply peanut varieties to be delivered to other villages. They expected people from other places to take care of their seeds, including those who receive seeds from Kwaryja. In this way, there would be several places cultivating the same varieties, each one serving as a backup to the others. No interviewee mentioned *ex situ* strategies for conserving Kaiabi crop diversity.

Social Work Organization

Agriculture is performed within the same framework as other Kaiabi villages: men choose the site for the fields; clear the area, fell trees, and burn new fields, with cooperative work involving members of the extended family. The place for peanut within the fields is prepared by men, women, and children. In 2005, for example, ten men were employed to clear and fell the vegetation of an area of 11,000 m^2. After burning the area, fourteen men worked with hoes and nineteen women handled rakes to prepare the plots for sowing peanuts, which was performed by adults, youths and children of both genders. Caring for the field was performed as usual, with periodic visits to the site when the development of the crop was assessed and actions were taken as required (weeding, stepping on the plants, insects killing, etc) through regular practices carried out by the Kaiabi.

For the peanut diversity management initiative in Kwaryja village, Tuiarajup decided to strengthen an old practice that had become relaxed: the *mosirup*, or the invitation of residents of other villages to take part in agricultural labor, mainly during harvest time. However, reflecting recent changes in other components of the Kaiabi farming system, the current *mosirup* was articulated through radio communication instead of invitation during personal visits as happened in former times. There is no direct compensation for the workers beyond receiving transportation and food from the host village. Abundance of fish and *kawĩ* is a must in these occasions. After the harvest, each female participant takes home a modest amount of produce without asking permission, which is an acceptable social practice. In this way, informal circulation of varieties is promoted, which people generally do not consider either a gift or compensation for their time. Tuiarajup decided to promote this kind of work arrangement for two main reasons: 1) to contribute to the Kaiabi cultural revival process; and 2) to showcase his family's work on peanut recovery, along with his own connections with the spiritual world. He used part of the free time during the period when his guests were in the village to address the myth of *Kupeirup* and the relationships between the spirits and peanut diversity management. A third product of this process was voiced mainly by Wisi'o who emphasized opportunities for women to meet and talk not only about peanuts, agriculture, and food, but also about other themes of their interest.

For the 2003 harvest, Tuiarajup invited his relatives from Tuiarare village, asking for ten people. Exceeding his expectations, 16 women and three men (his father-in-law, Xupé, his brother-in-law Jowosipep, and his son-in-law, Tamakari) arrived. Along with women from Kwaryja, they harvested and hauled the production to dry in the village plaza. During this time, Tuiarajup told the myth of *Kupeirup*, explained his connections with her, and highlighted the link between the spiritual domain and peanut diversity. Furthermore, as mentioned earlier in this chapter, when a team from Rede Globo was in the village recording two shows for Globo Rural, Tuiarajup took advantage of the opportunity to advertise his work. He paid tribute to *Kupeirup* performing a ceremony in which the participants were painted and he wore adornments, danced and sang, accompanied by women. Despite his being regarded as a seasoned singer and having participated in several other festivals, this was a unique opportunity, the first time I had seen him dressed in this way.

In May 2004, Tuiarajup invited people from Capivara village to work in the peanut harvest. Kupejani and his wife Rea arrived, along with other couple and children. The guests stayed in the village for ten days, when again Tuiarajup paid tribute to *Kupeirup*, singing, dancing and expressing his vision of her myth. Also, he talked about the origins of crops, and the appropriate care they required. Elders also sang and told stories. Guests praised the work on peanut management and recovery, including the increasing number of varieties, while acknowledging the spiritual sources for new types and the recommendations about crop care. Capivara women highlighted the importance for them to meet other women during work as a means to exchange opinions and experiences.

Kururu village (now called Ipore) residents were invited to participate in the harvest of 2005. However, they were busy with their own fields and were unable to attend the invitation. Thus, they asked to postpone their contribution for one year, and the harvest was performed only by Kwaryja residents. However, in 2006, a young woman resident of Ipore, passed away suddenly. The village was mourning her and could not come to work in Kwaryja. Again, family members from Tuiarare were invited; fourteen women and one man (Xupé) came. The work was performed as usual, with time to sing, tell stories and for Tuiarajup to renew his explanations about the process. The only difference was that this year, all the peanut production was left to dry in the field and later on Kwaryja women hauled it to the village.

A three-room community seed bank was inaugurated in 2005 in Kwaryja, and since then peanut production has been sheltered there along with other seeds. Tuiarajup told me that a tall spirit with a tattoo in his mouth was living in the seed bank building since it began operation. Until 2004, the harvest of peanut varieties under multiplication was stored at Tuiarajup's own house, or in his daughter's (Kwariup) house. Tuiarajup justified the need for this structure saying that it ensued a safer way to store seeds. "The storage and conservation of crop seeds in this new system does not threat our culture. Nothing changed, except the building", he added[49], emphasizing that seeds management stayed the same, including selection, shelling and sowing. Peanut varieties were stored unshelled, mainly in polyethylene bags, and in a few traditional (*munuwiyrũ*) baskets prepared by Arupajup. Each container was labeled with an individual number, corresponding to a specific peanut variety. Besides a house for storing seeds, Tuiarajup viewed the structure as a place for people to visit, learn about peanut diversity, and to search for

---

[49] By contrast, while an important leader I interviewed approved the model of the new facility, he also expressed concerns about whether other villagers could understand that what changed was only the building and not the approach to seed storage. He argued that at least some people would ask to build a similar facility in their villages in order to keep their seeds in a safe place.

and contribute seeds and exchange of information. As such, training events related to seed management, including workshops I conducted in the village, occurred in the community seed bank. Moreover, it soon turned in a multipurpose facility; it was also used for regular classes when the villagers were waiting for local school to be built, and the village pharmacy occupied one of the rooms until I left in late 2006.

Shelling is an operation performed basically by the residents of the village. In 2006, 23 individuals directly took part in this operation in Kwaryja village (Table 4-13). Three men worked occasionally for a short time while women performed most of the work, which was done gradually between August 18th and September 19th. Most of the work was performed independently by two teams of 4 to 10 people, in the house built for teaching the youngsters to prepare and serve Kaiabi food[50]. All the elder women participated, as did most of middle aged women. A small number of young adults, adolescent women, and female children were also involved in the operation. However, many other children, including small boys, were around playing, watching the work and listening to the conversation. The themes varied but included several observations on peanut varieties. In general, work started around 8:30-9:00am until noon, but occasionally it took all day long. Depending on the amount of seeds and shell hardness, it took 0.5-1.0 hr for a variety to be shelled, including the identification and separation of new types. Tuiarajup explained that the operation was directed to the identification of new varieties, emphasizing that those that had already appeared would be left behind. For this reason, although during this particular year shelling peanut followed the general framework normally applied to the activity, it took much more time than the operation performed in other villages. A final point relates to the association between agricultural practices and the spiritual world. Tuiarajup told me

[50] This facility also turned to be the village meeting house, and a guest house sheltering visits. Before it was built I used to stay with some family, but later I lived in this house for several months.

that during the shelling period, the sons of *Kupeirup* were there, accompanying the work during the day. At night, her eldest son along with his wife slept in the seed bank, while his young brother went back home. *Kupeirup* was at home with her grandchildren, taking care of her crop fields. Later on, she would come to accompany the sowing work.

Shelling as currently performed in Kwaryja shows how elements of the supernatural world and human farmers interplay. Remarkably, while male the shaman intermediates this connections, female workers perform the actual seed selection, translating mythological inputs into management practice. In other Kaiabi villages where the identification of new peanut varieties is still carried out, the agency of *Kupeirup* used to be perceived more subtly. However, under Tuiarajup influence the spiritual foundations for the practice seem to be gaining a renewed significance and strength.

Sowing peanut fields in Kwaryja involves individuals from the village, and occasionally close relatives from other villages might participate as well. In 2006, Tare'i, Tuiarajup's son-in-law, who lives in Tuiarare, was visiting the village and participated in sowing peanut fields. Table 4-12 also shows that in Kwaryja in 2006 while most old varieties were sown by more than one person, the majority of new varieties were sown by a unique individual. However, some of these varieties were duplicated in the fields belonging to the same extended family, as explained earlier. The choice of what variety to sow in each field belonging to nuclear families was made mainly by the eldest women of each expanded family, in close consultancy with their husbands: Jepoi'i (Arupajup's eldest wife), her daughter Morekatu (Parisum's wife), and Wisi'o (Tuiarajup's wife). In the last case, Tuiarajup was held responsible for a field and Wisi'o for another one, in which each spouse decided what to grow. Wisi'o sowed only new varieties in her field. In addition, both chose together which varieties to sow in their young son's field (Arutari).

Disaggregation of the total 39 individuals who sowed unique peanut varieties into Kaiabi age categories shows that most of them were adults (Table 4-14, Appendix F). Twenty-seven people participated in sowing old peanut varieties, of whom 15 (56%) were women and 12 were men (44%). According to gender division, women sowed 15 (79%) out of the 19 unique old varieties in an area of 3772m^2 (60%), encompassing 33 plots (58%). Men sowed 13 (68%) old varieties, performing the activity in 2528m^2 (40%), which represented 24 (42%) plots. When considering age categories, elder women (*iyruo* and *wawĩ*) were responsible for sowing most of the varieties (respectively 9 and 8 varieties, against 1 to 5 for the youngsters). In turn, the distribution of varieties sown by male age categories exhibits a more balanced proportion (3 varieties for the elders, and 4 to 6 varieties for the youngsters). Lastly, both women and men each sowed old peanut varieties in seven fields belonging to nuclear families of the 3 extended families.

Thirty people were involved in sowing newly-created peanut varieties in the same cropping season. Although the proportion between women and men was similar (16 and 14 individuals, respectively), women sowed 27 (69%) out of 39 varieties occupying a total area of 2678m^2 (56%), encompassing 31(57%) out of 54 plots. Men were involved with sowing 18 (46%) of the new varieties, which represented an area of 2083m^2 (44%) of 23 (43%) plots. Finally, again women sowed fields belonging to seven nuclear families but all eight nuclear family fields received new varieties sown by men. Overall, data about area and number of both old and new peanut varieties sown showed a slightly preponderance of female work. Also, elder women participated more intensively in the activity while for men a balance between age categories was visible, with the proportion of youths being a little higher.

Seed Circulation System

My field observations show that Kaiabi peanut varieties tend to be kept in the same place for a long time. The replacement of seeds of the same variety by seeds from other villages is an uncommon practice, and seeds circulate only when somebody is running out of them. In general, when somebody needs seeds, they first search within the expanded family. In the case of an unsuccessful outcome, the farmer looks for seeds with other expanded families, or outside her/his village.

The Kwaryja village initiative was designed to multiply and distribute seeds of peanut varieties to other Kaiabi villages in need of them. In order to have the most complete set of peanut varieties possible, residents looked for varieties lacking in the village. As a consequence, Kwaryja village received seeds of four peanut varieties from different places (Table 4-15), and delivered seeds of at least sixteen old varieties and ten new ones (Table 4-16). In addition, the village delivered other nine varieties whose identity was not recorded. The following villages received the seeds (in parenthesis is the number of varieties each village received): In 2003,Tuiarare (20); in 2004, Barranco Alto (2+1 unknown); in 2005, Samauma (5), Três Patos (6), Ilha Grande (2), Hurahossinkrô Kĩsẽdjẽ (1), Muitara (4, unknown), and Caiçara (3, unknown); in 2006, Kururuzinho, PA (3), Sobradinho (7), Diauarum (10), and Maraka Novo (2+1 unknown). Besides these villages, seeds were offered to Capivara village in 2005, but people there declined the offer because they had no fields available for planting the crop at that time. Ipore village did not receive seeds either because they were in a mourning period in 2006, when they had intended to participate in the harvest of peanut in Kwaryja.

Based on the lessons of his deceased father and other Kaiabi elders, Tuiarajup set up strict guidelines for farmers receiving seeds from Kwaryja. He decided to deliver peanut seeds to only one nuclear family in each village and instructed the recipients to multiply all the varieties for two years before further distributing them to other families. However, in the first delivery of seeds, to his father-in-law in Tuiarare village, his recommendations were not followed. The father-in-law, Xupé, is an old man with health problems. As such, his sons-in-law were supposed to open agricultural fields for him, which did not happen in the last years. Part of the seeds received was consumed as food and the remaining was divided among several families. They were sown on poor quality land, and most of the harvest was lost, as I witnessed in one field visited in 2004. Tuiarajup was disappointed, and decided not to deliver seeds in that year, resuming the activity in 2005 after reorganizing his distribution framework. Thus, he decided to deliver seeds according to those varieties that recipients declared to either have or not, based on his radio communication with them. The amount of seeds of each variety delivered (approximately1-1.5kg, shelled) was kept constant.

In addition to Tuiarare, later Tuiarajup visited the villages he provided seeds in order to see the results of the fields, following the traditional Kaiabi system of evaluation. In Três Patos, he found that the harvest was not bad, but could have been better. In the remaining villages, the production was good.

Apart from Kwaryja village, based on physical samples of seventeen peanut varieties and a complementary list with the names of other varieties, nuclear families interviewed in 2006 in other villages were asked to nominate all people to or from whom they had either provided or received peanut seeds. Some families expressed reservations in revealing whether or not they gave or received seeds, hence the information provided here includes data collected from third party informants. Data for peanut seed circulation among Kaiabi families in the Xingu Park for the 2006 crop season are summarized in Table 4-17 and Figures 4-4 and 4-5.

I found relatively limited circulation of peanut seeds among families and villages. The number and proportion of unique and cumulative [51] peanut varieties by expanded families and by nuclear families belonging to two same expanded families that exchanged seeds in 2006 is shown in Tables 4-18 through 4-21. Although more than one expanded family lived in distinct villages, the results show that only one family per village was involved in exchanging peanut seeds in 2006. Overall, only 17 (12%) Kaiabi nuclear families belonging to nine (24%) expanded families living in nine (41%) Kaiabi villages in Xingu Park (and two other places) said they had been involved in seed circulation. Of this total, seven (5%) nuclear families representing six (16%) expanded families from six (27%) villages acted as providers. There were 12 (8%) recipient nuclear families belonging to five (13%) expanded families from five (23%) villages. In addition to Kaiabi families living in Xingu, one family from a Yudja village (to which a Kaiabi family is linked through interethnic marriage), and a Kaiabi living in Kururuzinho, Pará (through Xinguans relatives), were also involved in peanut seed circulation.

Table 4-22 presents the characteristics of the nuclear families involved in seed exchange in 2006. With one exception, providers are considered to be elders by the Kaiabi. They originated mostly from Xingu, living in villages with distinct seed management systems. There is ample variation regarding whether they currently perform the practice of identifying new peanut types. Six of the providers were political leaders, four had paid jobs, and one was a shaman. Half of the nuclear families that received seeds were comprised of youngsters who were born in Xingu and lived in Sobradinho village. Three of them earned money from paid jobs. Some receivers were performing the identification of new peanut varieties in their fields. Regarding the seed

---

[51] I used the term *cumulative number of varieties* to express seed exchange events in which the same variety is involved more than one time. I considered a seed exchange event the movement of a single variety between any two farmers. For example, when a farmer provided three varieties to other, I counted it as three events regardless of the identity of the varieties involved in the operation.

management system, all the recipients showed a range of variation within the system B, in which members of a given expanded family work together during at least some part of the crop cycle, including the preparation of one or more peanut fields. In this sense, for agricultural purposes, expanded families in larger villages act as if they were an autonomous small village. Seeds are managed by the nuclear family under the guidance of elders within the expanded family.

Up to 25 unique peanut varieties were involved in seed exchanges events among nuclear families in 2006. There were 14 (56%) traditional varieties and eight (32%) newly-created ones, in addition to three (12%) unidentified varieties[52], probably new ones. Traditional varieties were involved in 43 (65%) of the cumulative number of seed exchange events while 19 (29%) of the events included a newly-created variety. Four events (6%) involved unidentified varieties. Expanded families provided between one and 16 unique varieties, receiving between one and 18 of them. The cumulative number of varieties provided was in the range of one to 26, and between one and 33 varieties were received. In turn, nuclear families provided a number of unique varieties ranging from one to 16, while for the recipients the number varied from one to ten. The cumulative number of peanut varieties provided by nuclear family donors was between one and 23, and recipients received between one and ten varieties each (Figure 4-5).

Nevertheless, varieties were not always correctly identified by informants. Consequently, in some cases, the names given to the varieties were wrong. I believe that the explanation for this fact is three-fold: 1) the lack of knowledge of the old varieties, including the confusion about the name for old varieties that are morphologically similar but differ in details; 2) the lack of familiarity with new types; and 3) the practice of pooling together new varieties that are similar to the old ones under the same name. As the interviews were conducted during the cropping

[52] The actual number of unique varieties may vary from 22 to 25, according to the actual identity of the unidentified varieties. However, for the quantifications in this section I considered the number of unique varieties to be 25.

season, most families did not have samples of their seeds at home, posing difficulties to positively identify some of these misidentified varieties. Hence, I used an artifice of comparing the varieties held by the donors and recipients. Table 4-23 presents data on peanut varieties whose names did not show a match between the donors' and recipients' declared collections of seeds (based on the physical samples of varieties).

Peanut varieties were mistakenly identified in 24 (36%) out of 66 total seed exchange events, involving 12(48%) out of 25 unique varieties circulating in 2006, with equal proportion of traditional and new ones. Erroneous identification of traditional varieties was present in nine (14%) events. However, with only one exception, no other new variety was properly identified; representing 15 (23%) seed exchange events. Most of the cases involving new varieties occurred within the two expanded families that received the greatest number of varieties, EF7 in Diauarum, and EF2 in Sobradinho, which also gave wrong names respectively to six (11%) and two (4%) traditional varieties. It is noteworthy that in this last village, the name of a single traditional variety (*m. teikwarapypepytangĩ*), which did not exist there, was given three times. For reasons explained above, it was not possible to probe whether the farmers were referring to the same variety or not. Furthermore, none of the unidentified varieties was named by the recipients. Moreover, in two cases, encompassing the flow of six varieties, it was not possible to verify the identity of the varieties. The nuclear family NF4 lives in Kururuzinho village in Pará. Although I had the opportunity to interview the couple, it was not possible to use the peanut samples to check the identity of the three varieties they received. The other case involved a family (NF5) whose male head had passed away some months earlier, and the widow told me that all peanut seeds were eaten by the children during the mourning period. The following analyses take into consideration the problem with the identification of varieties by recipient farmers.

Considering the cumulative number of varieties involved in all seed circulation events, the most frequent varieties exchanged were the traditional *m. ayimirangi* and *m. jakareape'i*, followed by a new variety called *m. emyamuku ayjmirang*, and then the traditional *m. ayjsing, m. emyamuku, m. py'wi, m. teikwarapypepirangĩ,* and *m. teikwarapypepytangĩ*. Villages Sobradinho (EF2), Kwaryja (EF11) and Diauarum (EF7) were the main sources of seeds in 2006. They provided a cumulative number of 26, 23, and 10 peanut varieties each. Together, these three villages were responsible for 89% of the cumulative number of varieties circulating in 2006, involving 24 out of 25 unique varieties exchanged in the same period. Traditional varieties came from different sources, the main one being Sobradinho village (EF2) with 11 (44%), followed by Kwaryja (EF11) and Diauarum (EF7), with six (24%) varieties each. Kwaryja village was the source for most unique new varieties (seven, or 28% of the total), and just one of them came from Samauma village. All unidentified varieties came from Kwaryja (Tables 4-17 and 4-18).

Kwaryja was the larger single provider of peanut varieties to other villages. The village provided seeds of seven varieties for Sobradinho (NF19), and ten for Diauarum (NF17). Kwaryja village delivered 16 unique varieties to four other villages while two nuclear families (NF14 and NF19) from Sobradinho (EF2) declared to have distributed seeds of 11 varieties already in place to six farmers, most of them cultivating their own share of a field at the same agricultural site. In addition to this seed movement, one nuclear family (NF19) from Sobradinho received seeds of another seven varieties from Kwaryja village, which were put into multiplication for later distribution. In Diauarum, a nuclear family (NF17) that received seeds from Kwaryja shared all of them with the wife's parents (NF11) (Tables 4-20 and 4-21). Kwaryja village also provided seeds to a family of relatives (EF4) that lives in Kururuzinho village, Pará, and to Maraka Novo village (EF5). Both received three different varieties.

Other major recipients of seeds were Sobradinho and Diauarum, with a respective cumulative number of 33 and 20 exchange events, involving 18 and 12 unique varieties (Table 4-18; Figure 4-5). However, due to the misidentification of four varieties by Sobradinho farmers and two varieties by the NF11 family in Diauarum, the number of unique varieties declared to be exchanged reached 18 and 12, respectively, as seen in Table 4-20. Without accounting for misidentified varieties, these figures drop to 14 and 10, respectively.

For the other donors and recipients, in six cases only one family from one village (Pakisaba Yudja, EF1) received seeds of one variety from one family of another village (Capivara, EF8). Another expanded family (EF6) received seeds of three varieties from two families and two villages (two from Muitara, EF10, and one from Sumaúma, EF9). Muitara village also provided seeds of three varieties to Itai (EF3). In two other cases, the same family received seeds from Kwaryja and provided seeds to others (Figure 4-5).

Recording seed circulation among Kaiabi families and villages was difficult because of under-declaration of events by farmers. Additionally, it was not always possible to positively identify the varieties involved in exchanges because of direct misidentification by farmers, mostly when new varieties were involved. The practice of putting more than one variety under the same name added to the confusion. Even when properly identified, seeds of varieties (traditional ones, in general) received from other villages were occasionally mixed with those already in place. Two important implications accrue from these results: on one hand, the data available points to an apparent limited circulation of peanut varieties among Kaiabi farmers. Kwaryja farmers were acting to boost seed exchanges among families while in other villages the internal movement of seeds was important. On the other hand, the findings reveal the complexity for estimating the genetic makeup of local peanut varieties based on their names. Despite its importance for conservation (Sadiki et al, 2007), this aspect of peanut management is not a concern for the Kaiabi.

Mechanisms for Seed Exchanges

Four main mechanisms for peanut seed circulation were identified in Kaiabi villages in 2006: 1) exchanging seeds within the expanded family; 2) donating seeds; 3) obtaining seeds when helping in the harvest of a peanut field; and 4) giving gifts. In addition to these mechanisms, I identified a fifth one, more informal, related to taking seeds from the kitchen during events. When considering the number of cumulative peanut varieties that circulated, the data show that exchanges within expanded families were the most frequent, with 35 events (53%), followed by donation of seeds involving 28 (42%) events (Table 4-24). In these mechanisms, traditional varieties were present in respectively 10 (15%) and 32 (49%) events, while newly-created varieties were involved in 14 (21%) donation events, and in just three (5%) events in exchanges within expanded families. Seeds obtained when helping in harvested were mentioned as occurring only in two events involving one traditional and one new variety, and a newly-created variety was given as gift. My perception is that people refrain from declaring seed gifts, which may be more common than the figures presented here.

Donation of seeds involved 18 (72%) unique peanut varieties while exchanges within expanded families were mentioned to involve 16 (64%) (Table 4-25). Unique traditional varieties taking part in donations accounted for respectively eight (32%) and 13 (52%) varieties, while seven (28%) newly-created varieties were involved in donation events, and just three (12%) took part in exchanges within expanded families. Seeds obtained when helping in the harvest and as gifts presented the same figures as for the cumulative number of varieties.

Finally, Table 4-26 shows that the exchange of seeds of unique varieties within expanded families was the main mechanism for seed circulation, with 53% of the 66 total events, followed by donation, encompassing 42% of the events. Again, the data show that a single expanded family (EF2) in Sobradinho was responsible for exchanging most seeds among its members, accounting for 39% of the events, with two nuclear families involved in 26% (NF19) and 14% (NF14) of the events. NF14 was the major recipient of seeds from the family, participating in 15% of the events. NF19 also received seeds in 11% of the events, through donation from EF11 (Kwaryja). EF7 responded for providing seeds within the expanded family in 14% of the cases and received donation of seeds in 17% of the events[53]. Kwaryja village (EF11) was the main source for seed donations (35%).

It is important to note that the families involved the most in the movement of seeds - EF2 (in Sobradinho) and EF7 (in Diauarum) - declared themselves to be actively engaged in expanding their patrimony of peanut varieties. As such, in 2006, they asked for seeds from Kwaryja village, where old varieties are multiplied systematically, along with new ones. This fact also explains the high number of newly-created varieties involved in donations events, as will be seen later in this chapter. Apart from these cases, seed circulation was performed between neighboring or more distant villages through kinship ties beyond the strict expanded family.

Nevertheless, the numbers presented so far must be viewed cautiously. There is an unspoken circulation of peanut seeds that partially appeared only when mining information from different informants. As explained before, helping in harvest (and other farming works) used to be performed by invitation, a social happening (*mosirup*) that has been losing strength among the Kaiabi. All the evidence I gathered points to the currently limited practice of inviting a family

[53] Actually, EF11 received and shared with EF17 the same set of ten varieties. The difference is an expression of misidentification of varieties names as explained above.

outside the expanded family to harvest peanut fields under normal circumstances. However, death or last minute health problems in the family still opens opportunities for other families to participate in harvesting peanut, as a solidarity act, and those who provide labor receive some amount of the product, although it is not directly regarded as a compensation for their time. Most farmers selected varieties from the product they received as food to sow it in their own fields. However, despite its practical consequences, the Kaiabi consider this practice as sharing food rather than exchanging seeds. In a similar fashion, seed gifts were declared to be present in just one case in 2006. I believe that other cases could have occurred but went undeclared, as they were considered a private matter. Finally, taking seeds for cultivation from the kitchen of training events and political meetings also seems limited, and no one mentioned this source of seeds in the interviews. I heard from other informants, not involved in the practice, of only three or four cases of this kind of seed circulation in the last years. I was unable to recover information about the number and identity of varieties involved in this mechanism.

I do not have quantitative data to support this, but my field observations show that peanut seed exchanges were limited within at least the last five years. Nevertheless, I acknowledge that seed circulation might have had a different intensity in old times. Although it is not possible to make conclusive longitudinal comparisons between the distant past and present situation, based on elder's narratives, I postulate that seed circulation was more intense in the past. Thus, although probably higher than the discussed above, I maintain my point that currently, apart from the initiative of Kwaryja village, seed circulation is performed by the majority of the Kaiabi mostly in emergency situations or occasions in which volunteer movement of seeds is not involved. Indeed, that is the perception of Kwaryja residents, which motivated them to engage in delivering seeds of varieties to other villages while seeking to strengthen peanut diversity management in their own village.

Spreading the Word: Strategies to Disseminate the Foundations and Practices Associated with Peanut Diversity Management

Tuiarajup's unique perspective on crop diversity is also revealed through his talent as a communicator. He gradually developed a full set of strategies to grab people's attention about his approach to agrodiversity management. His skills in managing different media allowed him to address different audiences, including elders and youngster of both genders of his family in Kwaryja, other Kaiabi villagers and leaders, other ethnic groups, and non-Indians, within and outside the Xingu Park. He adopted three main strategies, which he used alone or combined according to the audience. First, he exhorted and incentivized the Kaiabi to exercise direct contact with peanut varieties, during all phases of the cropping cycle and related activities. Second, he practiced oration through speeches and storytelling. Third, he adopted elements of written and graphic communication. In addition, he employed other means of communication that happened to be available at the time, such as the amateur radio, TV broadcasting, and participation in events external to the Xingu Park.

In 2000, after we completed the census about varieties availability in all villages in Xingu, along with his family, he was the main individual who fostered a discussion on the consequences of the loss of crop diversity for the Kaiabi, which was echoed in Kururuzinho and Tatuy. However, when elaborating his work on peanut recovery in 2002, Tuiarajup's thoughts were primarily directed to his family, mainly the new generations. He carefully crafted a strategy to communicate his ideas to them, later expanding to include other audiences. His argument was based on the transitory character of human life, saying that his brother was already old, and he also would not live forever. Thus, it would be necessary to teach the children, for them to get acquainted with issues related to Kaiabi culture. In 2004 he told me that

> Como o trabalho que está sendo feito trata da recuperação de nossas sementes, dentro da nossa cultura, se misturar as coisas do branco os nossos filhos não vão entender e aprender a nossa cultura. O que está sendo conversado e discutido é repassado para todos. Os mais velhos e os mais novos estão aprendendo.[54]

Accordingly, in several opportunities he used speeches and storytelling including the myth of *Kupeirup* and explanations of his approach to multiply rare varieties along with the mechanisms employed to create new varieties. During activities involving peanut field preparation, cultivation, harvest, or shelling, he spoke to the people of his own village. Also, every year he addressed the residents of other Kaiabi villages (mainly women, most of them mothers) and invited them to harvest peanut in Kwaryja. This procedure is in agreement with Sullivan (1988), who stated that the performance of agricultural activities is a privileged opportunity to transmit cosmological and technological lessons. Such speeches were also partially conceived as an interim evaluation system of the *Munuwi Project*, when he left space for the participants to voice their opinion. In 2003 he told me that

> As mulheres que vieram participar da colheita do amendoim, (também) vieram para eu contar um pouco essa história para elas. Elas acharam que eu estava fazendo esse trabalho à toa. (Eu) não tinha o sentimento de fazer (este trabalho), talvez algumas mulheres sentiram que eu estava contando a história (que envolve meu finado pai), que eu estava fazendo esse trabalho que é muito importante.[55]

---

[54] "As our work deals with the recovery of our seeds, within our culture, if you mix what is ours with things belonging to the whites our children will not understand nor learn our culture. What is being discussed is transmitted to everybody. The elders and the youngsters are learning." Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

[55] "Women that came here to participate in peanut harvesting, (also) came to listen to me telling this story to them. They thought that I was working in vain. I do not feel like doing this work; maybe some women felt that I was telling the history (about my father), that I was doing this work that is very important." Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

Tuiarajup embraced the recording of the Kwaryja experience as a strategic component of his work, asking me to prepare written, illustrated reports about the work, justifying that "(tudo) vai estar registrado no papel e talvez de lá vai ser repassado para os nossos filhos e netos”[56]. He also envisioned a role for the village school:

> Talvez os meninos não estão entendendo o trabalho, o pessoal tem que fazer perguntas para aprender. O professor também tem que trabalhar sobre a recuperação das sementes da roça. Para isto o banco de sementes está sendo construído, não é só para guardar as sementes, é também para os alunos fazer pesquisa sobre as sementes lá dentro.[57]

However, the school in Kwaryja village, run by Sirawan, was not operating for most the time in the last years of my research. This fact occasionally provoked tension between Tuiarajup and his nephew who was expected to perform the written record of the activities developed in Kwaryja but occasionally failed to do so.

To fulfill this gap, Tuiarajup engaged in training workshops on agrodiversity management for the youth, and to prepare them to record the work developed in his village. During these opportunities, he stressed the importance of being prepared to not depend much on external support, including from ATIX. Acknowledging the importance of the association to deal with political and administrative issues, supporting the effort made in the villages, his reasoning indicated that the development of the Kwaryja initiative in turn was contributing to educate ATIX’s members in Kaiabi cultural issues. As a partial product of these workshops, a para-didactic material called “*Ciência da Roça Kaiabi*”, or Kaiabi Swidden Science (Silva and Athayde, 2002) was published and distributed to the villages of all ethnic groups living in Xingu

---

[56] “Everything will be recorded on paper. Maybe it will reach our children and grandchildren.” Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

[57] “Maybe the kids are not understanding the work, they need to ask questions to learn. The teacher should also work on the recovery of crops. For this the seed bank is being built. It is not just to store seeds, it is also for the students to do research about the seeds in there too.” Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

Park. In addition, as commented earlier, a brochure with pictures and names of all peanut varieties known at that time was produced in 2004. Finally, in 2006 I prepared a report (Silva, 2006) on peanut management focusing mainly on the experience of Kwaryja village, but also including inputs based on what I learned in other Kaiabi villages. In addition, a poster about the history of Jepepyri and the initiative on peanut diversity management in Kwaryja was produced for a meeting Tuiarajup and his wife Wisi'o attended in Italy[58]. Tuiarajup used this poster, along with his rendering of *Kupeirup*'s place and written materials, to support the point he was making during different meetings he was invited to attend in Xingu Park. Occasionally he also showed these materials while talking to the people in Kwaryja village. Lastly, upon his request, the "complete" myth of *Kupeirup* as told to Rosana Gasparin is being transcribed, and the final product may be transformed into a publication.

At the time of my first visit to the village, in 1997, Kwaryja village was already famous for its abundance of food, attracting many travelers on the Xingu river. Later, Tuiarajup used every opportunity to show visitors the seed bank, and explained his approach to agrodiversity management to all Indians and non-Indians who passed by. He also employed radio communication to exchange impressions with residents of other villages and political leaders about the work carried out in Kwaryja.

Still within the Park, he took advantage of political events and meetings promoted by ATIX, and by the Health Service, to deliver his message. On two opportunities he benefited from specific settings for advancing his vision. In 2005, the Health Service promoted a meeting in order to discuss malnutrition in children, and Tuiarajup and Wisi'o were granted a large time slot to present their work on agrodiversity management. The audience included elders, mature and

[58] The *Madre Terra Meeting*, promoted by the *Slow Food Movement*. Turin, Italy, 2006.

young women and men, political leaders, village teachers, and shamans from the Kaiabi, Yudja, Kĩsêdjê, Ikpeng, among others. In June 2006, Tuiarajup himself promoted a meeting at ATIX headquarters in Diauarum directed to the Kaiabi, as part of the formal evaluation for the *Munuwi Project*. He opened the meeting referring to *Kupeirup* and asked those present, first the elders, then the shamans, and finally the teachers to explain about the origins of crops and the appearance of new varieties. After listening to them, he showed the poster depicting *Kupeirup*'s house and fields and delivered a speech. Afterwards, he and Wisi'o presented samples of 35 new peanut varieties for the presenters to examine and comment upon. At last, he offered the opportunity for those who needed seeds to ask for them in Kwaryja. Although not a complete novelty for the audience, the fact that Tuiarajup and his family were sharing the results of their work in public brought an atmosphere of respect and admiration for their initiative. Particularly, Tuiarajup's prestige peaked. His frequent visits to Kaiabi villages (Tuiarare, Capivara, Samauma, Ilha Grande, Muitara, Diauarum Post, Ipore, Paranaita, Manito, Sobradinho, and Maraka Novo), where seeds were delivered, to evaluate in person the performance of peanut fields, also contributed to consolidate this reputation.

Furthermore, visits with other ethnic groups added to his prestige. In August 2006, I had the opportunity to accompany Tuiarajup's family while visiting his cousin Kokoti Aweti Kaiabi, then the head of Leonardo Post, and later Aritana Yawalapiti, the great political leader. Among other themes, the conversation advertising the peanut management in Kwaryja village made a very positive impression on the hosts.

Later, during the last phase of my field research, I travelled to all Kaiabi villages in Xingu to perform interviews. Tuiarajup, Wisi'o and Arupajup accompanied me, along with some children. After completing my work in each village, Tuiarajup provided residents with an account of his approach to peanut diversity management. On these opportunities, he exhibited pictures, printed materials and explained his interactions with *Kupeirup*, again showing the rendering of her house and fields. He stressed where the new varieties came from, advised people to properly take care of agricultural fields, and how to work respectfully while managing agrodiversity. During such visits, he also called the attention of village teachers, saying that they are in the position to spread the correct information to the youth. On our way to Caiçara village, we made a short stop in Tuba Tuba Yudja village, where Tuiarajup set up a meeting for the next day, on our travel back to Diauarum. In this meeting, he performed a long presentation, employing all his oral and visual resources. Later he told me that other ethnic groups living in the north part of the Xingu Park could carry out similar work:

> Os Suya (Kĩsẽdjẽ), Juruna (Yudja), eles também têm que contar a história deles, porque esses povos também têm pajés. Eles devem conhecer o que é deles, o que vem do avô deles. Cada povo tem sua história, então eles também têm como contar a história do povo deles, como nós. Isso é bom para nós, é bom para eles, para que estejam conhecendo o que nós temos.[59]

During the meetings and visits I witnessed, Tuiarajup talked most of the time. When I asked Arupajup why he rarely expressed his vision, he told me that "Tuiarajup is the shaman, the one who knows." After he finished his explanations, usually Wisi'o talked a little, addressing her speech mainly to the women. As a consequence, Tuiarajup's prestige as a shaman grew considerably, and he was confirmed as the greatest Kaiabi authority on peanut matters. His brother stayed in the shadow, while Wisi'o earned public prestige as a co-adjuvant actress. Nevertheless, besides talking to women visiting her place, Wisi'o also visited other villages and attended meetings when she had opportunities to exchange impressions with other women.

[59] "The Suya (Kĩsẽdjẽ) and Juruna (Yudja) should tell their history too, for they to have shamans also. They should know what is theirs, what comes from their grandparents. Each people has its own history, so they have ways to tell their history, just like we do. This is good for us and it is good for them; for them to get to know what we have." Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

Borrowing an expression from Laure Emperaire (pers. comm., 2005) that applies well to this case: “I would say that men as shamans are epistemologists; women, in turn, are the agronomists.” These performances reproduce the dynamic of Kaiabi social interactions in which women are mainly associated with the domestic sphere, while men are expected to manifest their voice in the public arena, as observed by Grünberg (2004), Oakdale (1996), and Travassos (1984). Afterwards, to ensure that I had understood what happened in the villages, referring to both *Kupeirup* agency and to the systematic peanut management performed in Kwaryja, Tuiarajup told me, including quotes of villagers, that

> (Foi) isso que expliquei para o pessoal nas aldeias. Pessoal ficou quietinho escutando, depois falaram. Jyapã disse: ‘nossa, pensei que era uma coisa falsa esse seu trabalho, agora tô vendo. O desenho mostra de onde vem o caminho da casa da dona para o Xingu. A gente não tava sabendo que você tava fazendo esse trabalho. Isso é importante para nós.’ Já foi provado o trabalho, é bom seguir para não acabar. No (aldeia) Três Irmãos, Kaipa falou que ‘hoje os velhos não tem mais condições de fazer isso, tem que ter jovem para fazer este trabalho para nós.’ Agora o povo conheceu o trabalho que está sendo feito aqui. [60]

Kwaryja residents also had the opportunity to reach audiences outside Xingu Park. As mentioned earlier, in 2003 Rede Globo asked them to record two shows, respectively about manioc cultivation and “traditional” diet, and about peanut management. The programs were broadcast nationally, disseminating the Kaiabi initiative to a public much greater than they ever imagined. Finally, Tuiarajup attended international workshops on agrodiversity management and related themes in 2001 (Colombia), 2002 (Brazil), and in 2006 (in Italy, along with Wisi’o), when he advertised the work of his family connecting the spiritual world with agricultural practices, and exchanged experiences with other indigenous peoples and non-indigenous

[60] “That is what I explained to the people in the villages. They listened to me quietly and then spoke. Jyapã said: ‘well, I thought that your work was fake but now I can see. The picture shows the way from the house of the owner (of crops) to Xingu. We did not know what you were doing in your work. This is important for us’. The work was already tested and it is better to keep going so that it does not end. In Três Irmãos village Kaipa said that ‘today the elders don’t have the means to work on this anymore, we need a youngster to do this work for us.’ Now the people know the work that is being carried out here.” Tuiarajup Kaiabi, Kwaryja village. My translation from Portuguese.

advisors. Thus, he and Wisi'o broadened their communication capabilities. In this context, it is worthy to recall Sullivan's words (1988, p. 369):

> It is important to remain cognizant of the sacred origins of gardening. Agricultural labor often becomes a medium of the messages it signifies and the context of their transmission. Apprenticeship serves as a time to acquire tradition along with technology.

Myths, storytelling, informational speeches, and conversations about the work performed are usual practices for the Kaiabi, and are present in most social gatherings. Moreover, they are not restricted to the shaman. The use of printed material is not a novelty given the relatively long history of indigenous administrative experience and schooling in Xingu Park. However, based on his authority as a shaman, Tuiarajup used these resources to strengthen his renewed arguments about the sacred context of agriculture, particularly of agrodiversity management. His approach represents a blend of old and new communication skills, revealing his awareness of the relative loss of importance of transmission of knowledge about the spiritual world and of the vertical transmission of farming practices. While still valuing oral expression and the direct contact with plants and associated agronomic practices in the field, Tuiarajup simultaneously felt the need to record myths and traditional agricultural processes in writing and pictures for use by future generations.

Initiatives about Crop Diversity in Other Kaiabi Villages

The work on peanut management in Kwaryja spurred other Kaiabi villages to deal with their crop diversity. Among them, Capivara village launched a movement to recover maize varieties, along with efforts to experiment with agroforestry practices to recuperate exhausted *terra preta* spots. Três Irmãos village expressed their desire to work with manioc varieties, and Sobradinho village with fava bean diversity. However, all of them require external funds to begin work. Although Capivara residents received technical support to design a project, they did not succeed in getting funds for their proposal. The other two villages are far behind this phase.

Tuiarajup supports their initiatives, saying that this widespread interest is proof that his family's work has helped to attract the attention of the Kaiabi to crop diversity. However, he voiced concerns that his relatives want to address crop diversity without enough consideration of the spiritual dimension. According to him, without a trained shaman, they will not reach their manifested objectives.

On the other hand, a Brazilian research institution proposed a project to investigate peanut diversity in Ilha Grande village. This proposal profoundly divided the Kaiabi, and ATIX initially refused to participate in the research because it included the collection of germplasm. Leaders feared that the villagers would not benefit from the results of the research, and that after the collection of the seeds the Kaiabi would lose control over their agrodiversity. In a polemic meeting in Diauarum in 2004, although many leaders expressed their disagreement with the project, it was approved by the president of the association, and a contract was signed authorizing the research. In 2006, most key informants I interviewed[61] told me that they were never informed about the research activities and saw no benefit for the Kaiabi people as a whole. I also interviewed the leader of Ilha Grande who had approved the project. He told me that he was not concerned with other villages' claims because they had tried to block his project. In addition, he plainly stated that a scientist told him that the process of creating new varieties through spiritual intervention does not make any sense. Nevertheless, he was unable to clarify what specific research activities were being performed in his own village. As I did not have access to publications describing such activities, I cannot comment on them. In contrast, the initiative developed in Kwaryja was unanimously praised by villagers and leaders as authentically run under the control of the Kaiabi people, with an efficient strategy of

[61] One of the key informants declined to comment on the issue saying that he was not informed about it, and another declared that he would not feel comfortable talking about a neighbor's decision.

communication and without taking seeds outside the Park. Although criticized in some aspects, as discussed earlier, virtually all interviewees expressed the desire that Tuiarajup and his family continue to work on peanut diversity to deliver seeds to villages that had not yet received them, and for Tuiarajup to keep explaining the origins of new peanut varieties. People from different villages and backgrounds repeated*: 'he is a shaman, he knows'*.

A Brief Note on the Evaluation of the *Munuwi Project*

Although informal conversations about peanut management can occur at any time, two times a year Kwaryja villagers gathered to evaluate the work performed in the *Munuwi Project*; they usually met in the end of March or beginning of April and again after the harvest (late May or June). Access to the meeting was granted to everybody, when all the adults were able to manifest their opinions. According to the narratives I heard, these meetings were generally positive, with emphasis on achievements. I never heard of problems emerging on these occasions. In a meeting held in June of 2006, people discussed that besides successfully multiplying peanut varieties, they were pleased with the project's promotion of traditional dishes, because it increased attention to other crops, such as fava beans, yam, taro and others. In this way, they said, children were able to better know their traditional food. However, these successes were not without problems. I witnessed moments of tension over different interpretations about individual behavior concerning the peanut diversity recovery initiative. These included divergences between Arupajup and Tuiarajup, and between Tuiarajup and Sirawan, the village teacher. Maybe the most prominent event took place in 2005, when Tuiarajup was absent from the village for a long time, and the recording for the work was poorly performed. Although carefully voiced in public, on occasions when these issues were discussed during village meetings with me present, they were generally addressed privately among the Kaiabi. I was informed of them in private conversations.

Besides this kind of internal evaluation, political meetings promoted by ATIX were used to advertise the work of Jepepyri's family and to ask for feedback from their relatives. As in community meetings in Kwaryja, no one raised open criticism about the project during these opportunities. Nevertheless, some people told me privately that Kwaryja residents were able to multiply seeds because they have good land available. However, in the future they might face a similar lack of suitable land that other villages are experiencing now, which could harm the efforts so far. However, as shown earlier, Kwaryja village has plenty of good land for current and future use, invalidating the criticism. Moreover, gossip abounds about everyone and all issues. I heard several malicious comments about the work being executed in Kwaryja[62], some of them related to money management for the formal project. Regarding this topic, several times Tuiarajup, Arupajup and Wisi'o told me that they started this work without any external support and would continue to do so. Furthermore, ATIX was in charge of the money management, not the villagers. Based on these facts, I silently regarded these comments as mere jealously. Finally, another criticism I heard is that everything revolved around Tuiarajup, and if something happened to him there would be nobody to carry on the work on peanuts[63]. In addition, some critics told me that once Tuiarajup became "owner" of this work, he was supposed to permanently provide seeds for anyone who needs them. Tuiarajup is fully aware of the project's dependence on him, which is a source of pride and concern. He responded to this criticism by continuously promoting the dissemination of his knowledge, including the new generations. He also acknowledged that people tend to consider Kwaryja as a permanent source of seeds. We

[62] I include my research in the same context. On some opportunities I was accused of becoming rich, benefiting from money I obtained on behalf of the Kaiabi people, or selling information about their agriculture (and culture in general) I had learned in the villages.

[63] This echoes the arguments raised by Elias et al (2000) regarding the risks involved in depending solely on an Amuesha shaman's work on manioc diversity reported earlier by Salick et al (1997).

talked extensively about this subject, and his reaction pointed to the need for the Kaiabi to assume the responsibility of taking care of "their" own seeds. Indeed, if for any reason (referring to natural disasters or sorcery), peanut fields in Kwaryja failed to produce, village dwellers would need to receive seeds from those who previously benefited from the work developed in the village. Because of this, he insisted that people strictly follow his instructions on how to multiply the seeds, care for them appropriately, and ensure that their fields yield compatible harvests in order to conserve peanut varieties alive. However, given the autonomy enjoyed by each individual and family, there is no guarantee that others will act in the way Tuiarajup would like. Maybe this is the biggest threat to Kaiabi peanut diversity in the long run, pointing to the need to combine local strategies for conservation with *ex situ* approaches. Nevertheless, I am not sure whether the Kaiabi are open to allowing the remainder of their seeds to go to a gene bank without complete legal warranty that they would have exclusive decision-making power on the destiny of their genetic patrimony.

Discussion and Conclusion

Peanut Diversity, Management, and Re-Creation

This chapter demonstrated how essentially different approaches to crop management are: western science is based on botanical and genetic perspectives, while the indigenous approach values the combination of cosmology and mythology, which in turn guides agronomic actions and social practices. As Sullivan (1988) emphasized, contemporary indigenous agricultural practices carry symbolic meanings that connect food production with the agency of divinities in primordial times. According to the Kaiabi perception of peanut reproductive behavior, varieties are materialized manifestation of the spirit of *Kupeirup* in the human world, and do not follow the rules of western science. This cosmological perspective is the foundation for peanut diversity to be used as a symbol of ethnic identity. The rationale behind this argument is as follows: 1) true Kaiabi individuals cultivate, eat, and have peanuts available to offer visitors; 2) true peanut varieties are essentially Kaiabi in origin, with those coming from other sources considered second class, usually dangerous varieties; 3) true Kaiabi peanut varieties originate from *Kupeirup*, both in primordial times when old, traditional varieties were given to the ancestors, and recently, involving new varieties obtained from her contemporary association with humans. Ideally, these relationships require the intermediation of a shaman, someone who can foresee the varieties before they are identified in the fields, and receive the correct name for the varieties and inform ordinary people about them. Among other duties, shamans are entitled to be zealous about social order (Travassos, 1984). According, Tuiarajup used to urge people to follow the model prescribed by primordial beings when applying technology to their agricultural fields.

Nevertheless, variation in agricultural technology is found in the villages. Currently not all Kaiabi display the same level of knowledge or awareness about the lessons left by *Kupeirup*, or feel compelled to equally respect them. Also, as demonstrated in chapter 3, distinct behaviors articulate contradictory and complementary cultural forces that push novelty while trying to maintain Kaiabi roots (Oakdale, 1996), which permeate the practice of agriculture too. Variation in agricultural practices reflects the political and economic autonomy of families and villages, a valued Kaiabi attribute (Grünberg, 2004; Oakdale, 1996). This autonomy guides the social labor organization and includes determining whether or not, and when, to invite residents of other villages to participate in activities in the fields, the *mosirup*. On the other hand, when data on agrodiversity management are disaggregated by age categories and places, the differentiated acquaintance with mythological aspects of agriculture and crop technology also shows the unevenness of knowledge distribution within Kaiabi society. Furthermore, it points to changes in venues for knowledge transmission. In this sense, strategies applied in different villages expose distinct arrangements in order to operate the cooperative ties among extended and nuclear families when performing agriculture, including agrodiversity management. Altogether, these factors are translated in the current geography of seed management systems, as presented above.

In chapter three I emphasized the depletion of *Terra Preta* spots, and its consequence for agrodiversity management. Peanut diversity is especially at risk in some places. Similarly to old farming technologies, the traditional practice of seed selection is still alive, and the mechanisms for this process seem to have not changed in essence recently. However, the local weakening or abandonment of the practice of selecting new varieties where it was once performed systematically represents an important cultural and social shift. The same applies for the practice of *mosirup*, which in the past enabled farmers to more intensively acquire seeds of both old and new varieties. Currently, exchange of seeds within expanded families is the venue involved in the greater number of events for the circulation of varieties. However, it tends to maintain the same set of varieties locally available, unless complemented by other mechanisms. Seed donations are an important source for the re-entrance of traditional varieties and the arrival of new materials. Seed gifts may play a similar role but available data suggest that each event involving this mechanism operates with a limited number of varieties. Finally, I consider the emergence of taking seeds when serving as a crew member for events as a secondary, compensatory mechanism that tends to partially replace other well established mechanisms for acquiring peanut varieties. Overall, the work in progress in Kwaryja village, and to a lesser degree in Sobradinho and Diauarum, points to a renewed continuity of peanut diversity management systems. In other villages, the current management points to adaptations to changing environmental and social conditions showing a less complete set of practices and varieties.

Initiative to Manage and Recover Peanut Diversity in Kwaryja Village

Among the Kaiabi, Jepepyri and his descendants in Kwaryja village have historically been keepers of crop diversity. They are certainly not the only Kaiabi family to do so, as in many places it was possible to identify concerned families. Compared to other villages, Kwaryja residents expressed most vigorously concerns with agrodiversity management. Recently, they engaged in a community based project to deal specifically with agrodiversity recovery. This was fueled by the generally perceived threat of crop diversity loss, a result of messages propelled mainly by Tuiarajup and his brother Arupajup, on behalf of their deceased father. Their concerns were translated in concrete actions that transcended their village, using, conserving and re-creating crop diversity on a level not seen in any other contemporary Kaiabi village.

Following the lessons of his father, an in intimate consultancy with his brother, gradually Tuiarajup developed a unique approach to peanut diversity that allowed him to make a shift in the relationship of humans with *Kupeirup*. Through his shamanic practice, he changed the direction of these connections, evolving from a position as passive recipient of seeds, dependent on the will of the spirit, to developing an active acquaintance with *Kupeirup* in order to ask for new peanut varieties. This approach is also strongly tied to agricultural practices, and the fields are the place where these new varieties materialize. Here, Tuiarajup identifies a critical point that poses difficulties for replicating the Kwaryja initiative in other places: the lack of well trained shamans who are able to develop positive relationships with *Kupeirup*, the owner of the crops.

Although it is possible to identify new varieties during harvest, most are found during shelling. As women are the main agents for dealing with peanut selection and harvest, some of them are very knowledgeable. In Kwaryja, this applies to most elder and to some young women. However, there are differences in the way the work performed by men and women are perceived within Kaiabi society. In this case, as the prestige of Tuiarajup as a shaman and the greatest

Kaiabi authority on peanut issues has grown across villages in recent years, his wife, Wisi'o gained a discreet but clear recognition as a great farmer and crop diversity manager. In addition, although every villager is considered associated with peanut management activities, Tuiarajup's brother and most women in the village rarely had their names mentioned in public meetings approaching the initiative of Kwaryja village. This apparent contradiction seems to be linked with the public image of Tuiarajup as a strong leader and a respected shaman; to the humble and shy nature of his brother; and to the self image of women in general who identify themselves with the domestic domain as opposed to the public exposure. During private conversations, however, most Kaiabi demonstrated full awareness of women's role, and that the work has been performed by Kwaryja villagers as a team.

Tuiarajup also showed an ability to mobilize members of his family and more distant relatives to perform agriculture practices in Kwaryja. In this context, he exercised the practice of *mosirup* as a multi-purpose mechanism involving the re-valuing of a weakening social practice, expanding his audience, and demonstrating the results of the work on peanut diversity management developed by his family. In this context, the process of creating new varieties through direct connections with the spiritual world, and seed dissemination, is more important than the exact number or the identity of the new varieties. Hence, impressive as they are, the number and distinctiveness of new varieties may be better conceptualized as a proxy for the intensity of acquaintance with the spiritual world.

Seed circulation among Kaiabi families includes a non-spoken component that did not allow me to fully assess its dimension. Nevertheless, in recent years, particularly 2006, I found a limited circulation of peanut seeds among families and villages. I attribute this low movement to a choice made by the Kaiabi, relating to strengthening of the relative autonomy of the expanded family and the cooperative ties of its constituent nuclear families. As part of this strategy, maintenance of families' agricultural autonomy, including safeguarding seed stocks, is a highly appreciated social value. On the other hand, this situation is also influenced by the lower importance the *mosirup* practice currently enjoys in many villages, in contrast to its more valued status in the past. However, seed circulation is also deterred in some villages of Xingu Park due to limited agricultural performance linked to poor land quality (exhausted *Terra Preta* spots), and the low availability of peanut varieties. Surely, broad socio-cultural transformations affecting old and new generations have a role in this process.

In contrast, following Jepepyri's practice, the current approach of Kwaryja village includes openness to others through putting in circulation seeds and the associated knowledge. Although the village received a limited number of peanut varieties in recent years, in 2006 it was the most important single source of peanut seeds delivered to other families/places, including both old and new varieties. Indeed, delivering newly-created varieties exposes a strategy to divulge connections between agriculture and the spiritual realm. The drawback of Kwaryja as a major source of seeds is a tendency for other families to rely on this as permanent. In addition, Tuiarajup was mentioned as being everlastingly in charge of agrodiversity management due to his work as a shaman and a keeper of crop varieties. He fought this trend, referring to *Kupeirup* and her ownership of crops and lessons associated with agricultural practices.

Tuiarajup was always very serious when urging people to stick to their roots, following the orientation *Kupeirup* left to the Kaiabi, and disseminating the correct names for peanut varieties as an act of respect to her. Also, he valued the lessons of his deceased father and other Kaiabi elders, emphasizing how to multiply seed samples received from other sources, and other farming practices. He showed discomfort when people seemed to not believe or to understand his re-interpretation of the myth of *Kupeirup*, and openly criticized those who overlooked the correct name for the varieties. Similarly, he expressed discontent when farmers disobeyed his strict instructions, as happened with the inappropriate management and loss of peanut seeds that he delivered in 2003. Even dealing with issues derived from sacred origins, I foresee difficulties for other individuals following such strict orientations in the future. Specifically, current practices show no trend towards uniform application of any name for newly-created peanut varieties.

Contrasting to Tuiarajup's severe approach, the initiative in Kwaryja village also reveals the constant interplay of the conservative and progressive forces, and their variation within villages, families and individuals. Among other elements, the acquision of a powerful multi-frequency amateur radio and the building for the community seed bank in the village are eloquent examples of the interplay of these forces. Furthermore, Tuiarajup himself incorporated changes in his shamanic practices and adapted the design and management of his peanut fields. Also, the strategies he applied to disseminate the message about *Kupeirup*, the origins of new varieties, and the associated agricultural practices encompass a mix of old and new approaches. He was very successful in using pictures and written records to address different audiences without losing his point. In other words, since this blend does not interfere with the content, it is seen as a set of valid tools, as he openly acknowledges. Having mastered an ample repertoire of tools, Tuiarajup gained prestige and attracted more political power, as he and his village became known for peanut diversity management among the Kaiabi, other Indians, and non-indigenous peoples.

Indigenous Farmers' Management and Conservation

The way the Kaiabi manage peanut diversity has important consequences for agrodiversity conservation. The rationale behind seed selection, naming varieties, and the current pattern for seed circulation seems to promote genetic diversity, represented by local variants of peanut varieties (Freitas et al, 2007). However, pushed by both internal and external forces, the Kaiabi are facing a relative loss of importance of agriculture and traditional diet, and a crisis to accommodate the demands imposed by the limited availability of *Terra Preta* to a growing population. The ultimate outcome of this process is reflected in agricultural technology transformation that include operations linked to the management of diversity, which may result in the partial loss of local variants of peanut varieties. In contrast, there is an ongoing movement of ethnic resistance in agriculture, which includes the action of primordial beings present in their cosmology and mythology. Specifically, some families and individuals are actively committed to conserve and expand their patrimony of varieties. In this context, Tuiarajup and Kwaryja village are playing a remarkable role as keepers and re-creators of peanut diversity, and as disseminators of seeds and knowledge. Nevertheless, there is a risk involved in concentrating most of the diversity in one or a few fields (Elias et al, 2000; Brush, 2004). Therefore, ideally, an external backup system would be in place to more efficiently protect the Kaiabi peanut varieties.

Spiritual values, social organization and the knowledge associated with managing peanut diversity, which are essential components of the Kaiabi seed management system, cannot be captured by *ex situ* approaches (Ishizawa, 1999; Brush, 2004). Hence, a combination of *local* and *ex situ* approaches would be most suitable to promote the conservation of agrodiversity (Zimmerer, 1996; Qualset et al, 1997; Brush, 1999). However, due to their historical exploitation by non-indigenous interests, issues about germplasm ownership raise resistance to the collection of indigenous varieties (Hawtin and Hodgkin, 1997; Carneiro da Cunha and Almeida, 2000; MacGuire et al, 2003; Brush, 2005; Cleveland and Soleri, 2007a; Jarvis et al, 2008). Although peanut germplasm was already collected in Kaiabi villages (Freitas el al, 2007), it is not possible to predict whether the Kaiabi will agree with further deposit of their peanut varieties in gene banks. It is clear, however, that to conserve agrodiversity and maintain a productive physical environment for indigenous farmers, it is essential to uphold the socio-cultural settings and the landscape in which such diversity is generated, managed, and evolved through time (Altieri and Merrick, 1987; Oldfield and Alcorn, 1987; Collins and Hawtin, 1999; Cromwell and Oosterhoult, 1999; Brush, 2004). The Kaiabi are doing their part, partially supported by external actors. The future will tell if their actions and the required broader political and technological support for indigenous peoples will be translated into effective actions promoting local conservation of crop diversity.

Table 4-1. Partial morphological characterization of selected peanut varieties cultivated by the Kaiabi.

Peanut varieties	Weight 100 peas (g)	Pod length (cm)		Pod width (cm)		Pea length (cm)		Pea width (cm)	
		Average	St dev	Average	St dev	Average	St dev	Average	St dev
Old varieties									
M. Takapesingĩ uu	228.35	4.92	1.30	1.78	0.14	2.87	0.29	1.28	0.18
M. Takapeun	218.43	5.71	0.69	1.65	0.23	2.80	0.25	1.30	0.17
M. Wyrauna	204.23	4.67	0.71	1.65	0.13	2.43	0.43	1.30	0.11
M. Emyamuku	180.17	5.25	0.70	1.61	0.22	2.46	0.79	1.29	0.26
M. Takapesingĩ	177.36	5.20	0.96	1.37	0.12	2.48	0.30	1.19	0.10
M. Jakareape ete	171.53	8.64	13.11	1.73	0.16	2.43	0.28	1.19	0.13
M. ayjsing	171.03	4.31	0.84	1.71	0.15	1.22	0.18	2.24	0.27
M. ayjgwasiat	169.03	4.17	0.72	1.81	0.21	2.17	0.23	1.25	0.13
M. Py'wi	167.51	4.57	1.16	1.40	0.23	2.49	0.35	1.08	0.12
M. teikwarapypepirangĩ	136.17	1.40	0.12	3.27	0.38	1.59	0.28	1.18	0.12
M. Ayjmirangĩ	134.00	4.53	0.79	1.30	0.10	2.06	0.53	1.06	0.11
M. teikwarapypesingĩ	114.97	3.67	0.87	1.22	0.11	1.82	0.35	1.05	0.11
M. Jakareape'i	112.36	3.28	0.35	1.46	0.21	1.70	0.19	1.13	0.09
M. siãeko'i	102.41	3.04	0.35	1.29	0.13	1.44	0.23	1.09	0.11
M. teikwarapypepytangĩ	102.03	3.04	0.42	1.40	0.10	1.52	0.25	1.09	0.12
M. Uni	94.87	4.08	0.41	1.09	0.06	1.88	0.23	0.95	0.09
M. tapy'yjã'yt	93.84	2.98	0.27	1.38	0.10	1.53	0.24	1.06	0.08
Murunu	55.56	2.26	0.36	0.71	0.12	1.68	0.23	0.58	0.07
M. Myãpe'ĩ	44.90	2.80	0.21	0.89	0.06	1.30	0.16	0.76	0.05
M. ayjsingĩ	na	3.66	0.56	1.25	0.22	2.45	0.38	1.25	0.13

Table 4-1. Continued.

Peanut varieties	Weight 100 peas (g)	Pod length (cm)		Pod width (cm)		Pea length (cm)		Pea width (cm)	
		Average	St dev	Average	St dev	Average	St dev	Average	St dev
Newly-created varieties									
M. Emyamuku pytun	226.32	5.71	1.08	1.87	0.19	2.67	0.34	1.21	0.14
M. Py'wi pytun	222.50	5.59	0.58	1.73	0.18	2.70	0.49	1.24	0.13
M. Py'wi uu	215.03	5.73	0.95	1.81	0.23	2.83	0.30	1.27	0.15
M. Apepang	211.90	4.19	1.02	1.90	0.16	2.10	0.25	1.28	0.17
M. jakareape ayjmirang	204.55	4.76	0.47	1.87	0.20	2.23	0.35	1.27	0.14
M. Ayjkwasiat un	198.22	4.62	0.81	1.66	0.22	2.45	0.38	1.25	0.13
Munuwijup	188.54	2.81	0.28	1.38	0.08	1.48	0.17	1.03	0.06
M. Akapejup	184.62	4.85	0.56	1.81	0.14	2.44	0.25	1.32	0.15
M. Ayjmiranguu	176.87	4.27	0.53	1.73	0.11	2.25	0.24	1.27	0.12
M. Emyamuku ayjmirang	173.29	4.94	1.14	1.67	0.21	2.52	0.37	1.18	0.17
Munuwi uu'jup	172.75	4.47	0.95	1.49	0.15	2.45	0.39	1.29	0.13
M. jakareape ayjpinimĩ	169.90	4.45	0.51	1.72	0.19	2.23	0.23	1.27	0.11
M. Py'wi ayjgwasiat	167.25	4.30	1.00	1.70	0.19	2.30	0.38	1.23	0.19
M. Wyrauna ju´wi	165.71	4.32	0.57	1.53	0.12	2.12	0.27	1.19	0.15
M. Wyrauna uu	164.74	4.60	0.60	1.85	0.13	2.27	0.26	1.29	0.13
M. ayjsing ayjun	151.60	4.99	0.67	1.65	0.18	2.26	0.23	1.20	0.16
M. Kupejowuu	147.95	4.90	0.62	1.33	0.13	2.37	0.38	1.19	0.16
M. jakareape ayjuni	144.74	4.34	0.63	1.70	0.18	2.11	0.26	1.23	0.13
M. py'wi uni	142.86	3.93	0.88	1.37	0.16	2.09	0.37	1.12	0.11
M. wyraunajup	114.97	3.51	1.00	1.27	0.18	1.92	0.31	1.06	0.12
M. Teikwarapype ayjuni	88.74	3.94	0.32	1.52	0.09	1.90	0.20	1.13	0.08
M. Py'wi i'i	84.13	3.73	0.30	1.13	0.08	1.86	0.25	0.96	0.10
M. Tapy'yjãyriĩ	80.00	2.83	0.31	1.08	0.08	1.39	0.15	0.94	0.05

Table 4-2. Names for Kaiabi peanut varieties according to different authors.

Ribeiro (1979)	V. Boas and V. Boas (1989)	Rodrigues (1993)	This research
		Munuwíaímirang▲	_Munuwi ayjmirang_
Munuvi-icin		_Munuwíaessing_▲	_Munuwi ayjsing_
Munuvi-mu-amokú		_Munuwímuemukú_▲■	_Munuwi emyamuku_
Munuvi-jacaré-apé		_Munuwíyakareapé_	_Munuwi jakareape_
		Munuwíí▲***	_Munuwi myãpe'ĩ_
Munuvi-puvi		_Munuwípewí_▲■	_Munuwi py'wi_
Munuvi takapé-un		_Munuwítakapeún = munuwíôô_▲□	_Munuwi takapeun_
		Munuwítapi~aet▲	_Munuwi tapy'yjã'yt_
Munuvi tei-kua-pe-peí (white)			_Munuwi teikwarapypesing ĩ_
		Munuwítikwarapëpei▲ _(red)_	_Munuwi teikwarapypepirang ĩ_
	Murunú**	_Murunú****_	_Murunu_
		Munuwíú▲	_Munuwijũ_
		Munuwíkanaún▲ □	_Munuwi kanaun_
		Munuwíkupêàwe◊	_Munuwi kupeowy_
Munuvi uhú*	_Manuwi-u*_		_Munuwi uu*_
		Munuwíeô	Unidentified variety

* This name does not refer to a specific variety, but it is a general name applied by the Kaiabi to all peanuts varieties with big pods / seeds.
** V. Boas and V. Boas (1989) mentioned the name of this variety as being the name for the peanut crop.
*** This name does not refer to a specific variety, but it is a general name applied by the Kaiabi to all peanuts varieties with small pods / seeds.
**** Rodrigues (1993) recorded that this variety came from the city.
▲ Varieties of which Rodrigues (1993) collected samples.
■ □ Although with different names, Rodrigues (1993) considered his samples of these varieties to belong to a same "group".
◊ According to my informants, this variety was already extinct at the time Rodrigues (1993) performed his research, in 1991.

Table 4-3. Names for Kaiabi peanut varieties, and respective synonymous.

Status	Variety name	Synonymous and variations
Surveyed in all villages		
Old	*M. ayjgwasiat*	
Old	*Munuwi takapesing ĩ*	
Old	*Munuwi py'wi*	
Old	*Munuwi takapeun*	
Old	*Munuwi myãpe'ĩ*	*Munuwi'ĩ, m. tukura posit*
Old	*Munuwi emyamuku*	*Munuwi pyreteten*
Old	*Munuwi teikwarapypepirang ĩ*	
Old	*Munuwi ayjsing*	
Old	*Munuwi wyrauna*	*Munuwi pyreremuu*
Old	*Munuwi takapesing ĩ uu*	
Old	*Munuwi ayjmirang*	*Ayjmirangĩ*
Old	*Munuwi jakareape' ĩ*	
Old	*Munuwi unĩ*	*M. wyrauna'ĩ, m. Ayjunĩ*
Old	*Murunu*	Moreno's
Old	*Munuwi tapy'yjã'yt*	
Old	*Munuwi teikwarapypesing ĩ*	
Old	*Munuwi teikwarapypepytang ĩ*	
Surveyed only in Kwaryja		
Old	*Munuwi siãeko'i*[a]	
Old	*Munuwi ayjsingĩ*	
Not surveyed varieties		
Old	*Munuwi jakareape*	
Old / city	*Munuwijũ*[b]	
Extinct	*Munuwi apat*	
Extinct	*Munuwi juru'em*[c]	
Extinct	*Munuwi kanaun*[d]	*Akapesinguu*
Extinct	*Munuwi kupeowy*	
Extinct	*Munuwi pyreren*[c]	
Extinct	*Munuwi takapejuwuu*[ce]	*M. ayjsinguu*

a) *M. siãeko'i* is considered by some elders to be synonymous to *m. takapesingĩ*. However, in Kwaryja village it was considered to be a different variety.
b) There is no agreement about the identity and name for this variety, which sometimes is erroneously called *murunu*. Most Kaiabi farmers say it thrives spontaneously in open areas (accordingly, its name means literally *peanut of the field*) while some traced its origins to external sources such as the cities.
c) Peanut varieties that were not brought from the Teles Pires or Tatuy river to the Xingu Park.
d) Munuwi kanaun sometimes is mistakenly called *m. takapeun* and both are also referred to as *munuwiuu*, the general name for varieties with large shells and grains.
e) This variety was also referred to as munuwi akapejuwoo, which is considered to be a wrong name.

Table 4-4. Characteristics of people who declared to have participated in the identification of new peanut varieties, and those still performing the practice in selected villages excluding Kwaryja, Xingu Park, 2006.

	Total	Interviewed							
	Research	Participated in past events				Still identify			
	%	count	%	p-value	η^2	count	%	p-value	η^2
Number of villages	54.55	8	38.10	0.000 *	0.27	4	19.05	0.000 *	0.42
Expanded families	55.26	17	80.95	0.000 *	0.35	6	28.57	0.000 *	0.37
Nuclear families	46.52	46	68.66	0.001 *	0.70	9	13.43	0.000 *	0.76
Gender				0.197	0.01			0.004 *	0.04
Female	152	35	28.69			8	6.56		
Mean age (years)	31.0+-14.5	37.8 +- 14.7				46.0+-18.0			
Age range (years)	15-82	16-72				20-72			
Male	134	27	22.13			4	3.28		
Average age (years)	36.0+- 15.0	45.2 +_ 12.5				52.5 +- 12.2			
Age range (years)	17-78	23-67				36-65			
Age status				0.001 *	0.05			0.003 *	0.04
Elders	41.67	51	41.80			11	9.02		
Youngsters	45.12	11	9.02			1	0.82		
Area of origin				0.000 *	0.09			0.000 *	0.12
Tatuy	17.39	2	1.64			0	0.00		
Teles Pires	37.21	12	9.84			2	1.64		
Kururuzinho	66.67	8	6.56			7	5.74		
Xingu	44.88	40	32.79			3	2.46		
Selected occupations									
Shaman	33.33	2	1.64	0.837	0.00	1	0.82	0.291	0.01
Political leaders	51.28	9	7.38	0.075 ***	0.02	1	0.82	0.200	0.01
Paid job	54.90	16	13.11	0.578	0.00	2	1.64	0.183	0.01
Kaiabi age categories				0.000 *	0.13			0.000 *	0.13
Iymani	59.26	7	5.74			2	1.64		
Iywyruu	52.63	11	9.02			1	0.82		
Kunumiuu	36.36	9	7.38			1	0.82		
Kunumiuga	33.33	0	0.00			0	0.00		
Wawĩ	52.38	12	9.84			5	4.10		
Iyruo	45.83	21	17.21			3	2.46		
*Kujãmuku*fet	35.71	2	1.64			0	0.00		

* sig. at the 1% level; ** sig. at the 5% level; ***sig.at the 10% level.

Table 4-5. Personal characteristics of people who still perform the identification and separation of new peanut types.

Gender	Age	Age category	Age class	NF	EF	Village	Place of origin	Occupation
Interviews with all informants in 9 villages.								
Male	57	*Iymani*	Elder	NF1	EF1	Diauarum	Kururuzinho	
Female	47	*Wawĩ*	Elder	NF1	EF1	Diauarum	Kururuzinho	shaman
Female	72	*Wawĩ*	Elder	NF2	EF2	Diauarum	Teles Pires	
Male	65	*Iymani*	Elder	NF3	EF3	Samauma	Teles Pires	paid job, leader
Female	59	*Wawĩ*	Elder	NF3	EF3	Samauma	Kururuzinho	
Male	52	*Iywyruu*	Elder	NF4	EF4	Tuiarare	Kururuzinho	
Female	36	*Iyruo*	Elder	NF4	EF4	Tuiarare	Kururuzinho	
Male	36	*Kunumiuu*	Young	NF5	EF5	Três Irmãos	Xingu	paid job
Female	46	*Wawĩ*	Elder	NF6	EF6	Tuiarare	Kururuzinho	
Female	26	*Iyruo*	Elder	NF7	EF7	Tuiarare	Xingu	
Female	20	*Iyruo*	Elder	NF8	EF7	Tuiarare	Xingu	
Female	62	*Wawĩ*	Elder	NF9	EF7	Tuiarare	Kururuzinho	
Selected informants in additional 12 villages								
Female	38	*Iyruo*	Elder	NF10	EF8	Iguaçu	Xingu	
Male	73	*Iymani*	Elder	NF11	EF9	Caiçara	Teles Pires	paid job, leader
Female	68	*Wawĩ*	Elder	NF11	EF9	Caiçara	Teles Pires	
Male	54	*Wawĩ*	Elder	NF12	EF10	Capivara	Tatuy	leader
Female	59	*Iymani*	Elder	NF12	EF10	Capivara	Tatuy	leader
Male	66	*Iymani*	Elder	NF13	EF11	Capivara	Tatuy	paid job [a]
Female	53	*Wawĩ*	Elder	NF14	EF2	Itai	Teles Pires	shaman
Female	43	*Wawĩ*	Elder	NF15	EF12	Sobradinho	Xingu	

a) Retirement.

Table 4-6. Cultivation of peanut fields by Kaiabi nuclear families, according to male's age categories.

	At least one time before 2006				Field in 2006		
	N	Count	%	p-value	Count[a]	%	p-value
EF	38	37	97.37		27 (29)	75.00 (76.32)	
NF	143	107	74.83		56 (61)[a]	39.16 (42.66)	
Age status				0.000*			0.001*
Elders	65	65	60.75		37 (42)	66.07 (68.85)	
Youngsters	78	42	39.25		19 (19)	33.93 (31.15)	
Kaiabi age categories				0.000*[b]			0.004*[b]
Iymani	25	25	23.36		15 (17)	26.79 (26.15)	
Iywyruu	40	40	37.38		22 (25)	39.26 (38.46)	
Kunumiuu	74	42	39.25		19 (19)	33.93 (31.15)	
Kunumiuga	4	0	0.0		0	0.0	

NF = nuclear family; EF = expanded family; * sig. at the 1% level.

a) Figures in parenthesis include farmers that had saved seeds but did not have a peanut field in 2006; b) Some cells count less than 5 cases.

Table 4-7. Variations on peanut seed management systems currently found in Kaiabi villages. Xingu Park, 2006.

Management system		Garden Ownership	Garden preparation	Garden Care	Seed management	Villages	Families involved	
							NF	EF
A		EF	EF	EF	EF	Iguaçu, Muitara, Mupada, Onze	7	4
A/B		shared EF	EF	NF / EF	EF/ NF	Fazenda Kaiabi, Paranaita, Três Buritis, Três Patos	9	4
B	Ba	shared EF / NF	EF	NF / EF	NF / EF	Caiçara, Ipore, Itai, Maraka Novo, Pequizal, Samauma	17	7
	Bb					Capivara, Diauarum, Tuiarare	67	27
C		EF	EF	NF resp	NF resp	Barranco Alto, Ilha Grande, Três Irmãos	16	3
D		NF / EF	EF	NF / EF	EF / NF	Kwaryja	13	3
B/D		shared EF / NF	EF	NF / EF	EF / NF resp	Sobradinho	14	1

NF = nuclear family; EF = expanded family; resp = responsibility.

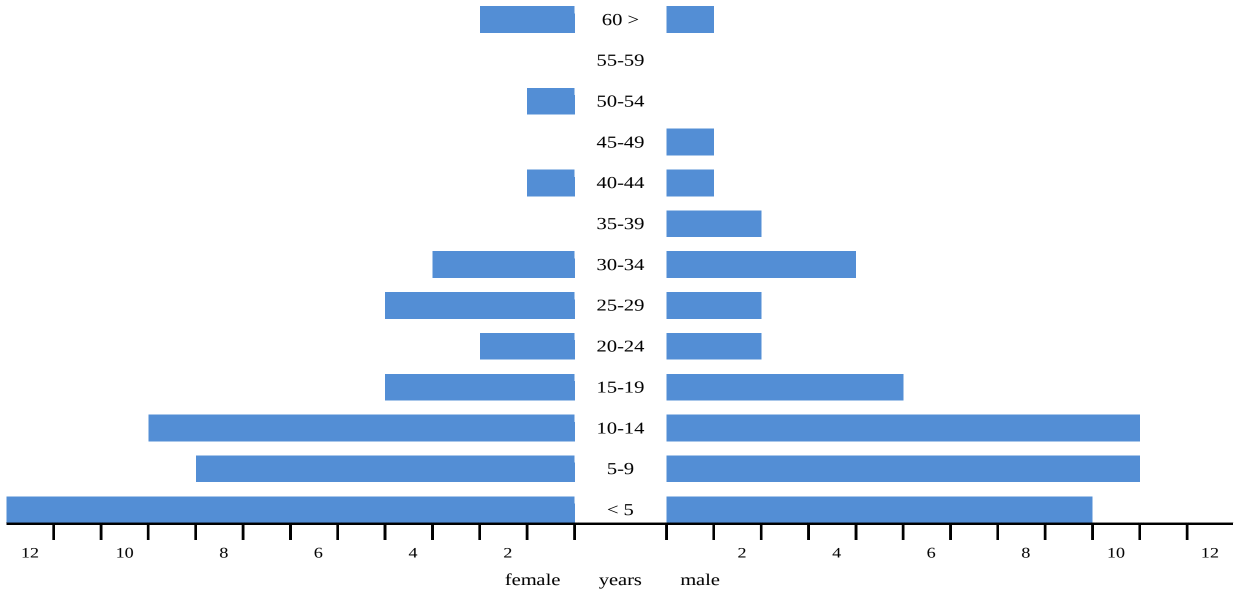


Figure 4-1. Age pyramid for Kwaryja village residents, 2006.

Figure 4-2. Known *Terra Preta* spots located nearby Kwaryja village.

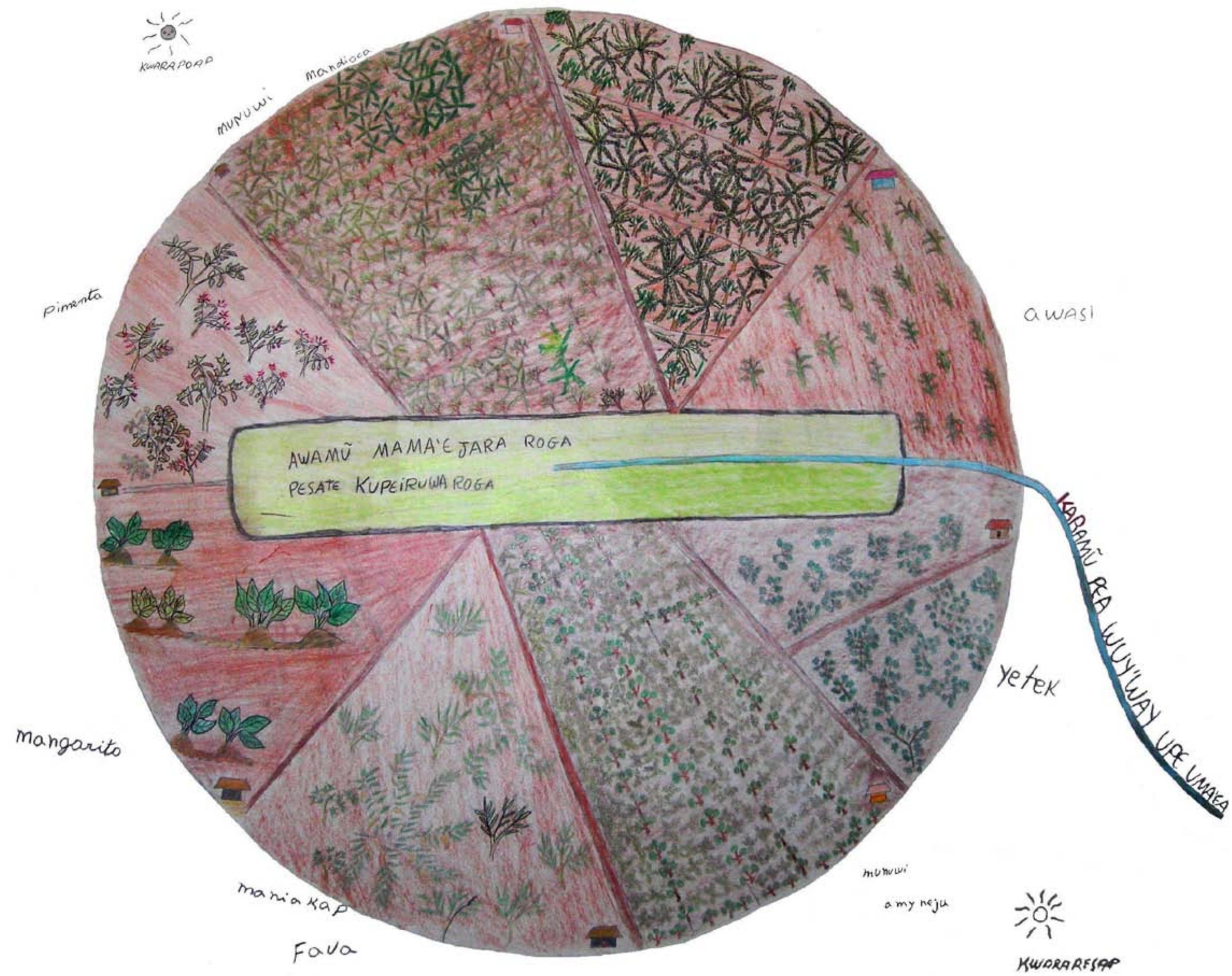


Figure 4-3. *Kupeirup's* place showing agricultural fields, storage facilities, and the pathway to Xingu Park.

Table 4-8. Area, number of plots, number of varieties sown each year, and the number of varieties identified from 2000 through 2006. Kwaryja village, Xingu Park.

Cropping season	All crops field size (m^2)		Peanut area (m^2)		Peanut plots	Varieties sown
1999/2000	na	na	na	na	na	15-17
2002/3	180 x 190	34200	na	4466	19	19
2003/4	na	6092	87 x 56	4874	35	30
2004/5	110 x 118	12980	115 x 104	11960	49	37
2005/6	113 x 123	13899	100 x 88	8800	64	na
2006/7	Eight fields		Eight fields	11060	111	58

na = not available.

Table 4-9. Kaiabi peanut varieties sown in Kwaryja village from 2002 through 2006.

Variety name	Origins	1st record	1999/00	2002/03	2003/04	2004/05	2006/07
All varieties			16	19	30	37	58
Traditional varieties			16	15	17	18	19
M. ayjgwasiat			X	X	X	X	X
M. ayjmirangĩ			X	X	X	X	X
M. ayjsing			X	X	X	X	X
M. emyamuku			X	X	X	X	X
M. myãpe'ĩ			X	X	X	X	X
M. py'wi			X	X	X	X	X
M. takapesingĩ			X	X	X	X	X
M. takapeun			X	X	X	X	X
M. tapy'yjã'yt			X	X	X	X	X
M. teikwarapypesingĩ			X	X	X	X	X
M. teikwarapypepirangĩ			X	X	X	X	X
M. teikwarapypepytangĩ			X	X	X	X	X
M. uni			X	X	X	X	X
M. wyrauna			X	X	X	X	X
M. jakareape'i	Tapirapé village	2002	X	X	X	X	X
M. takapesingĩuu	Caiçara Kaiabi village	2002			X	X	X
M. ayjsingĩ	Ipore Kaiabi village	2003			X	X	X
Murunu	Received from Kĩsẽdjẽ	2004	X			X	
M. siãeko'i	Recreated from *m. py'wi* i'i	2005					X
M. Jakareape ete	Recreated from *m. jakareape ayjun*	2005					X
New varieties				4	13	19	39
M. ayjsing ayjun	*m. ayjgwasiat*	2001		X	X	X	X
M. emyamuku ayjmirang	*m. ãyjmirangĩ*	2001		X	X	X	X
M. py'wi uu	*m. py'wi*	2001		X	X	X	X
M. akapejup	*m. takapeun*	2001		X	X	X	X
M. jakareape ayjun	*m. ayjgwasiat*	2002			X	X	X
M. jakareape ayjuni	*m. akapejup*	2002			X	X	
M. wyraunajup	*m. akapejup*	2002			X	X	X
M. uu'jup	*m. jakareape'i* (Tapirapé)	2003				?	X
M. ayjgwasiat un	*m. takapesingĩ uu*	2003			X	X	
M. emyamuku pytun	*m. py'wi i'i*	2003				?	X
M. jakareape ayjmirang	*m. takapesingĩ uu*	2003				?	
M. jakareape ayjpinimĩ	*m. ayjgwasiat*	2003			X	X	X
M. Kupejowuu	*m. ayjgwasiat*	2003			X	?	
M. py'wi ayjgwasiat	*m. takapesingĩ*	2003			X	X	
M. py'wi akapeun	*m. py'wi*	2003				X	X

Table 4-9. Continued.

Variety name	Origins	1st record	1999/00	2002/03	2003/04	2004/05	2006/07
New varieties (cont.)							
M. py’wi i'i	*m. py’wi*	2003			X	X	X
M. Ayj uni	*m. myãpe’ĩ*	2003				X	?
M. Teikwarapype ayjuni	*m. uni*	2003			X	X	X
M.jup	*m. akapejup*	2003				?	?
M. Apepang	*m. takapesing ĩ uu*	2004					X
M. ayjsingapeywet	*m. ayjgwasiat*	2004				X	X
M. py’wi pytun	*m. py’wiuu*	2004				X	X
M. takapeuni	*m. py’wi i'i*	2004					X
M. Teikwarapype ayjgwasiat	*m. teikwarapypepirang ĩ*	2004				X	?
M. wyrauna ju'wi	*m. wyrauna*	2004				X	?
M. Apepang ayjmirang	*m. apepang*	2005					?
M. py’wi uni	*m py’wi ii*	2005				X	?
M. Ayjmiranguu	*?*	2005					X
M. Ekui	*m. emyamuku ayjmirang*	2005					?
M. Ju'wi	*m. teikwarapype ayjuni*	2005					X
M. Pytangĩ	*m. py’wiuu*	2005					?
M. Tapy’yjãyriĩ	*m. py’wi i'i*	2005					X
*M. Akapepiren **	*m. ayjmirangĩ*	2006					X
M. ayjsing ayjgwasiat	*m. emyamuku*	2006					X
*M. Ejup **	*m. myãpe’ĩ*	2006					X
*M. Emy erut **	*m. tapy’yjã’yt*	2006					X
*M. py’wi ayjmytang **	*m. py’wi*	2006					X
*M. Re'mari **	*m. tapy’yjã’yt*	2006					X
*M. Re'nun **	*m. tapy’yjã’yt*	2006					X
*M. Re'ta **	*m. myãpe’ĩ*	2006					X
*M. Teikwarapype piru'i **	*m. teikwarapypepirang ĩ*	2006					X
M. teikwarapypesing ĩ pytun	*m. akapejup*	2006					X
*M. uni ayj ju'wi **	*m. tapy’yjã’yt*	2006					X
*M. uni ayjwep **	*m. uni*	2006					X
*M. Uu'i**	*m. akapejup*	2006					X
*M. wyrauna uu**	*m. jakareape ayjpinim ĩ*	2006					X
*M. wyrauna ysejan **	*m. wyrauna*	2006					X

* Varieties identified during shelling in 2006, which Tuiarajup gave name afterwards.
** Varieties identified during shelling in 2006, but which Tuiarajup had not given names until the sowing date.

Table 4-9. Continued.

Variety name	Origins	1st record	1999/00	2002/03	2003/04	2004/05	2006/07
New varieties (cont.)							
Unnamed 1 **	?	2006					X
Unnamed 2 **	?	2006					X
Unnamed 3 **	*m. ayjsingapeywit*	2006					X
Unnamed 4 **	*m. jakareape ayjun*	2006					X
M. Iurena *	*m. ayjgwasiat*	2006					?
M. siãeko'i ayjkupesing	*m. siãeko'i*	2006					?
*M. takapeun ayjsing **	*m. takapeun*	2006					?
*M. Teikwarapype ju'wi **	*m. teikwarapypepirang ĩ*	2005					X

* Varieties identified during shelling in 2006, which Tuiarajup gave name afterwards.

** Varieties identified during shelling in 2006, but which Tuiarajup had not given names until the sowing date.

.

Table 4-10. Particularities about Kaiabi peanut varieties sown in Kwaryja village from 2002 through 2006. Xingu Park.

Variety name	Status	origins	Year	Observation
M. siãeko'i	old /new	*M. teikwarapypesing ĩ*	na	The Kaiabi had an old variety with this name but the material under cultivation now was identified recently.
		M. Py'wi i'i	2005	
M. siãeko'i	new	*M. teikwarapypepirang ĩ*	2004	Formerly called munuwi owẽt, it was considered to be munuwi siãeko'i because both varieties were very similar.
		M. Teikwarapypei ayjun	2005	
		M. Akapejup	na	
M. ayjsing ayjun	new	*M. ayjgwasiat*	2001	Formerly called munuwi ayjsingapeywet, it received the new name in 2006.
M. Akapejup	new	*M. Takapeun*	2001 2003	The variety was identified two times from the same origin. After the first identification, children ate all the seeds.
M. wyraunajup	new	*M. Akapejup*	2002 2003	The variety was identified two times from the same origin.
M. jakareape ayjuni	new	*M. Akapejup*	2002	
		M. Myãpe'ĩ	2003	
M. Kupejowuu	new	*M. ayjgwasiat*	2003	Disappeared because children ate all the seeds after the harvest.
M. ayjgwasiat un	new	*M. Takapesing ĩ uu*	2003	Disappeared because its grains changed color in 2004.
M. Py'wi akapeun	new	*M. Py'wi*	2003	Came from Nacepotiti Panara village.
		M. Py'wi	2004	It was identified at Kwaryja village.
M. Ju'wi	new	*M. Jakareape'i* (Tapirapé)	2003	This variety was considered to be *jakareape* ete until 2005.
M. Teikwarapype ayjuni	new	*M. Uni*	2003	
		Teikwarapypepirangĩ	2005	
M. Wyrauna ju'wi	new	*M. Uni*	2004	Disappeared because its grains changed color in 2004.
M. Teikwarapypei ayjgwasiat	new	*M. teikwarapypepirang ĩ*	2004	

Table 4-10. Continued

Variety name	Status	origins	Year	Observation
M. py'wi uni	new	*M ayjmirangĩ*	2004	
		M. Py'wi i'ĩ	2005	
M. Takapeuni	new	*M. Py'wi i'i*	2004 2006	The variety was identified two times from the same origin.
M. Ekui	new	*M. Emyamuku ayjmirang*	2005	
M.u'iup	new	*M. ayjsingapeywit*	2006	
		M. Teikwarapypei ayjun	2005	
M. Iurena	new	*M. ayjgwasiat*	2006	Both *m. ayjgwasiat* and *m. ayjsing* are very similar, with large white seeds but the first variety have small red spots all over the grain. They are referred to as Apiaka and Kaiabi, because the former Indians used to be painted with annatto, opposite to the second ones.
		M. ayjsing	2006	

Table 4-11. Peanut plots and varieties sown according to expanded and nuclear families. Kwaryja village, 2006/2007 season.

			Peanut varieties			Area (m^2)			
EF	NF	Plots	Old	New	Total	Average	Sd	Total	%
Arupajup	Aramut	24	13	11	24	137.56	21.21	3301.54	29.9
	Aritu	12	9	3	12	73.00	14.61	876.01	7.9
	Maraja	9	7	2	9	96.26	14.39	866.37	7.8
	Arupajup	9	6	3	9	39.97	8.82	359.76	3.3
	total	54	16	11	27			5403.68	48.9
Tuiarajup	Tuiarajup	11	8	3	11	225.68	49.99	2482.53	22.4
	Arutari	15	5	10	15	80.73	28.97	1211.00	10.9
	Wisi'o*	15	0	15	15	21.47	11.27	322.10	2.9
	total	41	12	21	33			4015.63	36.3
Parisum	Parisum	16	9	7	16	102.57	28.61	1641.06	14.8
Village		111	19	39	58			11060.37	

* Although Wisi'o is Tuiarajup's wife, belonging to the same NF, she had a field under her direct management in which she sown only new varieties.

Table 4-12. Number of plots for peanut seeds multiplication, according to varieties sown. Kwaryja village, Xingu Park, 2006/2007 season.

		Area (m^2)				
Variety name	Plots	Total	Average	Sowers	NF	EF
Traditional varieties	57	6299.72				
M. py'wi	6	530.89	88.48	6	6	3
M. takapeun	5	657.63	131.53	4	5	3
M. takapesingĩ	5	635.38	127.08	5	5	3
M. emyamuku	5	538.34	107.67	5	5	3
M. wyrauna	5	472.08	94.42	4	5	3
M. ayjmirangĩ	5	449.32	89.86	4	5	2
M. jakareape'i	5	431.42	86.28	5	5	2
M. tapy'yjã'yt	4	507.21	126.80	4	4	3
M. teikwarapypepirangĩ	3	265.09	88.36	3	3	1
M. myãpe'ĩ	2	389.56	194.78	2	2	2
M. uni	2	279.93	139.97	2	2	2
M. ayjgwasiat	2	236.59	118.29	2	2	2
M. teikwarapypepytangĩ	2	159.38	79.69	2	2	2
M. ayjsingĩ	1	241.96	241.96	1	1	1
M. ayjsing	1	167.75	167.75	1	1	1
M. takapesingĩ uu	1	146.39	146.39	1	1	1
M. siãeko'i	1	72.00	72.00	1	1	1
M. Jakareape ete	1	59.50	59.50	1	1	1
M. teikwarapypesingĩ	1	59.30	59.30	1	1	1

Table 4-12. Continued

Variety name	Plots	Area (m^2) Total	Area (m^2) Average	Sowers	NF	EF
New varieties	54	4760.65				
M. py'wiuu	4	638.29	159.57	4	4	3
M. akapejup	5	617.95	123.59	3	5	3
M. py'wi pytun	4	380.79	95.20	4	4	2
M. emyamuku ayjmirang	3	251.61	83.87	3	3	1
M. jakareape ayjun	2	298.88	149.44	2	2	2
M. wyraunajup	2	294.08	147.04	2	2	2
M. jakareape ayjpinim ĩ	2	239.23	119.61	2	2	1
M. Ayjapeywet	1	225.68	112.84	1	1	1
M. emyamuku pytun	1	169.31	169.31	1	1	1
M. Apepang	1	156.83	156.83	1	1	1
M. Ju'wi	1	135.24	135.24	1	1	1
M. py'wi akapeun	1	131.31	131.31	1	1	1
M. teikwarapypesing ĩpytun	1	121.00	121.00	1	1	1
M. Teikwarapype ayjuni	1	115.00	115.00	1	1	1
M. takapeuni	1	108.00	108.00	1	1	1
M. Teikwarapype ju'wi	1	107.63	107.63	1	1	1
M. ayjsing ayjun	1	101.76	101.76	1	1	1
M. uu'jup = m. Ju'wi	1	99.00	99.00	1	1	1
M. Ayjmiranguu	1	83.23	83.23	1	1	1
M. wyrauna uu	1	72.00	72.00	1	1	1
M. ayjsing ayjgwasiat	1	62.25	62.25	1	1	1
M. Uu'i	1	60.75	60.75	1	1	1
M. py'wi ii	1	58.50	58.50	1	1	1
Unnamed 4	1	50.43	50.43	1	1	1
M. uni ayj ju'wi	1	41.51	41.51	1	1	1
M. Ejup	1	26.36	26.36	1	1	1
M. Re'mari	1	24.34	24.34	1	1	1
M. Emy erut	1	23.12	23.12	1	1	1
M. py'wi ayjmirang	1	21.75	21.75	1	1	1
M. uni ayjwep	1	21.53	21.53	1	1	1
M. Teikwarapype piru'i	1	19.18	19.18	1	1	1
M. Re'nun	1	17.15	17.15	1	1	1
M. Re'ta	1	17.15	17.15	1	1	1
Unnamed 1	1	12.54	12.54	1	1	1
Unnamed 2	1	12.54	12.54	1	1	1
Unnamed 3	1	12.54	12.54	1	1	1
M. Tapy'yjãyri ĩ	1	12.00	12.00	1	1	1
M. Akapepiren	1	10.97	10.97	1	1	1
M. wyrauna ysejan	1	10.97	10.97	1	1	1

Table 4-13. Individuals that directly took part in shelling peanuts in Kwaryja village, according to Kaiabi age categories. Xingu Park, 2006.

Kaiabi age categories	Number	Shellers
Total	23	
Female	20	
Wawĩ	5	Jare'i
		Jepo'oi
		Karu
		Morekatu
		Wisi'o
Iyruo	8	Erurajup
		Eteuu
		Juwe
		Juwekatu
		Kwareaiup
		Kwariup
		Reairop
		Toperyp
Kujãmukuuu	3	Irujuwi
		Kujaesangue
		Kyritui
Kujãmuku	3	Katumait
		Rypoit
		Wiure
Kyriee	1	Urukari
Male	3	
Iymani	1	Arupajup
Iywyruu	1	Tuiarajup
Kunumiuu	1	Arutari

Table 4-14. Sowers of unique peanut varieties according to Kaiabi age categories, 2006/2007 season, Kwaryja village.

Age categories	Total	Sowers	Plots	EF	NF	Area (m^2)
All varieties	58	39	111	3	8	11060.4
Traditional varieties	19	27	57	3	7	6299.7
	32.8%	69.2%	51.4%	100%	88%	57.0%
Female	15	15	33	3	7	3772.1
	78.9%	55.6%	57.9%	100%	100%	59.9%
Wawĩ	8	4	11	3	6	1428.6
Iyruo	9	5	11	3	7	1263.0
Kujãmuku	5	3	6	3	4	701.2
Kujãmuku	4	2	4	2	4	325.4
Kyriee	1	1	1	1	1	53.9
Male	13	12	24	3	7	2527.6
	68.4%	44.4%	42.1%	100%	100%	40.1%
Iymani	3	1	5	2	3	271.5
Iywyruu	3	1	3	3	3	332.1
Kunumiuu	5	3	5	2	4	592.2
Kunumiuga	4	3	5	3	4	641.6
Kunumi	6	4	6	2	3	690.2
Siraga'	--	--	--	--	--	--
Kunumi'i	--	--	--	--	--	--

Table 4-14. Continued.

Age categories	Varieties	Sowers	Plots	EF	NF	Area (m^2)
New varieties	39	30	54	3	8	4760.6
	67.2%	76.9%	48.6%	100%	100%	43.0%
Female	27	16	31	3	7	2677.6
	69.2%	53.3%	57.4%	100%	88%	56.2%
Wawĩ	8	3	9	3	5	926.1
Iyruo	11	5	11	3	6	1125.5
Kujãmukuuu	4	3	4	3	3	228.9
Kujãmuku	4	2	4	2	2	165.8
Kyriee	3	3	3	1	2	231.3
Male	18	14	23	3	8	2083.1
	46.2%	46.7%	42.6%	100%	100%	43.8%
Iymani	2	1	2	2	2	385.1
Iywyruu	5	2	5	2	4	442.0
Kunumiuu	5	4	5	2	4	241.0
Kunumiuga	2	2	2	2	2	209.5
Kunumi	5	3	7	3	5	542.7
Siraga'	1	1	1	1	1	108.6
Kunumi'i	1	1	1	1	1	154.2

Table 4-15. Peanut varieties received by Kwaryja village from other places.

Peanut varieties	Village of origin	Year
Munuwi jakareape'i	Makupa brought it from Tapirapé Indians, and Xupé gave it to his daughter Wisi'o (Tuiarajup wife's)	2000
Munuwi ayjsingĩ	Came from Kururuzinho, Pará, through Ipore village	2003
Munuwi takapesingĩ uu	Came from Caiçara village	2003
Murunu	Uteri brought seeds from Roptotxi Kĩsẽdjẽ to her mother Jare'i (Arupajup wife's)	2004

Table 4-16. Peanut varieties delivered by Kwaryja village to other places.

Peanut varieties	Village of destiny	Year
Traditional varieties	16	
M. ayjgwasiat, m. myãpe'ĩ, m. py'wi, m. takapesingĩ, m. takapeun, m. teikwarapypepytangĩ, m. teikwarapypesingĩ, m. uni (wyraunai)	Tuiarare	2003
M. Ayjmirangĩ	Tuiarare	2003
	Hurahossinkrô Kĩsẽdjẽ	2005
M. ayjsing	Tuiarare	2003
	Diauarum	2006
M. ayjsingĩ	Ilha Grande	2005
M. Emyamuku	Tuiarare	2003
	Três Patos	2005
M. Jakareape'i	Diauarum	2006
M. Tapy'yjã'yt	Tuiarare	2003
	Ilha Grande	2005
	Samauma	2005
	Três Patos	2005
	Sobradinho	2006
M. Teikwarapypepirangĩ	Tuiarare	2003
	Kururuzinho, PA	2006
M. Wyrauna	Tuiarare	2003
	Três Patos	2005
	Diauarum	2006

Table 4-16. Continued.

Peanut varieties	Village of destiny	Year
New varieties	10	
M. Akapejup	Tuiarare	2003
	Barranco Alto	2004
	Três Patos	2005
	Sobradinho	2006
M. ayjsing ayjun	Tuiarare	2003
	Diauarum	2006
	Maraka Novo	2006
M. Emyamuku ayjmirang	Tuiarare	2003
	Samauma	2005
	Diauarum	2006
	Kururuzinho, PA	2006
	Maraka Novo	2006
	Sobradinho	2006
M. Jakareape ayjpinimĩ	Tuiarare	2003
M. Jakareape ayjun	Tuiarare	2003
	Samauma	2005
	Três Patos	2005
	Diauarum	2006
	Sobradinho	2006
M. Py'wi uni	Kururuzinho, PA	2006
M. Py'wi uu	Tuiarare	2003
	Diauarum	2006
	Sobradinho	2006
M. Py'wi i'i	Barranco Alto	2004
M. Uu'jup	Samauma	2005
	Três Patos	2005
M. Wyraunajup	Tuiarare	2003
	Samauma	2005
	Diauarum	2006
	Sobradinho	2006
Unknown1	Barranco Alto	2004
Uunknown2, unknown3, unknown4	Caiçara	2005
Unknown5, unknown6, unknown7, unknown8	Muitara	2005
Unknown9	Maraka Novo	2006

Table 4-17. Kaiabi nuclear families and respective villages involved in peanut varieties seeds circulation. Xingu Park, 2006.

Nuclear Families	Expanded families	Village	Provided seeds to				Received seeds from			
				villages	NF	Cumulative varieties		villages	NF	Cumulative varieties
NF18	EF11	Kwaryja	yes	4	4	23	no	0	0	0
NF19	EF2	Sobradinho	yes***	1	5	17	yes	1	1	7
NF14	EF2	Sobradinho	yes*	1	4	9	no	0	0	0
NF17	EF7	Diauarum	yes	1	1	10	yes	1	1	10
NF16	EF10	Muitara	yes**	2	2	5	no	0	0	0
NF13	EF8	Capivara	yes*	1	1	1	no	0	0	0
NF15	EF9	Samauma	yes**	1	1	1	no	0	0	0
NF11	EF7	Diauarum	No	0	0	0	yes	1	1	10
NF12	EF2	Sobradinho	No	0	0	0	yes	1	2	10
NF10	EF2	Sobradinho	No	0	0	0	yes*	1	2	6
NF3	EF3	Itai	No	0	0	0	yes**	1	1	3
NF4	EF4	Kururuzinho	No	0	0	0	yes	1	1	3
NF5	EF5	Maraka Novo	No	0	0	0	yes*	1	1	3
NF6	EF6	Tuiarare	No	0	0	0	yes**	2	2	3
NF7	EF2	Sobradinho	No	0	0	0	yes*	1	2	3
NF8	EF2	Sobradinho	No	0	0	0	yes	1	1	3
NF2	EF2	Sobradinho	No	0	0	0	yes*	1	1	2
NF9	EF2	Sobradinho	No	0	0	0	yes*	1	1	2
NF1	EF1	Pakisaba	No	0	0	0	yes*	1	1	1
Totals			7	11	18	66	14	15	18	66
Average				0.58	0.95	3.47		0.79	0.79	3.47
SD				1.02	1.61	6.65		0.54	0.54	3.49

* Information provided only by the donor; ** information provided only by the recipient; *** information provided mostly by the donor.

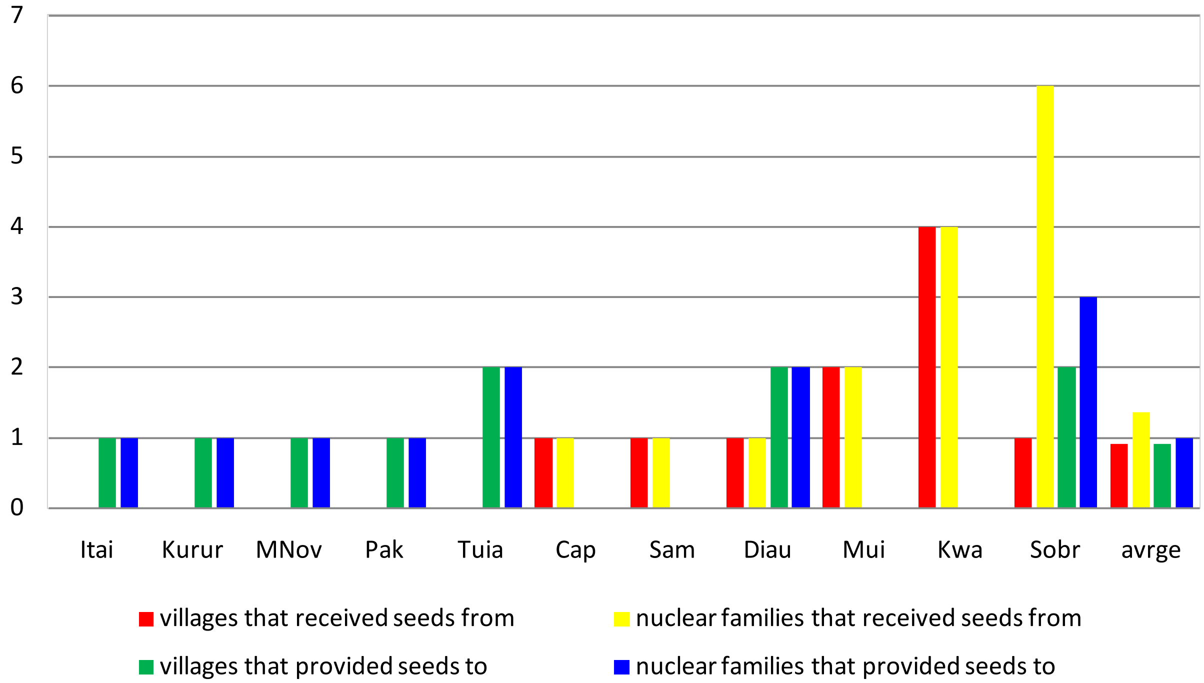
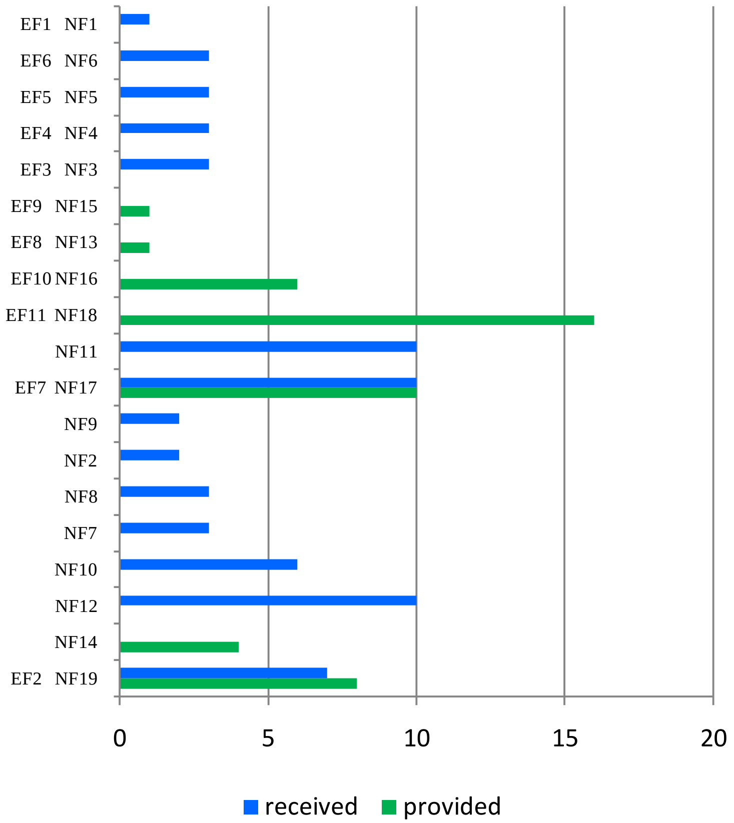
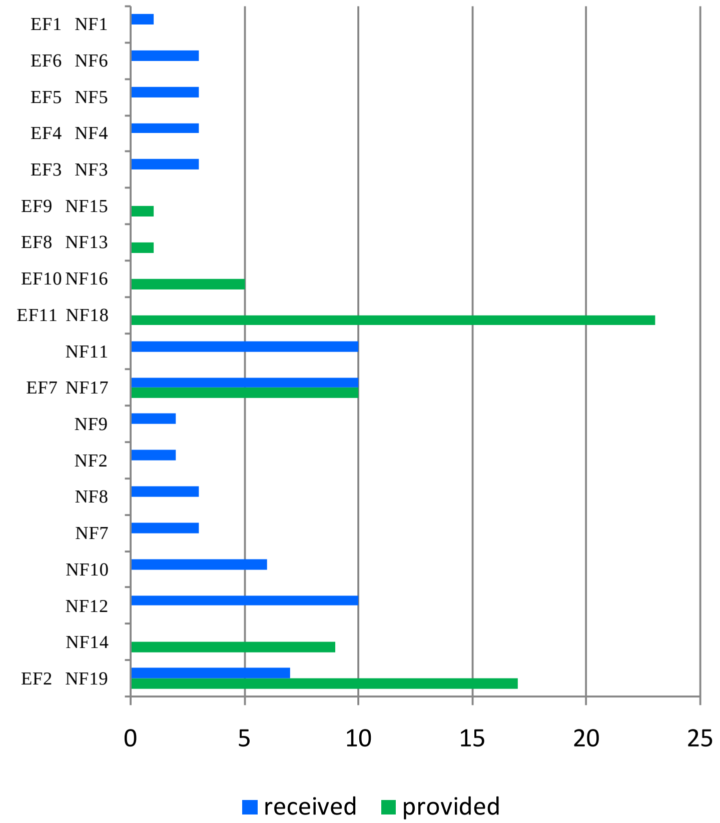


Figure 4-4. Number of villages and number of nuclear families that either provided or received peanut seeds, according to the villages involved in peanut seeds circulation. Xingu Park, 2006.



a) Unique varieties



b) Cumulative number of varieties

Figure 4-5. Number of peanut varieties exchanged by nuclear families, and their respective expanded families. Xingu Park, 2006. a)Unique varieties. b)Cumulative number of varieties.

Table 4-18. Cumulative number of peanut varieties exchanged, according to expanded families and villages involved. Xingu Park, 2006.

	EF2	EF11	EF7	EF10	EF8	EF9	
Peanut varieties	Sobradinho	Kwaryja	Diauarum	Muitara	Capivara	Samauma	Total
Seed providers							
All varieties (n= 25)	26	23	10	5	1	1	66
	39.4%	34.8%	15.2%	7.6%	1.5%	1.5%	
Traditional (n= 14)	26	6	6	4	1	0	43
	39.4%	9.1%	9.1%	6.1%	1.5%	0.0%	65.2 %
M. ayjsing	4	0	1	1	0	0	6
M. jakareape'i	4	0	0	0	0	0	4
M. ayjmirangĩ	3	1	1	0	0	0	5
M. takapesingĩ	3	1	0	0	0	0	4
M. teikwarapypepytangĩ	3	0	1	0	0	0	4
M. takapesingĩ uu	3	0	0	1	0	0	4
M. takapesingĩ	2	0	0	0	0	0	2
M. ayjsingĩ	1	1	1	1	0	0	4
M. emyamuku	1	0	0	1	0	0	2
M. takapeun	1	0	0	0	0	0	1
M. wyraunai	1	0	0	0	0	0	1
M. tapy'yjã'yt	0	1	1	0	1	0	3
M. wyrauna	0	1	1	0	0	0	2
M. teikwarapypepirangĩ	0	1	0	0	0	0	1
New (n= 8)	0	14	3	1	0	1	19
	0.0%	21.2%	4.5%	1.5%	0.0%	1.5%	28.8 %
M. emyamuku ayjmirang	0	4	1	0	0	0	5
M. jakareape ayjun	0	2	1	0	0	0	3
M. wyraunajup	0	2	1	0	0	0	3
M. akapejup	0	2	0	0	0	0	2
M. ayjgiapeywit	0	2	0	0	0	0	2
M. py'wi uni	0	1	0	1	0	0	2
*M. py'wi*uu	0	1	0	0	0	0	1
Looks like *m. ayjmirangĩ*	0	0	0	0	0	1	1
Unidentified (n= 3)	0	3	1	0	0	0	4
	0.0%	4.5%	1.5%	0.0%	0.0%	0.0%	6.1%
Unidentified1	0	1	1	0	0	0	2
Unidentified2	0	1	0	0	0	0	1
Unidentified3	0	1	0	0	0	0	1

Table 4-18. Continued.

Peanut varieties	EF2 Sobradinho	EF7 Diauarum	EF3 Itai	EF4 Kururuz	EF5 M Novo	EF6 Tuiarare	EF1 Pakisaba
Seed recipients							
All varieties (n= 25)	33	20	3	3	3	3	1
Traditional (n= 14)	27	10	3	1	0	1	1
	40.9%	15.2%	4.5%	1.5%	0.0%	1.5%	1.5%
M. ayjsing	4	1	0	0	0	1	0
M. jakareape'i	4	0	0	0	0	0	0
M. ayjmirangĩ	3	2	0	0	0	0	0
M. py'wi	3	0	0	1	0	0	0
M. teikwarapypepirangĩ	3	1	0	0	0	0	0
M. takapesingĩ	3	0	1	0	0	0	0
M. teikwarapypepytangĩ	2	0	0	0	0	0	0
M. ayjsingĩ	1	2	1	0	0	0	0
M. emyamuku	1	0	1	0	0	0	0
M. takapesingĩ uu	1	0	0	0	0	0	0
M. wyraunai	1	0	0	0	0	0	0
M. takapeun	0	2	0	0	0	0	1
M. wyrauna	0	2	0	0	0	0	0
M. tapy'yjã'yt	1	0	0	0	0	0	0
New (n= 8)	5	8	0	2	2	2	0
	7.6%	12.1%	0.0%	3.0%	3.0%	3.0%	0.0%
M. emyamuku ayjmirang	1	2	0	1	1	0	0
M. jakareape ayjun	1	2	0	0	0	0	0
M. wyraunajup	1	2	0	0	0	0	0
M. akapejup	0	1	0	0	1	0	0
M. ayjgiapeywit	1	1	0	0	0	0	0
M. py'wi uni	1	0	0	0	0	1	0
*M. py'wi*uu	0	0	0	1	0	0	0
Looks like *m. ayjmirangĩ*	0	0	0	0	0	1	0
Unidentified (n= 3)	1	2	0	0	1	0	0
	1.5%	3.0%	0.0%	0.0%	1.5%	0.0%	0.0%
Unidentified1	0	2	0	0	0	0	0
Unidentified2	0	0	0	0	1	0	0
Unidentified3	1	0	0	0	0	0	0

Table 4-19. Cumulative number of peanut varieties exchanged by nuclear families belonging to the same Kaiabi villages. Xingu Park, 2006.

	Providers				Recipients						
	EF2	EF2	EF7	EF7	EF2	EF2	EF2	EF2	EF2	EF2	EF2
Peanut varieties	NF19	NF14	NF11	NF17	NF12	NF19	NF10	NF7	NF8	NF2	NF9
All varieties (n= 25)	17	9	10	10	10	7	6	3	3	2	2
Traditional (n= 14)	17	9	6	4	10	1	6	3	3	2	2
	25.8%	13.6%	9.1%	6.1%	15.2%	1.5%	9.1%	4.5%	4.5%	3.0%	3.0%
M. ayjsing	3	1	0	0	1	0	1	0	1	0	1
M. jakareape'i	3	0	0	0	1	0	1	0	0	1	0
M. ayjmirangĩ	3	0	1	1	1	0	0	1	1	0	0
M. py'wi	3	0	0	0	1	0	1	0	0	1	0
M. teikwarapypepirangĩ	2	0	0	0	1	0	0	0	1	0	0
M. takapesingĩ	1	0	0	0	1	0	0	0	0	0	0
M. teikwarapypepytangĩ	1	0	0	0	1	0	0	0	0	0	0
M. ayjsingĩ	1	0	1	1	0	0	1	0	0	0	0
M. emyamuku	0	4	1	0	1	0	1	1	0	0	1
M. takapesingĩ uu	0	3	1	0	1	0	1	1	0	0	0
M. wyraunai	0	1	0	0	1	0	0	0	0	0	0
M. takapeun	0	0	1	1	0	0	0	0	0	0	0
M. wyrauna	0	0	1	1	0	0	0	0	0	0	0
M. tapy'yjã'yt	0	0	0	0	0	1	0	0	0	0	0
New (n= 8)	0	0	3	5	0	5	0	0	0	0	0
	0%	0%	4.5%	7.6%	0%	7.6%	0%	0%	0%	0%	0%
M. emyamuku ayjmirang	0	0	1	1	0	1	0	0	0	0	0
M. jakareape ayjun	0	0	1	1	0	1	0	0	0	0	0
M. wyraunajup	0	0	1	1	0	1	0	0	0	0	0
M. akapejup	0	0	0	1	0	0	0	0	0	0	0
M. ayjgiapeywit	0	0	0	1	0	1	0	0	0	0	0
M. py'wi uni	0	0	0	0	0	1	0	0	0	0	0
*M. py'wi*uu	0	0	0	0	0	0	0	0	0	0	0
Looks like *m. ayjmirangĩ*	0	0	0	0	0	0	0	0	0	0	0
Total unidentified n= 3	0	0	1	1	0	1	0	0	0	0	0
	0%	0%	1.5%	1.5%	0%	1.5%	0%	0%	0%	0%	0%
Unidentified1	0	0	1	1	0	0	0	0	0	0	0
Unidentified2	0	0	0	0	0	0	0	0	0	0	0
Unidentified3	0	0	0	0	0	1	0	0	0	0	0

Table 4-20. Unique peanut varieties exchanged, according to expanded families and villages involved. Xingu Park, 2006.

	EF11	EF2	EF7	EF10	EF8	EF9	
peanut varieties	Kwaryja	Sobradinho	Diauarum	Muitara	Capivara	Samauma	total
Seed providers							
All varieties (n= 25)	16	11	10	5	1	1	44
	64.0%	44.0%	40.0%	20.0%	4.0%	4.0%	
Traditional (n= 14)	6	11	6	4	1	0	28
	24.0%	44.0%	24.0%	16.0%	4.0%	0.0%	63.6%
M. ayjsing	1	1	1	1	0	0	4
M. jakareape'i	1	1	1	0	0	0	3
M. ayjmirangĩ	0	1	1	1	0	0	3
M. py'wi	0	1	1	0	0	0	2
M. teikwarapypepirangĩ	1	1	0	0	0	0	2
M. takapesingĩ	0	1	0	1	0	0	2
M. teikwarapypepytangĩ	0	1	0	1	0	0	2
M. ayjsingĩ	0	1	0	0	0	0	1
M. emyamuku	0	1	0	0	0	0	1
M. takapesingĩ uu	0	1	0	0	0	0	1
M. wyraunai	0	1	0	0	0	0	1
M. takapeun	1	0	1	0	1	0	3
M. wyrauna	1	0	1	0	0	0	2
M. tapy'yjã'yt	1	0	0	0	0	0	1
New (n= 8)	7	0	3	1	0	1	12
	28.0%	0.0%	12.0%	4.0%	0.0%	4.0%	27.3%
M. emyamuku ayjmirang	1	0	1	0	0	0	2
M. jakareape ayjun	1	0	1	0	0	0	2
M. wyraunajup	1	0	1	0	0	0	2
M. akapejup	1	0	0	1	0	0	2
M. ayjgiapeywit	1	0	0	0	0	0	1
M. py'wi uni	1	0	0	0	0	0	1
*M. py'wi*uu	1	0	0	0	0	0	1
Looks like *m. ayjmirangĩ*	0	0	0	0	0	1	1
Unidentified (n= 3)	3	0	1	0	0	0	4
	12.0%	0.0%	4.0%	0.0%	0.0%	0.0%	9.1%
unidentified1	1	0	1	0	0	0	2
unidentified2	1	0	0	0	0	0	1
unidentified3	1	0	0	0	0	0	1

Table 4-20. Continued.

	EF2	EF7	EF3	EF4	EF5	EF6	EF1
Peanut varieties	Sobradinho	Diauarum	Itai	Kururuzinho	M Novo	Tuiarare	Pakisaba
Seed recipients							
All varieties (n= 25)	18	12	3	3	3	3	1
	72.0%	48.0%	12.0%	12.0%	12.0%	12.0%	4.0%
Traditional (n= 14)	12	6	3	1	0	1	1
	48.0%	24.0%	12.0%	4.0%	0.0%	4.0%	4.0%
M. ayjsing	1	1	1	0	0	0	0
M. jakareape'i	1	1	0	0	0	0	0
M. ayjmirangĩ	1	1	0	0	0	1	0
M. py'wi	1	1	0	0	0	0	0
M. teikwarapypepirangĩ	1	0	0	1	0	0	0
M. takapesingĩ	1	0	1	0	0	0	0
M. teikwarapypepytangĩ	1	0	1	0	0	0	0
M. ayjsingĩ	1	0	0	0	0	0	0
M. emyamuku	1	0	0	0	0	0	0
M. takapesingĩ uu	1	0	0	0	0	0	0
M. wyraunai	1	0	0	0	0	0	0
M. takapeun	0	1	0	0	0	0	1
M. wyrauna	0	1	0	0	0	0	0
M. tapy'yjã'yt	1	0	0	0	0	0	0
New (n= 8)	5	5	0	2	2	2	0
	20.0%	20.0%	0.0%	8.0%	8.0%	8.0%	0.0%
M. emyamuku ayjmirang	1	1	0	1	1	0	0
M. jakareape ayjun	1	1	0	0	0	0	0
M. wyraunajup	1	1	0	0	0	0	0
M. akapejup	1	0	0	0	0	1	0
M. ayjgiapeywit	0	1	0	0	1	0	0
M. py'wi uni	0	0	0	1	0	0	0
*M. py'wi*uu	1	1	0	0	0	0	0
Looks like *m. ayjmirangĩ*	0	0	0	0	0	1	0
Unidentified (n= 3)	1	1	0	0	1	0	0
	4.0%	4.0%	0.0%	0.0%	4.0%	0.0%	0.0%
Unidentified1	0	1	0	0	0	0	0
Unidentified2	0	0	0	0	1	0	0
Unidentified3	1	0	0	0	0	0	0

Table 4-21. Unique peanut varieties exchanged by nuclear families belonging to same villages. Xingu Park, 2006.

	Providers			Recipients								
	EF2		EF7	EF2							EF7	
Peanut varieties	NF19	NF14	NF17	NF12	NF19	NF10	NF7	NF8	NF2	NF9	NF11	NF17
All varieties (n= 25)	8	4	10	10	7	6	3	3	2	2	10	10
	32%	16%	40%	40%	28%	24%	12%	12%	8%	8%	40%	40%
Traditional (n= 14)	8	4	6	10	1	6	3	3	2	2	6	4
	32%	16%	24%	40%	4%	24%	12%	12%	8%	8%	24%	16%
M. ayjsing	1	1	0	1	0	1	0	1	0	1	0	0
M. jakareape'i	1	0	1	0	0	1	0	0	0	0	1	1
M. ayjmirangĩ	1	0	1	1	0	0	1	1	0	0	1	1
M. py'wi	1	0	0	1	0	1	0	0	1	0	0	0
M. teikwarapypepirang ĩ	1	0	0	1	0	0	0	0	0	0	0	0
M. takapesingĩ	1	0	0	1	0	1	0	0	1	0	0	0
M. teikwarapypepytang ĩ	1	0	0	1	0	0	0	0	0	0	0	0
M. ayjsingĩ	1	0	0	1	0	0	0	1	0	0	0	0
M. emyamuku	0	1	1	1	0	1	1	0	0	1	1	0
M. takapesingĩ uu	0	1	1	1	0	1	1	0	0	0	1	0
M. wyraunai	0	1	0	1	0	0	0	0	0	0	0	0
M. takapeun	0	0	1	0	0	0	0	0	0	0	1	1
M. wyrauna	0	0	1	0	0	0	0	0	0	0	1	1
M. tapy'yjã'yt	0	0	0	0	1	0	0	0	0	0	0	0
New (n= 8)	0	0	3	0	5	0	0	0	0	0	3	5
	0%	0%	12%	0%	20%	0%	0%	0%	0%	0%	12%	20%
M. emyamuku ayjmirang	0	0	1	0	1	0	0	0	0	0	1	1
M. jakareape ayjun	0	0	1	0	1	0	0	0	0	0	1	1
M. wyraunajup	0	0	0	0	0	0	0	0	0	0	0	0
M. akapejup	0	0	1	0	1	0	0	0	0	0	1	1
M. ayjgiapeywit	0	0	0	0	1	0	0	0	0	0	0	1
M. py'wi uni	0	0	0	0	1	0	0	0	0	0	0	0
M. py'wiuu	0	0	0	0	0	0	0	0	0	0	0	1
Looks like *m. ayjmirangĩ*	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified (n= 3)	0	0	1	0	1	0	0	0	0	0	1	1
	0%	0%	4%	0%	4%	0%	0%	0%	0%	0%	4%	4%
Unidentified1	0	0	1	0	0	0	0	0	0	0	1	1
Unidentified2	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified3	0	0	0	0	1	0	0	0	0	0	0	0

Table 4-22. Characteristics of Kaiabi nuclear families involved in circulation of peanut varieties. Xingu Park, 2006.

NF	EF	Age (yr)		Male age	Male age	Village	Place of	Seed mgt	Still ident.	Occupation	Cumulative #
		female	male	Class	categ		Origin	system	New types		of varieties
Providers											
NF18	EF11	47	49	Elder	*Iywyruu*	Kwaryja	Xingu	D	Yes	Leader, shaman.	23
NF19 [a]	EF2	43	44	Elder	*Iywyruu*	Sobradinho	Xingu	BD	na	Paid job, leader.	17
NF17 [a]	EF7	32	40	Elder	*Iywyruu*	Diauarum	Xingu	Bb	No	Paid job, leader.	10
NF14	EF2	29	34	Young	*Kunumiuu*	Sobradinho	Xingu	BD	na	Paid job, leader.	9
NF16	EF10	37	40	Elder	*Iywyruu*	Muitara	Xingu	A	No	Leader.	5
NF15	EF9	59	65	Elder	*Iymani*	Samauma	Teles Pires	Ba	Yes	Paid job, leader.	1
NF13	EF8	na	43	Elder	*Iywyruu*	Capivara	Tatuy	Bb	No		1
Recipients											
NF11	EF7	47	57	Elder	*Iymani*	Diauarum	Kururuzinho	Bb	Yes		10
NF12	EF2	28	25	Young	*Kunumiuu*	Sobradinho	Xingu	BD	No		10
NF10	EF2	25	29	Young	*Kunumiuu*	Sobradinho	Xingu	BD	na		6
NF5 [b]	EF5	67	-	Elder	*Wawĩ*	Maraka Novo	Teles Pires	Ba	No	Leader.	3
NF3	EF3	27	45	Elder	*Iywyruu*	Itai	Xingu	Ba	No		3
NF6	EF6	46	50	Elder	*Iywyruu*	Tuiarare	Xingu\ Kururuzinho	Bb	Yes		3
NF8	EF2	34	60	Elder	*Iymani*	Sobradinho	Teles Pires	BD	na		3
NF7	EF2	22	27	Young	*Kunumiuu*	Sobradinho	Xingu	BD	na	Paid job.	3
NF2	EF2	27	26	Young	*Kunumiuu*	Sobradinho	Xingu	BD	No	Paid job.	2
NF9	EF2	30	31	Young	*Kunumiuu*	Sobradinho	Xingu	BD	na	Paid job.	2

a) Family that provided and received seeds.
b) A widow is the head of the family; age class and category provided for the woman.
na = not available.

Table 4-23. Peanut varieties whose names declared by the recipients did not match the donor's peanut varieties collection in Kaiabi villages. Xingu Park, 2006.

	Naming events		Seed recipients		
Peanut varieties	Total	No matching	NF	EF	Village
All varieties	36	24			
Traditional	21	9			
M. ayjmirang ĩ	6	1	NF11	EF7	Diauarum
M. ayjsing	4	1	NF10	EF2	Sobradinho
M. py'wi	4	1	NF11	EF7	Diauarum
M. takapesing ĩ	2	1	NF12	EF2	Sobradinho
M. takapesing ĩ uu	1	1	NF12	EF2	Sobradinho
M. teikwarapypepytang ĩ	4	4	NF3	EF3	Itai
			NF10	EF2	Sobradinho
			NF12	EF2	Sobradinho
			NF2	EF2	Sobradinho
New	15	15			
M. ayjgiapeywit	2	2	NF17	EF7	Diauarum
M. emyamuku ayjmirang	3	3	NF11	EF7	Diauarum
			NF17	EF7	Diauarum
			NF19	EF2	Sobradinho
M. jakareape ayjun	3	3	NF11	EF7	Diauarum
			NF17	EF7	Diauarum
			NF19	EF2	Sobradinho
*M. py'wi*uu	2	2	NF17	EF7	Diauarum
			NF19	EF2	Sobradinho
M. akapejup	2	2	NF6	EF6	Tuiarare
			NF19	EF2	Sobradinho
M. wyraunajup	3	3	NF11	EF7	Diauarum
			NF17	EF7	Diauarum
			NF19	EF2	Sobradinho

Table 4-24. Cumulative number of peanut varieties taking part in mechanisms for seed circulation identified in Kaiabi villages. Xingu Park, 2006.

Mechanism for seed circulation	Exchange within EF	Donation	Helping harvesting	Gift	Total
All varieties	35	28	2	1	66
	53.0%	42.4%	3.0%	1.5%	
Traditional varieties	32	10	1	0	43
	48.5%	15.2%	1.5%	0%	65.2%
M. ayjmirangĩ	5	0	1	0	6
M. emyamuku	4	0	0	0	4
M. jakareape'i	4	1	0	0	5
M. py'wi	4	0	0	0	4
M. teikwarapypepirangĩ	3	1	0	0	4
M. teikwarapypepytangĩ	3	1	0	0	4
M. ayjsing	2	2	0	0	4
M. wyraunai	2	0	0	0	2
M. ayjsingĩ	1	0	0	0	1
M. takapesingĩ	1	1	0	0	2
M. takapesingĩ uu	1	0	0	0	1
M. takapeun	1	2	0	0	3
M. wyrauna	1	1	0	0	2
M. tapy'yjã'yt	0	1	0	0	1
New varieties	3	14	1	1	19
	4.5%	21.2%	1.5%	1.5%	28.7%
M. emyamuku ayjmirang	1	4	0	0	5
M. ayjgiapeywit	0	2	0	0	2
M. jakareape ayjun	1	2	0	0	3
*M. py'wi*uu	0	2	0	0	2
M. wyraunajup	1	2	0	0	3
M. py'wi uni	0	1	0	0	1
M. akapejup	0	1	1	0	2
Looks like *m. ayjmirangĩ*	0	0	0	1	1
Unidentified varieties	0	4	0	0	4
	0.0%	6.1%	0.0%	0.0%	6.1%
Unidentified1	0	2	0	0	2
Unidentified2	0	1	0	0	1
Unidentified3	0	1	0	0	1

Table 4-25. Number and proportion of unique peanut varieties taking part in mechanisms for seed circulation identified in Kaiabi villages. Xingu Park, 2006.

Mechanism for seed circulation	Exchange Within EF	Donation	Helping Harvesting	Gift	Total
All varieties	16	18	2	1	
	64.0%	72.0%	8.0%	4.0%	
Traditional varieties	13	8	1	0	
	52.0%	32.0%	4.0%	0.0%	
M. ayjmirangĩ	1	0	1	0	2
M. jakareape'i	1	1	0	0	2
M. ayjsing	1	1	0	0	2
M. teikwarapypepirangĩ	1	1	0	0	2
M. teikwarapypepytangĩ	1	1	0	0	2
M. takapeun	1	1	0	0	2
M. takapesingĩ	1	1	0	0	2
M. wyrauna	1	1	0	0	2
M. emyamuku	1	0	0	0	1
M. py'wi	1	0	0	0	1
M. wyraunai	1	0	0	0	1
M. ayjsingĩ	1	0	0	0	1
M. takapesingĩ uu	1	0	0	0	1
M. tapy'yjã'yt	0	1	0	0	1
New varieties	3	7	1	1	
	12.0%	28.0%	4.0%	4.0%	
M. emyamuku ayjmirang	1	1	0	0	2
M. jakareape ayjun	1	1	0	0	2
M. wyraunajup	1	1	0	0	2
M. akapejup	0	1	1	0	2
M. ayjgiapeywit	0	1	0	0	1
M. py'wiuu	0	1	0	0	1
M. py'wi uni	0	1	0	0	1
Looks like *m. ayjmirangĩ*	0	0	0	1	1
Unidentified varieties	0	3	0	0	
	0.0%	12.0%	0.0%	0.0%	
Unidentified1	0	1	0	0	1
Unidentified2	0	1	0	0	1
Unidentified3	0	1	0	0	1

Table 4-26. Proportion of cumulative number of peanut varieties that expanded and nuclear families provided and/or received, according to mechanisms for seed circulation identified in Kaiabi villages. Xingu Park, 2006.

Mechanism for seed circulation		Exchange within EF	Donation	Helping harvesting	Gift	Total
Total		35	28		1	66
		53.0	42.4	3.0	1.5	
Seed providers						
EF2		39.4	0.0	0.0	0.0	39.4
	NF19	25.8	0.0	0.0	0.0	25.8
	NF14	13.6	0.0	0.0	0.0	13.6
EF11	NF18	0.0	34.8	0.0	0.0	34.8
EF7	NF17	13.6	1.5	0.0	0.0	15.2
EF10	NF16	0.0	4.5	3.0	0.0	7.6
EF8	NF13	0.0	1.5	0.0	0.0	1.5
EF9	NF15	0.0	0.0	0.0	1.5	1.5
Seed recipients						
EF2		39.4	10.6	0.0	0.0	50.0
	NF2	3.0	0.0	0.0	0.0	3.0
	NF7	4.5	0.0	0.0	0.0	4.5
	NF8	4.5	0.0	0.0	0.0	4.5
	NF9	3.0	0.0	0.0	0.0	3.0
	NF10	9.1	0.0	0.0	0.0	9.1
	NF12	15.2	0.0	0.0	0.0	15.2
	NF19	0.0	10.6	0.0	0.0	10.6
EF7		13.6	16.7	0.0	0.0	30.3
	NF17	0.0	15.2	0.0	0.0	15.2
	NF11	13.6	1.5	0.0	0.0	15.2
EF3	NF3	0.0	4.5	0.0	0.0	4.5
EF4	NF4	0.0	4.5	0.0	0.0	4.5
EF5	NF5	0.0	4.5	0.0	0.0	4.5
EF6	NF6	0.0	0.0	3.0	1.5	4.5
EF1	NF1	0.0	1.5	0.0	0.0	1.5

CHAPTER 5
PEANUT DIVERSITY KNOWLEDGE AND VARIETIES DISTRIBUTION AMONG KAIABI FARMERS

Introduction

Building upon the results of the previous chapters, the goal of this chapter is to present and discuss data concerning knowledge about the names for peanut varieties; discuss the distribution of traditional and newly-created peanut varieties in cultivated fields in the 2006-07 cropping season, along with an exploratory longitudinal study from 1999-2000; and discuss knowledge transmission processes related to crop varieties. In the context of the current Kaiabi peanut diversity management practices, it also addresses the implications of the findings for local crop diversity management and conservation.

Therefore, this chapter addresses the following hypotheses:

H1: Peanut diversity knowledge is unevenly distributed within the Kaiabi society. I hypothesize that although elders, particularly women, hold greater knowledge about crop diversity, shamans also exhibit great knowledge of peanut diversity, use and management.

H2: There are differences in variety repertoire among Kaiabi families and villages. I hypothesize that the history of each specific variety (whether traditional or newly-created) is differently appropriated by individuals and families from different villages.

H4: According to their history of contact and inter-cultural interactions, indigenous peoples may face changes in their processes for agricultural knowledge transmission. I hypothesize that currently, organic knowledge transmission mechanisms have been partially replaced by institutionalized educational initiatives.

The research questions that guide this chapter are: (1) How is knowledge about names for peanut varieties distributed within the Kaiabi society? (2) How is peanut diversity distributed among the fields of Kaiabi farmers? And (3) How do changes in knowledge transmission systems impact the use and maintenance of indigenous agrodiversity?

Cultural Competence and Knowledge Distribution about Peanut Varieties,

Farmers' Familiarity with Peanut Varieties and Their Ability to Name Them

To test whether informants were familiarized with peanut varieties, whether they knew their names, and what names they apply to each variety, I ran a knowledge test based on a visual stimulus consisting of samples of actual peanut varieties. Based on the proportion of positive answers for each variety, I calculated individual indices of Kaiabi individuals' familiarity with peanut varieties, and whether they claimed to know the name for these varieties (Table 5-1). Data containing binary responses for each question were entered into a matrix. Then, I ran a reliability test on the respective matrices. Next, I ran consensus analyses on these matrices. Cultural Consensus Theory holds that there is a shared set of culturally proper answers for the questions asked, yielding consistent responses with a high agreement. As such, there is only one solution to the test, and cultural competence scores for each individual should fall between 1 and zero, the average score providing information directly about the level of agreement present in the data.

The instruments used to collect data for the first two questions were adequate, with an alpha coefficient of respectively 0.889 and 0.930 for whether individuals were familiarized with peanut varieties, and whether they claimed to know the name for the varieties. However, the data did not fit the requirements of the cultural consensus theory. For both cases the eigenvalues ratio was below 3.0 (respectively, 1.35 and 2.42) and there were negative cultural competence scores for 26 and 15 individuals, respectively. These results suggest that the answers I obtained might be affected by social desirability bias. In this situation, informants may deliberately tailor their answers to create a specific social image, which may vary between groups of respondents, creating heterogeneity in the strength and direction of the bias. When such bias is present, it yields invalid conclusions for the data (Stocké and Hunkler, 2007). Therefore, I did not use respondents' answers about familiarization with, and whether they knew the name for peanut varieties, for deriving results from the hypothesis outlined above.

Knowledge about the Names for Peanut Varieties: Individuals from All the Villages

General data

The test of knowledge about names for peanut varieties with all informants yielded a list of 133 unique names given to the 17 traditional varieties. Including those repeated for more than one variety, a total of 299 names was associated with the varieties, each of which received between 8 and 26 names (Table 5-2; Appendix G). I used standard names for each peanut variety obtained from elders and a shaman for determining the correctness of answers provided by interviewees during the knowledge test. The proportion of peanut varieties each informant correctly named is presented as an individual knowledge index (ki).

Knowledge about the names for peanut varieties varied according to specific varieties (Figure 5-1), and individuals. Kaiabi informants (n=286) obtained ki values varying from 1.0000 and 0.0000 (Table 5-3). Only four respondents (1.4%) obtained the maximum index, and about 10% of them provided correct names for thirteen or more varieties (ki equal to or above 0.7647). By contrast, about half of the interviewees correctly named up to five varieties (ki below 0.2941). Moreover, 33 informants (11.54%, the highest single proportion reached among the respondents), did not provide the correct name for any peanut variety (ki=zero).

Munuwi py'wi is the variety for which the greatest number of respondents (208, or 73%) provided the correct name. The next most correctly identified varieties included *m. ayjsing*, *m. ayjsingĩ*, *m. takapeun* and *murunu* which were correctly named by between 170 and 147 Kaiabi individuals (51 and 59%), followed by a second group containing *m. emyamuku*, *m. wyraunai*, *m.*

ayjmirangĩ, *m. ayjgwasiat*, *m. teikwarapypepirangĩ*, and *m. tapy'yjã'yt*, which was properly named by 86 to 110 farmers (30 to 38%). Next, *m. jakareape'i* and *m. teikwarapypepytangĩ* were correctly named by respectively 74 and 70 respondents (about 25%) and then *m. takapesingĩ*, munuwi ii, and *m. wyrauna*, which were correctly named by 51 and 35 (12 and 16%) of the interviewees. Finally, only 26 informants (9%) correctly named the variety *m. takapesingĩ uu*.

Consensus analysis and cultural competence knowledge about names for peanut varieties

Cultural Consensus Theory assumes that there is a single, shared set of culturally appropriate answers for questions asked in a test about a specific domain of knowledge, yielding consistent responses with a high agreement (Weller, 2007). After entering names for peanut varieties provided by all respondents into a matrix, I assigned a unique number for each name. Then I ran a reliability test on the recoded matrix yielding an alpha coefficient of 0.895, showing that my instrument for collecting data was adequate. Next I pulled all respondents with more than eight missing data (47 % of the 17 peanut varieties) out of the original matrix. This action did not affect the maintenance of all 17 peanut varieties in the study. Then, I ran consensus analysis on the matrix with data on the 149 remaining informants. The data fit well with Cultural Consensus Theory, based on the large eigenvalues ratio (53.00/4.56=11.16) and on the lack of negative cultural competence scores (Weller, 2007). The average competence score was 0.5525, showing a moderate level of cultural agreement. Table 5-4 shows descriptive statistics for cultural competence scores for the 149 respondents, and Appendix H lists the data for individuals.

Table 5-5 provides the names for traditional peanut varieties upon which informants culturally agreed, their count and weighted frequencies, and the proportion of missing data for each variety. All names for tested peanut varieties matched those considered as correct by the elders and shaman. However, one variety showed two names with a very close level of consensus. In this case, *m. myãpe'ĩ* presented a weighted frequency of 44.67% while 44.44% agreed upon calling it *munuwi'ii*. The second name means literally 'small peanut', and can be applied to other small-grain peanut varieties. Yet, another 6% called this variety *m. tukura posit*, a regional synonym applied by people associated to the Kururuzinho area. In addition, other varieties with acceptable synonyms included the name *m. pyreteten*, which received a weighted frequency of about 4% against 102% for the name *m. emyamuku*, about 6% called m. pyreremuu against 37% that agreed upon the name *m. wyrauna*, and finally the name *m. wyraunai* reached a consensus with a weighted frequency of 47% whereas 34% agreed upon the name *munuwi uni* (which has the variant form, *m. ayjuni*).

With a weighted frequency of 143%, the variety with by far, the best agreement upon its name was *m. py'wi*, which is considered by the Kaiabi to be the most delicious and productive variety and is regarded as being an innocuous variety for consumption, which means no food taboo applies to this variety. *M. ayjsing* had the second most agreed-upon name, with a weighted frequency of 133%, followed by *m. ayjsingĩ*, *m. takapeun*, *murunu*, *m. emyamuku*, and *m. ayjmirangĩ*, all presenting weighted frequencies between 100% and 124%. Then came a group of varieties showing weighted frequencies between 62 and 97%: *m. ayjgwasiat*, *m. teikwarapypepirangĩ*, *m. tapy'yjã'yt*, *m. jakareape'i*, and *m. teikwarapypepytangĩ*. Finally, the varieties for which the names showed the least agreement were *m. takapesingĩ, m. myãpe'ĩ*, *m. wyraunai*, *m. wyrauna*, and *m. takapesingĩ uu*. All these varieties presented weighted frequencies lower than 50%, except for *m. takapesingĩ*, which reached 62%. Nevertheless, the names *m. myãpe'ĩ* and *munuwi'ii* reached a similar agreement for the same variety. Also, *m. wyraunai* is a synonymous to *m. uni*.

Individuals selected to take part in the consensus analysis provided relatively homogenous (i.e. high agreement) answers for the name of most varieties, which reflects a fair distribution of knowledge about the names for peanut varieties for the group as a whole. Nevertheless, comparing means through analysis of variance, cultural competence scores revealed significant statistical difference within the following subgroups related to characteristics of individuals (Tables 5-6 and 5-7): nuclear families ($\eta2$=0.74); gender ($\eta2$=0.16); age category ($\eta2$=0.06) and age status($\eta2$=0.06); area of origins of individuals ($\eta2$=0.04); and engagement in paid job ($\eta2$=0.04). I also found statistical differences for the following subgroups of individuals associated with peanut management: whether an individual still identifies new peanut varieties ($\eta2$=0.19) or had participated in past events for identifying new peanut varieties ($\eta2$=0.09); seed management systems ($\eta2$=0.08); whether an individual ever cultivated a peanut field of her/his own ($\eta2$=0.05), or had a peanut field in 2006 ($\eta2$=0.04). Although only nuclear family showed a very strong association with the means for the competence scores, whether an individual can still identify new peanut varieties as well as gender presented moderately strong associations. All the remaining variables showed a weak association with the means for the competence scores ($\eta2$ below 0.10). I found no differences for average competence scores among expanded families, village of residence, whether an informant was shaman or political leader, or whether an individual was aware about the existence of dangerous peanut varieties.

Ninety two nuclear families were represented by individuals selected to compose the group included in the consensus analysis, of which 51 (55%) families contributed with only one individual. Analyzing characteristics of nuclear families along with expanded families, villages and individuals (Table 5-8) did not allow for the identification of a pattern of differences among nuclear families. Nevertheless, it showed that individuals within most NF obtained mean competence scores between 0.60 and 0.79 (33.7%), and between 0.40 and 0.59 (41.3%). It should also be noted that most informants that entered the consensus analysis were females and/or elders. Nuclear families presenting lower scores also showed lower proportions for having cultivated peanuts at least once, and the least proportion for cultivating a peanut field in 2006. Likewise, the proportion of those who had participated in at least one past event for identifying new peanut varieties, and those who still were performing the practice in 2006, decreased toward the lower competence scores averaged according to nuclear families.

Despite differences among nuclear families, I found no statistical difference for the means of competence scores among expanded families and villages. Although Kwaryja village showed the highest mean competence scores, there were other villages in which members of distinct expanded families also showed high knowledge about the names for the varieties. This finding suggests that the knowledge about the names for peanut varieties is fairly well-distributed among such families and places of residence. Therefore, this knowledge could be mobilized to inform new generations.

Female individuals showed greater competence than males, as did elders in relation to youngsters (Table 5-7, Appendix H). When combining age and gender through age categories, elder women (*wawĩ*) showed average competence scores significantly higher than any other age category, followed by male elders (*iymani*). However, middle age females (*iyruo*) presented average means different only from those for the young males (*kunumiuu*). Middle age males (*iywyruu*) showed no difference with youngster of both sexes, and means for female and male youngsters were not different from each other. These findings confirm my hypothesis that women and elders hold more knowledge about the names for peanut varieties. However, young people's performance, particularly among females was lower than I expected.. As explained previously, men at this age are often away from their villages and families, as opposed to women, who usually stay at their parent's house even after marriage. Given the dynamic of agricultural labor organization within families, women should then have more opportunities to maintain contact with crop varieties. Therefore, these results indicate that factors are likely interfering with young people's knowledge of peanut varieties. I will return to this point later in this chapter.

The only difference for the means between pairs of area of origins refers to informants from Xingu in contrast with Teles Pires (Table 5-7, Appendix I). However, all youngsters selected to take part in the consensus analysis were born in Xingu, and respondents who came from Teles Pires were older and therefore were more experienced individuals within their age category. When controlling for age, informants from Teles Pires consistently showed higher mean for the cultural competence score than elders from Xingu, and there were significant statistical differences between pairs of elders and youngsters from all the four areas of origins.

Informants earning income from paid jobs scored significantly lower than those who were not engaged in paid jobs. I expected this result because work outside of agriculture may detract from time that could be directed towards practicing more intense contact with crops. This trend is stronger among youngsters, who had fewer opportunities to practice agriculture. On the other hand, contrary to what I expected, shamans as a subgroup did not yield a higher mean than non-shaman individuals. The results for this subgroup point to the influence of other more effective forces than whether or not informants were shamans. My interpretation is that shamans had distinct degrees of acquaintance with the spiritual world (and particularly with *Kupeirup*), and commitment to agrodiversity management that went beyond differences about the knowledge about the names for peanut varieties when compared to lay people.

Means of competence scores for those in charge of political affairs did not differ from those of non-leaders. Since leaders are supposed to perform everyday tasks just like any ordinary individual, this result may be explained either by leaders' personal commitment to Kaiabi culture (Grünberg, 2004), or simply expose the effect of age and life experience on knowledge. Likewise, there was no difference in cultural competence between categories within the subgroup related to whether informants were aware about the existence of dangerous peanut varieties, suggesting a relatively homogenous perception about the existence of food taboos related to peanut consumption.

Informants that already had cultivated a peanut field on their own and those who had a peanut field in 2006 showed higher cultural competence in knowing the names for peanut varieties than those who did not cultivate peanuts. These results are concordant with the hypothesis that people more experienced with manipulating plants know them better than less experienced individuals. Likewise, respondents who had participated in at least one past event for selecting new peanut varieties and those who still perform the practice obtained mean competence scores significantly higher than those who did not participate in such events. Field observations[1] suggest that the performance of the practice was linked to families, and at least partially to places (i.e. villages). Today the identification of new peanut varieties is reportedly weakened, and typically not all the members of a given expanded family engage in it, which may help to explain differences among individuals. Noteworthy, the three expanded families from Kwaryja village were the only families to consistently keep identifying new peanut varieties. All informants from the village included in the consensus analysis performed the practice of selecting new peanut varieties in the past, and 85% of them were still participating in it in 2006.

[1] See the section 'Rationale and variations for peanut selection strategies' in chapter 4.

Comparing the means of individuals according to seed management systems yielded three clusters: means for systems A and Ba were not statistically different from system D (corresponding to Kwaryja village), and all the remaining systems were different from system D but not different from each other (Table 5-7, Appendix I). However, I found that the differences between systems A and Ba from D were influenced by the scores of the youth. When they were removed, such differences disappeared (Appendix I). In fact, 30% of the individuals from Kwaryja included in the consensus analysis were youngsters, and when not computing their scores the mean cultural competence score increased by almost 14%. On the other hand, there were no youngsters among the individuals of system A, and they accounted for only 5% of the individuals of system Ba. Pulling out youth individuals, the mean score rose about 4%. This finding suggests that individuals associated with system D (Kwaryja residents) are more acknowledgeable about the names for peanut varieties. Moreover, seed management systems incorporate the opportunity to interact with the crop through decisions about the arrangement of the number and placement of peanut field(s) in the village, labor organization, and the level of involvement with the seeds (e.g. during storage, sowing, harvesting, and shelling). Therefore, the results indicate that, in the context of the effort done in Kwaryja village to spread knowledge about peanut varieties, relatively more youngsters obtained higher competence scores but until the time of my fieldwork they still had not mastered the names for all varieties.

Knowledge index about peanut varieties names for informants excluded from consensus analysis

The correlation coefficient between the knowledge index (ki) and cultural competence scores for the group of 149 informants is 0.849, significant at the 0.01 level (1-tailed Pearson test), suggesting a good relationship for both variables within this group. However, almost half of the respondents (n=137) were removed in order to run the consensus analysis. To explore variations of knowledge within sub-groups of individuals excluded from the consensus analysis, I examined the data based on the knowledge index (ki).

Informants excluded from the consensus analysis reached an average ki of 0.1297 (SD=0.1200), with a maximum value of 0.5294 and a minimum value of 0.0000 (table 5-4, and Appendix H). Only five respondents (4% within the subgroup) obtained knowledge indices higher than 0.40; four informants (3%) reached ki=0.3529; twenty six respondents (19%) obtained ki values between 0.20 and 0.29; forty interviewees (29%) reached ki between 0.10 and 0.19; twenty nine respondents (21%) obtained ki=0.0588; and finally thirty three (24%) informants did not provide the correct name for any peanut variety (ki=0). These findings show that the knowledge about the names for peanut varieties is not uniformly distributed among Kaiabi respondents excluded from the consensus analysis.

Variations within sub-groups of individuals

Comparing means for ki among subgroups related to characteristics of individuals through analysis of variance, I found statistical differences for nuclear families to which the respondents belong ($\eta 2=0.80$), age categories ($\eta 2=0.21$) and age status ($\eta 2=0.15$), area of origins of the informants ($\eta 2=0.06$), and whether they were political leaders ($\eta 2=0.05$). Subgroups of individuals associated with peanut management showed statistical differences that depended on whether informants were still identifying new peanut varieties in 2006 ($\eta 2=0.13$), had cultivated a peanut field on their own previously ($\eta 2=0.07$), and had participated in at least one event in the past ($\eta 2=0.06$). Only nuclear families showed a very strong association with the means for the knowledge scores. Kaiabi age category, age status, and whether a farmer still identifies new peanut varieties presented a moderately strong association with the means for knowledge scores, while the remaining variables showed weak association ($\eta 2$ below 0.10). On the other hand, gender, expanded families to which respondents belong, current village of residence, whether respondents were shamans, engagement in paid jobs, awareness about the existence of dangerous peanut varieties, whether informants were cultivating a peanut field in 2006, and seed management systems all showed no difference in means for the knowledge index (Tables 5-9 and 5-10, and Append 5-4).

Ninety eight nuclear families were excluded from the consensus analysis, of which 59 (60%) contributed with only one individual. Again, the characterization of nuclear families along with expanded families, villages and individuals (Table 5-11) did not indicate any pattern for differences among nuclear families. Most NF (60%) obtained mean ki between 0.09 and 0.19 (corresponding to the knowledge of an average number of varieties names between 1.5 and 3.2). Compared to the group included in the consensus analysis, the proportions of female and elder individuals were lower, mainly for the lower values of the knowledge index. Also, among those excluded from the consensus analysis, fewer nuclear families were experienced with peanut cultivation, and fewer had a peanut field in 2006. Similarly, families in this group comprised a lower proportion of those who had participated in at least one past event for identifying new peanut varieties and those who still were performing the practice in 2006. Indeed, among those families with an average ki lower than 0.20 (corresponding to the knowledge about the names for 3.4 peanut varieties), no individual was performing the practice in 2006.

In agreement with the findings for competence scores, elders showed higher means for ki than youngsters (Table 5-10). Among age categories (Table 5-10, Appendix I), elder females (*wawĩ*) showed relatively low average ki but it was significantly different from any other category. In turn, middle aged females (*iyruo*) presented higher means than middle aged (*iywyruu*) and young (*kunumiuu*) males. Elder males (*iymani*) performed poorly, differing statistically only from young males (*kunumiuu*). Middle aged male (*iywyruu*) knew more names for peanut varieties than youngsters of both sexes (*Kujãmuku*fet, *kunumiuu*, and *kunumiuga*), whose means did not differed from each other.

With regard to area of origins, informants from Kururuzinho were the only group to consistently show higher mean ki than respondents originated in the three other areas (Table 5-10, Appendix I). Controlling for age status, elders from Xingu did not show differences in relation to the mean ki for individuals from other areas. Youngsters from Xingu had a lower mean than elders from the same area, in addition to those from Kururuzinho and Tatuy. However, their mean ki was not significantly different from that of elders from Teles Pires. On the other hand, political leaders presented mean ki values significantly different when compared to those who were not leaders, suggesting that they were more dedicated to crops, even if at a lower level than those who were included in the consensus analysis.

Respondents experienced with cultivation of the crop showed higher mean ki than those who had no experience (Table 5-10). However, the means for ki for those who had a peanut field in 2006 showed no difference in relation to those who did not have a field. Informants who had participated in at least one past event for selecting new peanut varieties obtained mean ki significantly higher than those who did not participate. Only five informants were among those excluded from the consensus analysis that still performed the practice in 2006. Nevertheless, the mean ki for this subgroup was significantly higher than for most individuals that do not identify new varieties anymore. All being equal, farmers who were more experienced with the crop are expected to have more opportunities for learning and retaining knowledge about peanut varieties. Yet, individual experience through time may be more relevant than cultivating a field occasionally, as may be the case for at least part of the farmers who had a peanut field in 2006 but performed poorly in the knowledge test (note: 38 never cultivated a peanut field, against 77 experienced peanuts cultivators). Moreover, an experienced farmer would be more likely to know the variety names when she/he also already had participated in events for the identification of new peanut varieties. Results indicate that some informants who took part in such events and later did not cultivate a field of their own, could still manage to retain knowledge while others, even experienced with cultivating peanuts, were not able to learn or retain the names for the varieties. Nevertheless, other aspects of life history of individuals may account for the answers to the knowledge test. For example, among those who had a peanut field in 2006 but did not provide the correct name for any peanut variety was an elderly couple and a young woman who lived in the city for a long time. Other respondents include young adults (*kunumiuu* and *Kujãmuku*fet) that were born and spent their lives in villages of Xingu. Other individuals recalled having witnessed the identification of new varieties but did not correctly name any peanut variety name.[2] As such, participation in past events is not necessarily akin to retaining knowledge. Beyond age status and age categories, these results reflect the influence of life history on the knowledge level of the respondents. Also, they point to the importance of the knowledge transmission processes, on which I will comment later in this chapter.

Main findings from knowledge tests

Altogether, the findings from knowledge tests indicate that naming varieties is a complex and dynamic process that entails variation across individuals and families. For the Kaiabi, there is a fair consensus about the names for traditional peanut varieties (that accommodates a few synonyms), which were received from the ancestors and transmitted across generations. About half of the participants in my research showed relatively high agreement upon culturally

[2] Included among these individuals are three women: one elderly woman who lived in the city and two young woman, one of whom came from the Tatuy area and the other who is daughter of an interethnic marriage; and four young men that accompanied their families gardening when they were children.

accepted names for peanut varieties. Nevertheless, a small proportion of the informants showed in-depth knowledge, and a few individuals were outstanding in their knowledge. However, the other half did not reach such consensus, exhibiting a remarkably low knowledge about the names of peanut varieties. The existence of these two groups of individuals shows an uneven distribution of knowledge within the Kaiabi society.

Results showed that the main differences regarding the knowledge about the names for peanut varieties for both groups of informants were due to membership in specific nuclear families and whether individuals were still practicing the selection of new peanut varieties. There is no apparent pattern for differences among nuclear families. Data suggest that such differences were linked to experience with the crop, and to the practice of identifying new peanut varieties.

For those included in the consensus analysis, gender was also important as female informants exhibited better knowledge than males. I expected these results, as they are in agreement with claims that women know more crop varieties due to their deeper involvement in agriculture (FAO, 2000a,b; Howard, 2003). In the Kaiabi case, although male farmers usually work on preparing and caring for the fields, females are more exposed to crop varieties through their involvement in key stages of agriculture such as selection, sowing and, harvesting. This pattern reflects gender relations for the division of responsibilities in agriculture (Zimmerer, 1996; Oakley and Momsen, 2005; Pfeiffer and Butz, 2005). On the other hand, those who performed more poorly in the knowledge test (and who were hence, excluded from the consensus analysis) did not show differences concerning gender. In addition, for all individuals interviewed, subgroups of individuals related to adult age status and age category showed differences in knowledge about the names for peanut varieties. However, differences influenced by age were less remarkable for informants included in the consensus analysis, accounting for only a small proportion of the total variation within these subgroups. Nevertheless, as expected the findings indicate that females held more knowledge than male informants, and elders more than youngsters.

Classification of individuals according to other subgroups also showed significant but weak differences in means for cultural competence scores and knowledge indexes. Both groups included and excluded from consensus analysis, area of origin of individuals was one of the variables marginally significant. Although biased by age, such differences point to the importance of Kaiabi history and families' movements to accommodate their needs in times of substantial changes in their lives. Furthermore, it also reflects the relevance of inter-ethnic interactions and particularities of the life history of individuals for agrodiversity management (Heckler and Zent, 2008).

For informants included in the consensus analysis, those not working paid jobs performed better in the knowledge test. However, such differences in performance between categories within this subgroup were only marginally explained. Nevertheless, this finding is consistent with evidence from outside the Brazilian Amazon suggesting that engagement in activities that detracts from time interacting with plants causes individuals to exhibit less knowledge about them (Zimmerer, 1996; Salick, 1997). Other subgroups showed weak differences for peanut management practices: seed management systems, whether an individual had previous experience with peanut cultivation, whether they cultivated a peanut field in 2006, and whether respondents had participated in at least one event in the past for selecting new peanut varieties. Altogether, these subgroups are related to the intensity of contact people enjoy with plants. Therefore, I expected to find stronger differences.

Yet, for informants excluded from consensus analysis, the subgroup focusing on whether individuals were political leaders also contributed to elucidate the behavior of respondents. As explained above, I expected that non leaders would have more time to dedicate to agriculture. However, the results suggest that Kaiabi leaders were able to retain knowledge about the names of varieties, despite the fact that many of them were not cultivating peanuts in recent years. Indeed, as expected, individuals that had no past experience with selection of new peanut varieties and their cultivation showed less knowledge than those who participated in such activities.

The distribution of knowledge about specific peanut varieties

Despite the wealth of information it provides, ki is an aggregated index that does not provide information about specific peanut varieties. Therefore, in addition to the group of Kaiabi respondents that were included in the consensus analysis, I used the proportion of informants that correctly named each variety in the knowledge test to examine the distribution of knowledge about each peanut variety. For this, I computed their answers both individually and by aggregating data for sub-groups of individuals (Table 5-12 through Table 5-14 and figures 5-2 through Figure 5-6).

With regard to the distribution of knowledge about specific varieties, a general picture emerged from the results despite occasional discrepancies according to subgroups of individuals. The better known variety for most individuals from different subgroups was munuwi py'wi, followed by *m. ayjsing*. Next, *murunu*, *m. takapeun*, and *m. ayjsingĩ* were correctly named by a relatively high proportion of informants. Following, comes a set of varieties composed of *m. wyraunai*, *m. tapy'yjã'yt*, and *m. emyamuku*. The final group of varieties reached with the lowest proportions of informants providing correct names include *m. teikwarapypepirangĩ*, *m. teikwarapypepytangĩ*, *m. jakareape'i*, *m. wyrauna m. ayjmirangĩ*, *m. ayjgwasiat*, *m. myãpe'ĩ*, and *m. takapesingĩ*. Interestingly, among respondents excluded from the consensus analysis, no individual provided the correct name for *m. takapesingĩ uu*. The last two varieties are morphologically similar, which might have accounted for at least part of the reason that incorrect names were provided for them.

For most peanut varieties, these results are consistent with the findings from the consensus analysis, which pointed to the cultural agreement upon the names for the peanut varieties. Nonetheless, three varieties deserve attention: *m. wyraunai*, *m. ayjmirangĩ*, and *m. ayjgwasiat*. *M. wyraunai* appears with a lower weighted frequency in the consensus analysis because of its synonymous name, *m. uni*. When computing the correct answers for the knowledge test, I did not make such a distinction because both names are considered to be correct. Therefore, this variety should exhibit a relatively high level of knowledge among the better known varieties for both groups of informants, included and excluded from the consensus analysis. On the other hand, for the last group, the proportion of individuals providing the correct name for the varieties *m. ayjmirangĩ* and *m. ayjgwasiat* (respectively 3.6 and 2.2%) fell well below the weighted frequencies in the consensus test (respectively 102 and 98%). In other words, these varieties were relatively well known, with fairly good cultural agreement upon their names among informants of the first group, but very poorly known by respondents excluded from the consensus analysis.

As expected, the proportion of correctly named peanut varieties increased from the individual level through nuclear families, expanded families, and villages (Table 5-12). Accordingly, the proportion of members of these subgroups who did not provide the correct name for any variety varied in reverse direction. About 24% of individual informants and 5% of the nuclear families did not provide the correct name for any variety, while at least one member of a given expanded family or village obtained an index above zero. These findings confirm that there is a repertoire of knowledge available within families and villages, but such knowledge is variety-specific. Moreover, the knowledge is unevenly distributed across age categories, generally increasing from youngsters to elders, and from men to women (Table 5-13 and Figure 5-2). Although the eldest respondents of both sexes included in this group of informants performed poorly (mainly females), together they accounted for only 4% of the total individuals, and their responses were influenced more by particularities of their life histories than by their age.

Regarding the area of origin of the informants, the data indicate that respondents excluded from the consensus analysis that had moved in from Kururuzinho obtained higher ki for a limited number of peanut varieties (Table 5-14). Following, those that came from Tatuy reached lower ki but knew the names for a greater number of varieties than those that came from Kururuzinho. Respondents originated from Xingu and Teles Pires reached lower proportions of correctly named varieties. However, although presenting low proportions for most varieties, informants from Xingu (comprising the larger population within this group), knew the name for the greatest number of varieties among people from the four areas of origins. In turn, those from Teles Pires, including elders who spent many years living outside the villages, knew the correct name for only four varieties. Moreover, while there was a balance between elders and youngsters that moved in from Tatuy, none of the current youth living in Xingu Park came from Teles Pires, in contrast to the elevated number of young Kaiabi adults that were born in Xingu. Most individuals that came from Kururuzinho were elders. Again, a combination of age and life history play an important role here.

A higher proportion of political leaders knew more names for the varieties than the non leaders (Figure 5-3). All of these leaders were male, mostly elders (67%), but only two were eldest men (*iymani*), 56% had a paid job, and 28% came from outside Xingu. My interpretation is that other motivations than their occupation focus pushes the leaders to keep crop variety knowledge.

Both informants with previous experience cultivating peanuts and those who had participated in events for identifying new peanut varieties in the past presented higher proportions of correctly named varieties (figures 5-4 and 5-5). Furthermore, respondents who claimed to still perform the selection of new peanut varieties in 2006 reached proportions conspicuously higher than any other category among subgroups of individuals excluded from the consensus analysis (figure 5-6).

Overall, analyzing the distribution of knowledge about specific peanut varieties based on subgroups of individuals yielded results in general concordance with the findings of the consensus analysis. This finding strengthens the former conclusion that indicated a cultural agreement upon the names of the peanut varieties within Kaiabi society. Nevertheless, it is clear that knowledge about the names for peanut varieties was not homogenously distributed across subgroups of Kaiabi individuals. There is a gradient of knowledge regarding the names for peanut varieties, which varies from those best known by most Kaiabi individuals through an intermediary group to a set of least known varieties.

Kwaryja Village: Knowledge about the Names for Peanut Varieties

Cultural consensus and knowledge indexes

For Kwaryja village residents, I added one less common traditional peanut variety and 11 newly-created varieties to the 17 traditional varieties surveyed in other villages. The test of knowledge about names for these varieties resulted in a list of 63 unique names given to the 12 traditional varieties. Including those repeated for more than one variety, a total of 96 names was associated with the varieties, each of which received between 2 and 12 names (Table 5-15; Appendix G).

I ran the consensus test with the same approach applied for the respondents in all villages. However, here I studied the presence of missing data separately for the traditional and for the newly-created peanut varieties. First, I eliminated from the dataset two newly-created varieties (*m. jakareape ayjun* and *m. wyraunajup*), for which more than 15 informants (out of 27, or 56 %) presented missing data. Then, while keeping the same threshold of eight (47%) missing data for each informant for the traditional varieties, I pulled the individuals with more than 50% of missing data for the new varieties out of the dataset. At the end, a total of 14 respondents were selected. The final matrix included nine new varieties for which between zero and 29% of the informants presented missing data, and individuals with zero to 50% of the total number of varieties exhibited missing data. For the 18 traditional varieties, these figures varied respectively from zero to 21%; and from zero to 41%. Pooling together all the 27 selected varieties, I found a range of missing data for each individual from zero to 37%. After recoding the original matrix with unique numbers for the names into a binary matrix (1/0) according to the names considered correct by elders and the shaman, I ran a reliability test for the instrument. The alpha coefficient is 0.932, confirming the adequacy of the instrument. Next, I ran consensus analysis on the 27x14 matrix with the coded names. The data fit well with Cultural Consensus Theory, based on the large eigenvalues ratio (7.224/0.701=10.304) and the lack of negative cultural competence scores. The average competence score was 0.6861[3]. Table 5-16 shows descriptive statistics for

[3] Weller (2007) estimated that the proportion of items correctly classified at .999 confidence level for a cultural competence of 0.70 is .95 for 10 respondents and .99 for 16. My final sample size for Kwaryja village was 14 and the average competency is 0.69, falling close to the suggested values. Hence, the answers I obtained have a high accuracy.

individuals' cultural competence scores and for the three knowledge indexes (for all varieties, ki_kwa_all; the traditional ones, ki_kwa_trad; and the newly-created ones, ki_kwa_new) for Kwaryja village residents. Appendix J lists the data for individuals. Correlation coefficients between the cultural competence scores and the three knowledge indexes (ki_kwa_all, ki_kwa_trad, and ki_kwa_new) are presented in Table 5-17. All correlations are significant at the 0.01 level. The cultural competence scores correlate well with each of the knowledge indexes. The same applies to the correlation between each pair of knowledge indexes (for all varieties, for the traditional ones, and for the newly-created ones).

Table 5-18 shows data on peanut variety names that informants culturally agreed upon, along with count and weighted frequencies and the proportion of missing data for each variety. Three varieties received a consensus name distinct from the one considered to be the correct by the elders and the shaman, one traditional and two new varieties. No synonyms surfaced. The name for the traditional variety called *m. ayjmirangĩ* reached a consensus at a weighted frequency of 4.94%. However, according to previous information from Tuiarajup, its name is *m. siãeko'i*. This variety exhibits a distinct shell and a variegated red and white color pattern, distinguishing it from *m. ayjmirangĩ*, which exhibits a full red testa color. The names for the two newly-created varieties on which the respondents agreed are *m. teikwarapypepytangĩ* and *m. wyrauna*, with weighted frequencies of 7.41% and 5.71%, respectively. I learned previously that their names were *m. ju'wi* and *m. py'wi uni*. The first pair of names upon which respondents agreed refers to varieties morphologically very similar (*m. teikwarapypepytangĩ* and *m. ju'wi*), which might have led people to confuse them. The second pair of varieties has the same color, but *m. py'wi uni* is conspicuously smaller and the shell is distinct from the *m. wyrauna*. For these three varieties, it seems that informants who agreed upon their names provided the name of a variety that most closely resembled the sample varieties offered in the test. Remarkably, these varieties reached relatively low consensus, being positioned close to the bottom of the rank of the weighted frequencies.

The first eight varieties upon which people agreed the most about their names were traditional ones. Again, *munuwi py'wi* was the best known, along with *m. tapy'yjã'yt*, both with a weighted frequency of 14%. Following, *m. ayjgwasiat*, *m. takapeun*, *m. ayjsingĩ*, and *m. takapesingĩ* showed weighted frequencies between 13.19% and 13.75%. Next, a group comprised by *m. ayjsing*, *m. teikwarapypepirangĩ* and *m. emyamuku* showed weighted frequencies around 12.5%. With a frequency of 12.34%, the first newly-created peanut variety occupying the ninth position in the rank was *m. py'wi uu*, which is very similar to *m. py'wi* except for the size of the seeds, which are conspicuously larger. Still among the traditional varieties, *m. jakareape'i*, *m. ayjmirangĩ*, *m. wyrauna*, *murunu*, *m. teikwarapypepytangĩ*, and *m. myãpe'ĩ* reached agreement upon their names with weighted frequencies between 11.81 and 10.37%. On the other hand, apart from *m. takapesingĩ uu* (8.29%), *munuwi uni* (7.11%), and *m. ayjmirangĩ* (*m. siãeko'i*, with 5.71%), all the other names upon which farmers agreed the least refer to new varieties: *m. ju'wi* (*m. teikwarapypepirangĩ*), *m. wyrauna* (*py'wi uni*), *m. jakareape ayjmirang*, *m. tapy'yjãyrii*, and *m. jakareape ayjpinimĩ*, with weighted frequencies ranging from 7.41% to 3.73%.

While respondents agreed upon the names for *m. ayjsingĩ*, *m. takapeun*, *m. ayjgwasiat*, *m. teikwarapypepirangĩ*, *m. jakareape'i*, *m. teikwarapypepytangĩ*, and *m. uni* (wyraunai) in a relatively similar level of weighted frequencies for each variety in Kwaryja and elsewhere, there are also sharp differences on the agreement for other varieties. Although *m. tapy'yjã'yt*, *m. wyrauna*, *m. myãpe'ĩ*, and *m. takapesingĩ* are moderately well known in Kwaryja, there is lower agreement upon the name for these varieties elsewhere. The opposite occurs with the varieties *m. ayjsing*, *m. ayjmirangĩ*, *murunu*, and *m. emyamuku*, which reached better agreement outside Kwaryja village. Finally, *m. takapesingĩ uu* is a variety for whose name the Kaiabi farmers showed a low consensus in Kwaryja and elsewhere.

Variations within subgroups of individuals

No subgroup of individuals showed differences in means for cultural competence scores, with one exception. Individuals that cultivated a peanut field in 2006 showed a higher mean (η^2=0.28) than those who did not (Tables 5-19 and 5-20). However, within this subgroup a low score was presented by a young woman that grew up in Kururuzinho, Pará, married to a Kwaryja resident. When she was pulled out from the analysis, the difference in the means turned out to be non-significant. I expected these results because Kwaryja is a small village where all residents are involved in the initiative for peanut diversity recovery. Among those who did not have a field in 2006 were the Jepepyri widow, a young woman that came from Kururuzinho and her husband, a school teacher, that never cultivated a peanut field of their own, as well as two other young women experienced with peanut cultivation. One of these women and the teacher were deeply involved in the effort of the agrodiversity revival in the village and obtained competence scores above the mean. However, their performance was balanced by the low scores obtained by other informants, which pushed down the mean for this category, leading to the difference between means when compared to those who had a peanut field in 2006. Yet noteworthy, the condition of being a political leader had no direct relationship with the knowledge of peanut varieties. In fact, those who are currently leaders are deeply involved in the activities of recovering and re-creating peanut diversity. The most striking case is of Tuiarajup, who developed his skills as a farmer while improving his political abilities. Simultaneously, he developed his shamanic knowledge, which is inextricably associated with his devotion to crop diversity management. However, he is not the only one to hold great knowledge about the names for peanut varieties. Other Kwaryja residents, mostly women, have solid knowledge about varieties names. As non-shamans included in the consensus analysis, their knowledge indexes were leveled when pooled together with other respondents knowledgeable in the matter.

Similarly to the whole set of Kaiabi informants, about 50% (13 out of 27) of the Kwaryja residents were excluded from the consensus analysis. Again, I used the means for the three knowledge indexes to explore differences among subgroups involving these respondents. Informants excluded from the consensus analysis reached an average ki_kwa_all of 0.2593 (SD=0.1627), with a maximum value of 0.6667 and a minimum value of 0.0370; the mean value for ki_kwa_trad was 0.2394 (SD=0.2394), with a maximum value of 0.9412 and a minimum of 0.0588; and ki_kwa_new reached a mean of 0.0692 (SD=0.0751), with a maximum value of 0.2000 and a minimum value of 0.0000. Such variation within the three indexes suggests that the knowledge about the names for peanut varieties is not uniformly distributed among Kaiabi informants that were not included in the consensus analysis.

For all 27 varieties pooled together, expressed by the index ki_kwa_all, I found statistical differences for age status ($\eta 2$=0.51), gender ($\eta 2$=0.30), and whether the informants still perform the identification of new peanut varieties ($\eta 2$=0.30, tables 5-21 and 5-22). Considering only the traditional varieties (tables 5-23 and 5-24), in addition to these three subgroups (which yielded respectively $\eta 2$=0.51, 0.36, and 0.34), Kaiabi age categories ($\eta 2$=0.68) also showed differences for the mean knowledge index (ki_kwa_trad). Finally, for the index accounting exclusively for the new varieties (ki_kwa_new, tables 5-25 and 5-26), only the subgroup based on engagement in paid job presented statistical difference for the means ($\eta 2$=0.28). However, only one young man was receiving money from a paid job within those excluded from the consensus analysis.

Although he provided the correct name for only two new peanut varieties, all informants who were not engaged in a paid job correctly identified between one and no varieties in the knowledge test, causing their mean to be statistically lower than his index.

When considering only traditional varieties and the 27 varieties altogether, female informants showed higher means than male, as did elders compared to youngsters. When disaggregating the information by age categories, only the knowledge about traditional varieties showed difference for the means. One elder and two middle aged females presented equally the highest means, followed by one middle-aged male. Then three young females showed mean ki_kwa_new higher than five young males, whose mean in turn was higher than the only very young male. As to whether the informants still perform the identification of new peanut varieties, all six informants who were not involved in the practice in 2006 were young men that obtained low values for the knowledge test. Although they worked in preparing peanut fields in the village, these informants neither participated in harvesting nor in shelling, when new peanut varieties are usually identified, despite sowing some peanut plots along with their families. Such gendered division of work according to phases of the cropping system points to the reduced contact of young males with crop varieties in general, which explains their poor performance in the test.

There is good agreement upon the name for peanut varieties among Kwaryja residents. I found no differences between nuclear and expanded families, showing that the knowledge is fairly spread throughout the village. Nevertheless, most differences between means among subgroups pointed to a distinction concerning the knowledge about traditional and newly-created peanut varieties. Differences on knowledge about names for newly-created varieties also influenced the outcomes when computing all varieties together.

Two subgroups of individuals were remarkably different with regard to knowledge of the names for traditional varieties: age status and participation in events for selecting new peanut varieties. In conforming to the findings for the respondents of all villages, it is safe to assert that among the residents of Kwaryja village elders know the names for traditional peanut varieties better than youngsters. In addition, data about age categories suggest that female and elders might know the traditional varieties better than male and youngsters. Similarly, informants still performing the identification of new varieties showed better knowledge about the names for the varieties in general. Despite the great dedication of Tuiarajup to teaching the names for newly-created peanut varieties, the data also showed that there is uniformly poor knowledge about them for virtually all subgroups in Kwaryja, and for most informants from other villages in Xingu Park.

Geography of Peanut Varieties

Not all Kaiabi farmers cultivate peanut fields every year. Regardless of whether or not they cultivate a peanut field in a given year, some farmers saved seeds for planting the next cropping season. For the purpose of this section, I included five farmers that had saved peanut seeds along with those who had a peanut field in the 2006 cropping season.

Thirty six out of 143 (25%) Kaiabi NF, all of them composed by youngsters, had never cultivated a peanut field on their own. For the 2006 cropping season, about 43% of all nuclear families held peanut varieties under cultivation or had saved seeds, of which two thirds were composed by elders. Nine expanded families (EF) did not have either a peanut field or saved seeds in 2006, and only one village did not grow peanuts (which is headed by a couple mixing a Kaiabi man and a Kĩsẽdjẽ woman).

Kaiabi farmers cultivating peanuts present varying levels of varietal diversity. For examining this issue I looked at the distribution of peanut varieties under cultivation in 2006 by nuclear family (NF), and by subgroups of individuals. First I present data about the 17 varieties included in the knowledge test, discuss an additional three traditional varieties not included in the samples for the survey, and examine data for newly-created varieties. Finally, I discuss traditional and newly-created varieties altogether.

Traditional Varieties

First, I used the results of the survey of traditional varieties carried out in all villages of Xingu Park to build a binary matrix to indicate whether each nuclear family had each specific peanut variety in their fields. Then I ran a reliability test, obtaining an alpha coefficient of 0.754, which confirmed the suitability of this statistical tool. Then, I examined the overall distribution of peanut diversity for differences within subgroups of individuals by comparing means for the total number of varieties under cultivation by NF. Finally, I identified differences in the distribution of specific traditional peanut varieties by comparing the means for the presence of each variety within subgroups of individuals.

The proportions of peanut varieties cultivated in 2006 showed an increase from nuclear families (7 to 70%) to expanded families (3 to 79%) to villages (19 to 90%) for all but one variety (Table 5-27). The exception, *m. myãpe'ĩ*, is a variety that was under cultivation by eleven NF (18%) belonging to nine different expanded families (31%) distributed among six villages (29%). *M. py'wi* was the most commonly cultivated variety, followed by *m. jakareape'i* and *m. ayjmirangĩ.* A second group of popular varieties included *m. emyamuku*, *m. takapesingĩ*, *m. takapeun*, *m. wyraunai*, and *m. ayjsingĩ.* A third group of moderately common varieties comprised *m. teikwarapypepirangĩ*, *m. tapy'yjã'yt*, *m. teikwarapypepytangĩ*, *m. wyrauna*, and *m. ayjgwasiat*. A set of less common varieties, which included *m. ayjsing*, *m. myãpe'ĩ*, *m. takapesingĩ uu* and *murunu*, were under cultivation by less than 20% of NF and therefore met my criterion for being considered rare.

Among subgroups of individuals, only expanded families ($\eta2=0.64$), village of residence ($\eta2=0.47$), and seed management system ($\eta2=0.26$) showed statistically significant differences in relation to the means for the total number of varieties under cultivation by nuclear families (Table 5-28). In addition, the means for farmers who were able to save seeds also showed differences in relation to those who had a peanut field in 2006 ($\eta2=0.05$, Table 5-29).

Comparing the means for the presence of each variety within these subgroups of individuals (Table 5-30), I found significant differences among expanded families in the distribution of five peanut varieties, which included the common varieties *m. takapeun*, *m. wyrauna*, *m. emyamuku* and the rarer varieties *m. myãpe'ĩ*, and *murunu*. For the villages, four common and two rare varieties presented statistical differences associated with their presence in the fields: *ayjgwasiat*, *m. takapesingĩ*, *m. emyamuku*, *m. wyrauna*, *m. myãpe'ĩ* and *murunu*. The first two varieties were concentrated in only one field belonging to one EF, and four out of five members of an expanded family were cultivating *murunu* in three villages. The only variety that statistically differed between those who had saved seeds and farmers cultivating a peanut field in 2006 was *m. py'wi*, which was kept in gardens of 75% of NF while only one farmer (20%) had saved its seeds.

No nuclear families, expanded families, or villages were cultivating all traditional peanut varieties included in the survey (Table 5-31). The average number of varieties cultivated by NF was 5.3 (+- 3.38) with a range of one to fourteen varieties (table 5-32). For expanded families the average was 7.41 (+- 4.54) with a range of one to fifteen varieties. Villages reached an average of 8.43 (+- 4.40) unique peanut varieties, varying from one to sixteen (Figure 5-7). The average number of traditional peanut varieties cultivated by farmers was statistically significant when comparing all nuclear and expanded families, and when comparing all nuclear families and villages, in all places studied (Table 5-33). However, no difference was found when comparing the number of varieties held by farmers grouped by expanded families and villages.

In Capivara village one EF was cultivating 16 varieties, and another in Kwaryja had 15 varieties. Two other EF (from Ipore and Sobradinho) had 14 varieties, and an EF from B. Alto had 13 varieties in its fields. Four EF were cultivating between 11 (from Três Buritis /Diauarum) and ten (from Kwaryja, Iguaçu and Muitara) peanut varieties. Three EF from Diauarum, Caiçara / Diauarum, and Kwaryja had nine varieties. An EF from Ilha Grande had eight varieties in its fields, and another EF (from Samauma/Diauarum/Tuiarare) was cultivating seven varieties. Four EF had six (Diauarum/Itai, Paranaita, Três Patos, and Três Irmãos), and one EF from Capivara had five varieties under cultivation. Four EF (from Maraka Novo, Capivara, Tuiarare and Diauarum) held four varieties. Finally, in the lower extreme, one EF (Capivara) was cultivating three varieties, three others (all from Capivara) had two varieties, and another two EF (Pequizal and Tuiarare) had only one variety under cultivation each.

Kwaryja and Capivara villages held 16 varieties under cultivation each, Sobradinho village was cultivating 14 varieties, followed by Barranco Alto, Ipore and Diauarum villages, which were cultivating between 12 and 13 varieties. Next, a group of four villages, Iguaçu, Muitara, Caiçara, and Três Buritis, cultivated between 10 and 9 varieties while, Ilha Grande, Mupada, Paranaita, Três Irmãos, Três Patos, and Tuiarare had between 8 and 6 varieties under cultivation. Two villages, Maraka Novo and Itai cultivated four and five varieties, respectively, while Fazenda Kaiabi cultivated three varieties. Finally, Pequizal and Samauma villages were cultivating only one of the researched varieties.

Figure 5-8 show the number of unique varieties under cultivation by a given number of nuclear families. Only one nuclear family (NF), which was comprised of elders from Capivara village, was cultivating 14 (82%) surveyed peanut varieties. Two NF composed of young adults from Kwaryja and B Alto had 13 (76%) unique varieties in their fields, while three elder and one young NF had ten (59%) varieties under cultivation. Seven NF, all composed of elders, had nine (53%) varieties under cultivation. Between two and four NF were cultivating from eight to six (47-35%) peanut varieties, and eight NF were cultivating five (29%) varieties in their fields. Both groups were predominantly comprised of elders. Finally, a concentration of NF, composed mainly of elders, was cultivating a lower number of peanut varieties, which included two sets of five NF families cultivating one and four (24% and 6%) varieties respectively, seven NF cultivating three varieties (18%) varieties and twelve NF cultivating two (12%) peanut varieties.

Despite the differences indicated by these results, most specific peanut varieties presented a similar pattern for their distribution among nuclear and expanded families, and villages (table 5-30). While some varieties were quite common, such as *m. py'wi*, *m. jakareape'i* and *m. ayjmirangĩ*, others like *m. ayjsing* and *m. myãpe'ĩ* were rare, with an intermediary group. More than half of the total number of varieties was under cultivation in ten villages (about 50%), which corresponds to 41% of those EF cultivating peanuts in 2006 (a third of the total EF) and only 13 NF (21%) cultivating peanuts in 2006, of which 18% were constituted by elders. The total number of NF cultivating peanuts represents less than 10% of all Kaiabi NF.

Important implications for crop diversity management stem from these findings. First, the results point to keepers concentrating peanut diversity, mostly in elders' fields belonging to distinct expanded families and living at different places, such as cultivators in Capivara, Kwaryja, and Barranco Alto. Also, the fact that some varieties are unevenly distributed among fields of NF belonging to a same expanded family reveals a strategic complementarity for the supply of different varieties by distinct nuclear families. For small villages, peanut diversity is managed by all family members. For larger villages composed by older, more independent NF, decisions about peanut diversity management lie somewhere in between EF and NF. While NF have freedom (and the required knowledge) to choose what varieties they want to cultivate, elders from the EF usually participate in their decision making process. In this context, the distribution of varieties under cultivation either shared or in fields belonging exclusively to elders and youngster is also designed to meet ecological and social criteria. For example, the area planted to a unique variety may be increased while coping with risks for the production through dispersion of the production in distinct fields, thereby increasing the availability of specific varieties related to culinary tastes. Also, the sense of ethnic identity is strengthened, and diversified fields contribute to the maintenance of social prestige of families that cultivate peanuts. Finally, these practices encourage the transmission of knowledge about varieties.

Variation according to local interests leads to specific strategies for peanut diversity management applied by nuclear and expanded families within the same village. Although six varieties were not equally distributed among villages, it is clear that in most villages seeds of peanut varieties were available for exchange in cases when they were sought for cultivation by other farmers. However, it is noteworthy that Kaiabi farmers did not always rely on other families living in the same village or on their own expanded family to provide seeds. For example, in Capivara, a village composed of several expanded families, one family constituted by an elder couple was cultivating 14 peanut varieties in 2006, therefore forming a source for most of the 16 varieties his expanded family held. In a visit to the village several months before conducting this survey, residents told me that they were cultivating few peanut fields because there were no seeds available in the village and that they would furthermore need to request some varieties from Kwaryja.

Beyond family and village limits, the distribution of peanut varieties is linked to the way the crop production is organized, as reflected by differences found across seed management systems[4]. Seed management systems represent an abstract categorization of agricultural practices that allows for analysis of famers' decisions. Therefore, farmers composing each SMS operate independently. Hence, SMS are not strictly comparable with grouping farmers according to affiliation to family and place, nor are specific varieties bound to any SMS. Nevertheless, it is possible to perform a general appraisal of SMS to make predictions about farmers' strategies for crop diversity management.

To analyze seed management systems (SMS), I took into account the proportion of peanut varieties under cultivation by nuclear families in 2006 while looking at what families were composing each system[5] (Table 5-34). However, EF living in different places may be classified within the same management systems; thus when its members were not cultivating a field in one place, others could be growing peanuts in another location. Although most peanut varieties were present across management systems, these findings show a noteworthy level of variation in the distribution of varieties in fields belonging to different families.

The data also allowed for estimating the overall peanut diversity for each system. For the 2006 cropping season, system B/D (involving a single expanded family) held the highest proportion (71%) of nuclear families cultivating a peanut field, followed by systems A/B (four EF) and Ba (six EF), which represented a similar proportion (about 65%) of the NF cultivating a peanut field. Next, system D (with three EF, 54% of the NF), and finally systems A (three EF, 43% of the NF), Bb (with 14 EF and 31% of the NF), and C (three EF, 19% of the NF) held the lowest proportions of nuclear families cultivating peanuts.

---

[4] A full discussion of the Kaiabi seed management systems can be found in chapter 4.
[5] The two EF not cultivating peanuts in 2006 were located in Onze (system A) and Tuiarare (system Bb) villages.

No seed management system included all varieties in 2006. The average number of peanut varieties cultivated within each SMS was 15.29 (+- 0.95), ranging from 14 to 16 varieties. Five individual peanut varieties showed significant differences concerning their presence in the fields of distinct systems: *m. takapesingĩ*, *m. wyraunai*, *m. emyamuku*, *m. wyrauna*, and *m. ayjmirangĩ*. The varieties most evenly distributed across NF fields were *m. py'wi*, *m. jakareape'i*, and *m. ayjmirangĩ*, while the least dispersed ones were the common *m. ayjsingĩ* and the rare *m. myãpe'ĩ*, *murunu* and *m. takapesingĩ uu*. Systems A, Ba, Bb and D were not cultivating one variety each. Systems A and Ba were not cultivating *m. tapy'yjã'yt* and *m. takapesingĩ uu*, respectively, while systems Bb and D did not cultivate *murunu*. Two varieties were not present in system A/B's fields: *m. takapesingĩ uu* and *m. myãpe'ĩ*. Systems B/D and C lacked three varieties each, with *murunu* absent in both, along with *m. myãpe'ĩ* and *m. wyrauna* lacking in the former and *m. takapesingĩ uu* and *m. ayjsingĩ* lacking in the latter system

System C, where only one NF is appointed the responsibility of peanut production for the village and where the work force comes from other EF members, presented a higher dispersion of peanut varieties in NF fields. Systems A and D showed a moderately high distribution of peanut diversity among nuclear families. However, while system A showed a fairly even distribution of eight peanut varieties, others were concentrated in only one field. This system is characterized by small villages in which most agricultural work is done through collaboration of the members of the expanded family, usually composed of children and/or young couples and involving only one peanut field. Seeds are managed under the guidance of elders. System D is performed only in Kwaryja village, currently in fields belonging to different NF. It involves the re-creation of peanut varieties and the multiplication of rare ones under the guidance of the shaman. Systems A/B and B/D showed an intermediate level for diversity concentration. System

A/B includes villages in which peanuts are cultivated mainly in shared fields by more independent nuclear families. Heads of nuclear families take decisions about peanut seed management along with elder members of the EF. System B/D shows an intermediate scenario between systems Bb and D. Systems Ba and Bb exhibited the most uneven distribution of varieties in NF fields. System Ba is composed by more independent, older nuclear families. Peanut may be cultivated in shared fields or NF may have separate fields. Although some NF might keep peanut varieties that are not cultivated by all the members of the expanded family, others do not cultivate peanuts regularly. System Bb, present in larger villages, mixes elements from systems A and Ba, and is composed of a greater number of expanded families that may work independently as common in small villages.

Finally, other subgroups of individuals showed statistical difference for the distribution of specific peanut varieties in the fields. Although there were no differences for the distribution of any variety between elders and youngsters, one variety, *m. jakareape'i*, showed differences among male age categories: 81% of the *iymani* (elders) were cultivating the variety against 23% of the *iywyruu* (middle aged) and 68% of the *kunumiuu* (youth). These results give strength to the assertion that the distribution of each specific peanut variety across fields of farmers at different ages is fairly similar. Regarding the occupation of at least one of the components of the nuclear families, among those who are shaman two peanut varieties were statistically differentiated. *M. py'wi* was under cultivation by all six shamans who had a peanut field in 2006 whereas 67% of the non-shaman farmers cultivated this variety. *M. teikwarapypepirangĩ* showed a reverse situation as no shamans kept the variety compared to 33% of the non-shamans that cultivated it. For those engaged in paid jobs, *m. ayjgwasiat* and *m. myãpe'ĩ* were the only two varieties showing significantly different proportions. Contrary to what I expected, in both cases families with paid workers held a greater proportion of these varieties, with 42 and 32% against 14 and 12%, respectively. Finally, for the only variety statistically differentiated, four of twenty two political leaders (18%) had *murunu* under cultivation, in contrast to none by the non-leaders. Regarding the area of origin, the only difference was found for *m. emyamuku*, which was not under cultivation by farmers from Kururuzinho but was present in 22% of the fields from those who came from Tatuy, 77% of NF from Teles Pires, and 39% from Xingu. Finally, I found a statistical difference between the 52% NF cultivating *m. ayjmirangĩ* that claimed to be aware about dangerous peanut varieties, in contrast to no farmers that were not aware.

Among nuclear families in which at least one of their members had participated in one or more events of identifying new peanut varieties, only one peanut variety, *m. jakareape'i*, was significantly different. The proportion of NF involved with this management practice that had the variety in their fields was 72% against 33% of those who did not. Regarding whether the farmers still perform the identification of new varieties, also only one rare variety showed a significant difference, *m. myãpe'ĩ*, which was under cultivation by 36% of those who still exercise the identification of new peanut varieties against 8% that do not perform the practice anymore.

Overall, the total number of traditional peanut varieties under cultivation by nuclear families was significantly different for subgroups of individuals related to expanded families, village of residence, and seed management system. Differences among families and places suggest that peanut diversity is available to circulate in exchange networks when required. However, Kaiabi farmers are not always willing to engage in such exchanges. In addition, differences in repertoire of varieties according to seed management systems reveal the influence of families upon the agricultural social work organization.

Proportions of specific peanut varieties under cultivation by farmers do not follow a systematic pattern across subgroups of individuals. I regard these differences as a product of the interplay of farmers' interest in crop diversity and personal choice based on taste and other cultural determinants. Also, to a lesser extent, it is dependent upon opportunity to obtain seeds. Altogether, these factors point to the distinction between those who are keepers of agrodiversity and regular farmers, both performing agriculture in the context of socio-cultural transformations the Kaiabi have been facing for at least the last one hundred years. This conclusion is concordant with evidence for manioc diversity in the Amazon (Emperaire, 2004), and from other crops elsewhere (Brush, 2004).

An exploratory longitudinal survey of traditional peanuts varieties: 2000 and 2006

A survey was taken in 2000[6] on peanut varieties that Kaiabi families held in their fields. However, three differences prevent a full comparison of data from 2000 and 2006. First, although both surveys included seventeen peanut varieties, the first one had three varieties[7] (*m. teikwarapypesingĩ*, m. *jakareape ete*, and *murunujũ*) that were not included in 2006, for reasons explained above. Second, in 2000 there were 37 Kaiabi expanded families living in Xingu Park, some of which opted for having the data collected by expanded families rather than nuclear families. No member of one EF was interviewed; about 40% of the NF were not surveyed, and not all interviewed NF were evenly distributed across EF. Expanded families interviewed as single units include Kwaryja residents (three EF in 2006), one family each from Capivara and the

[6] For details about this survey see the section on research methods in chapter 1.

[7] *M. jakareape ete* was not included in the survey because there was no seed available for the sample; mistakenly, two samples of *m. ayjsingĩ* were included as visual stimulus in the place of *m. teikwarapypesingĩ*, one of which was eliminated early during the interviews. As explained before, *murunujų* is a name for a peanut variety that has more than one meaning, but in general refers to a semi-spontaneous species associated with anthropogenic activity. Hence, Kiabi farmers mostly regard it as a no choice for their fields. In addition to these three varieties, *m. siãeko'i* was not included in the survey in all villages in 2006 because it was not considered to be a traditional variety at the time the survey was performed.

former Kururu village (now called Ipore) in which a middle aged man with unmarried children was interviewed together with his father-in-law and a family who lived in Diauarum and moved to another village. Hence, it is only possible to draw conclusions for 2000 at the aggregated level (EF). Third, the first survey relied on declarations made by the couples who were heads of nuclear or expanded families, instead of based on physical samples of the varieties as in the 2006 survey. Therefore, the results for specific varieties should be balanced because of variations Kaiabi individuals showed when applying names for peanut varieties. Overall, comparison of data between the two dates is possible but exploratory, and therefore should be examined with caution.

Thirty three Kaiabi EF (89%) were interviewed in 2000, of which 29 (88%) declared that they cultivated a peanut field in 2000. The proportion of families cultivating a given variety ranged from 100% to 3.45% (table 5-35). For 2006, the same number of EF was cultivating peanuts, and the proportions for specific varieties ranged from 79% to 3.45%.

Munuwi py'wi was declared to be present in fields belonging to all EF cultivating peanuts at that time, followed by *m. ayjmirangĩ* (79% of EF), and then a group comprised of *m. emyamuku* and *m. teikwarapypepirangĩ* (65%-62%), *m. myãpe'ĩ*, *m. uni*, *m. jakareape'i*, *m. takapeun*, *m. ayjsing*, and *m. tapy'yjã'yt* (52-41%). Then, a third group of varieties under cultivation by 34% to 27% EF was composed of *m. teikwarapypesingĩ*, *m. ayjgwasiat*, and *m. wyrauna*. Finally, m. *jakareape* ete and *murunu* were grown by 21% and 17% EF respectively while *murunujũ* was under cultivation by only one EF (3%). The proportion of EF cultivating each specific variety in 2006 was lower or equal to the corresponding proportion in 2000, except for three varieties (*m. jakareape'i*, *m. wyrauna*, and *m. ayjgwasiat*).

I found significant differences in the distribution of five peanut varieties among expanded families for 2000: *m. tapy'yjã'yt*, *m. ayjsing*, *murunu*, m. *jakareape* ete, and *murunujũ* (table 5-35). *Murunu* was the only variety showing different means in both dates. The other varieties presenting differences in 2006 were *m. takapeun*, *m. wyrauna*, *m. emyamuku*; and *m. myãpe'ĩ* (table 5-27).

For 2000, no EF held all seventeen varieties included in my study. On average, each EF had 7.79 (+_4.34) varieties under cultivation, with a range of 1 to 15. These numbers are very similar to those for 2006, when the mean was 7.41 (+- 4.54), varying from 1 to 16 varieties. Eleven EF had more than 50% of the varieties under cultivation, involving the villages Kwaryja, the former Kururu, Diauarum Post, Maraka, Tuiarare, Ilha Grande and Capivara. Twelve EF from Capivara, Tuiarare, Sobradinho, Barranco Alto, and Diauarum had between 20 and 50% of the varieties under cultivation. A group of six EF from Capivara, Diauarum, Itai, and Tuiarare held less than 20% of the varieties under cultivation. Finally, four EF were not cultivating peanuts (from Tuiarare, Diauarum, and Pequizal village).

Although exploratory in nature, the results of the survey suggest an overall decrease in peanut diversity held by expanded families from 2000 to 2006, which corroborates the narratives of elders. However, two points deserve a finer examination. First, not all families showed a decline in the peanut diversity that they maintained. As explained previously, although indigenous crop diversity may be dissimilarly affected by social, economic and cultural transformations reaching distinct places and environmental settings, other determinants also influence the maintenance of diversity. For example, a commitment to upholding the lessons of the ancestors, including attachment to traditional cuisine and connections with the supernatural world, is a primary factor influencing the maintenance of agrodiversity (Zimmerer, 1996; Valdez et al, 2004; van Etten, 2006). Furthermore, in agricultural terms, it emphasizes the existence of keepers of agrodiversity, despite the exposure to force of changes (Zimmerer, 1996; Rhoades and Nazarea, 1999; Brush, 2004). Second, changes in the composition of the repertoire of varieties over time indicate either an increase or decrease for the proportion in which specific varieties were being cultivated by EF. Therefore, the dynamic character of agrodiversity management is highlighted for both the Amazon (Emperaire, 2004), and elsewhere (Zimmerer, 1996; Brush, 2004). Nevertheless, a deeper study that provides better understanding about changes in crop diversity over time requires the systematic replication of the 2006 survey every five or ten years.

Newly-created Peanut Varieties and Additional Traditional Varieties

Besides the set of 17 peanut varieties included in the 2006 survey in all Kaiabi villages in Xingu Park, I also researched other peanut varieties potentially present in families' fields. This assessment involved two kinds of data: the cultivation of three less common traditional varieties[8] (*m. siãeko'i*, m. *jakareape* ete, and *m. teikwarapypesingĩ*) and all available information about newly-created varieties. During the survey, farmers were asked to indicate varieties they cultivated that were not included in the sample. Among the less common traditional varieties was *m. jakareape ete*, which was under cultivation in two fields in Caiçara village, one field in Tuiarare, and in a fourth field belonging to Arutari, son of Tuiarajup, in Kwaryja village. *M. siãeko'i* was under cultivation in Arutari's field, in addition to another one in Itai village. *M. teikwarapypesingĩ* was found in only one field in Kwaryja village, belonging to Aritu, son of Arupajup. In addition to these traditional varieties, one young farmer from Barranco Alto village cultivated a peanut variety from the city, which villagers called *munuwijũ*.

[8] See note 7 above for an explanation about theses varieties.

Because the three traditional varieties added were rare, their impact on the distribution of varieties among nuclear families, expanded families, and villages was locally circumscribed, and therefore did not alter the level of significance for the comparison of means (Tables 5-32 and 5-33). Moreover, in most places where these varieties were present, they were held in elders' fields. However, in Kwaryja these varieties were under cultivation exclusively in fields belonging to young NF. Hence, taking such varieties into account generated statistical differences for the set of twenty traditional varieties between youngsters within Kwaryja and young farmers living elsewhere in Xingu Park.

Previously I presented traditional and newly-created varieties under cultivation in Kwaryja village from 2002 through 2006 (Tables 4-8), which involve most varieties known by the Kaiabi. In addition to the varieties included in that inventory, two unnamed new varieties[9] were found in the fields of two expanded families in different villages, one created at Caiçara and another at Samauma villages. The last one was received as a gift by a couple living in Tuiarare. Except for these two varieties, all the remaining newly-created peanut varieties originated in Kwaryja village[10].

From the death of Jepepyri until the harvest of the crop in 2006, Tuiarajup was in charge of the main peanut area cultivated in the village. Although his brothers occasionally sowed a small peanut field for their own consumption, the systematic multiplication of peanut varieties was done in one large field under guidance of the shaman. However, for the 2006-2007 cropping season, Tuiarajup decided to return to the old system in which each family has its own fields. In doing so, each family established different strategies to manage peanut diversity. The varieties to

[9] During the survey, Kwaryja village received seeds from these varieties, to multiply them.

[10] Table 4-15 lists the names and destination for these varieties.

be sowed in each field were chosen by the elders of the respective expanded families. Tuiarajup's family cultivated three peanut fields (Table 4-10). One of the fields belonged to the headman, and a second one to his son, Arutari[11]. In these fields a set of 12 unique traditional varieties was sowed along with 13 non-overlapping new varieties. In addition, Wisi'o, the oldest wife of Tuiarajup, cultivated a third smaller field, which was exclusively sowed with 15 new varieties, to observe the development of the plants, and to multiply the seeds.

Arupajup's family, in turn, designed a different strategy to deal with his expanded family's peanut fields. Peanut varieties were distributed in his own field, another belonging to his son Aritu[12], and another three varieties belonging to his sons-in-law living in Kwaryja, all of them mixing traditional and new peanut varieties. Altogether, 16 traditional and 11 new unique varieties were sown in these fields. Finally, Parisum's family concentrated all the peanut production in one large field that received nine traditional and seven newly-created varieties.

There was a highly uneven distribution of new varieties in fields cultivated by NF and EF in distinct villages, with many varieties either under cultivation by less than 20% of NF or by only one farmer (Table 5-36). Therefore, all new varieties were considered to be rare. Average values for the number of new peanut varieties only present statistical significance when comparing subgroups of individuals (NF, EF, elders, youngsters) from Kwaryja with those from all remaining Kaiabi villages in Xingu Park (Table 5-33). Likewise, the inclusion of new varieties also influenced the statistical significance for the comparison of means involving all peanut varieties. There were differences for the diversity held by farmers aggregated by expanded families and village of residence in contrast to nuclear families in Kwaryja and

[11] It is noteworthy that, although Arutari was in couvade, he sowed some peanut varieties in his field, along with other members of his expanded family.

[12] One additional field belonging to another of Arupajup's sons was not sown because it did not burn well.

elsewhere. Also, I found differences between NF and EF, and elders and youngsters from Kwaryja compared to correspondent categories from the remaining Kaiabi villages in Xingu Park. However, there were no differences for the number of varieties under cultivation by elders and youngsters in all places, nor when comparing all farmers pooled together within expanded families and villages of residence.

These results are consistent with what I discussed previously, showing that peanut diversity is more commonly managed through interactions between expanded and nuclear families. Moreover, findings presented in this section suggest that peanut diversity is perceived and managed according to whether a particular variety is traditional or newly-created. Most families were no longer identifying new varieties, but cultivated them when they were available. However, as I demonstrated in Chapter 4 (Table 4-22), all newly-created peanut varieties involved in seed exchanges in 2006 were identified by their growers differently than those indicated by Tuiarajup[13]. Except for part of Kwaryja residents, such misnaming seems to not be a strong concern for the Kaiabi. Contrasting with the fairly homogenous perception about the names for traditional varieties, names for new varieties tend to be replaced by names for traditional varieties that resemble them the most. Therefore, the true identity of some new varieties under cultivation outside Kwaryja village remained unclear. Thus, such varieties tend to be treated as variations within traditional varieties rather than new ones, which farmers may keep in separate plots or mix with other seeds. Consequently, the perception of whether a peanut variety is traditional or newly-created, as well as the associated management practices, are not predetermined, and may vary across families, places, and over time. These complex naming

[13] Besides the wrong names for the newly created varieties, Table 4-22 also shows that traditional peanut varieties were misidentified in 9 out of 21 events involved in seed exchanges.

practices have sharp consequences for the genetic makeup of varieties, allowing for the existence of distinct biological materials under the same variety name (Brush, 2004; Sadiki et al, 2007).

On the other hand, data concerning the number of peanut varieties and their distribution in fields of nuclear and expanded families from Kwaryja village and elsewhere is accurate. Such information emphasizes the presence of a few families acting as keepers of peanut diversity while most regular farmers continue to grow a reduced number of varieties. Nevertheless, elders' narratives indicate that this situation is abnormal, and points to a waning interest in agrodiversity.

A final point refers to the role of the shaman regarding crop diversity management. Salick et al (1997) reported that the Amuesha Indians have a male shaman as the keeper of manioc diversity, despite the fact that the crop is managed mostly by women. In the case of the Kaiabi, the shaman has a great knowledge about peanut varieties, and based on his connections with the spiritual world directs the process of varietal selection and cultivation. His knowledge is similar to some elders of both sexes, and peanut varieties are dispersed throughout the fields of his expanded family. However, female farmers are more deeply involved in specific phases of the cropping system such as sowing, harvesting, and selection. Hence, they have the most contact with crop varieties, a factor that creates differences in knowledge of peanut diversity among genders. However, for nuclear families cultivating mostly traditional peanut varieties, differences based on the condition of being a shaman were not evident.

Also, because Tuiarajup is regarded as the greatest authority in matters related to peanut diversity management, other Kaiabi farmers tend to rely on him as a constant supplier of varieties. This would pose disincentives for others to maintain diversity because it could be accessed through exchange networks. The Kaiabi case is not unique (Elias et al, 2000; Brush, 2004). Conscious of this situation, the shaman fights this tendency by delivering seeds to families from other villages along with descriptions of their sacred origins, and by giving strict instructions on how the recipients should maintain them. I will return to this point later in this chapter.

Relationships between Popularity of Peanut Varieties in the Fields and Consensus On Their Names

My data do not allow for establishing a causal relationship between cultural agreement upon variety names and the proportions in which each variety was being cultivated by nuclear families in 2006. Nevertheless, it is possible to look at correlations between the distributions of both variables according to specific peanut varieties. Table 5-37 presents weighted frequencies (WFreq) from cultural agreement about the correct names for peanut varieties for residents from both all villages (Kwaryja included), and exclusively for Kwaryja[14] residents, and the proportions of families who were cultivating each traditional peanut variety in 2006 respectively, and the set of 27 traditional and new varieties altogether (%NFcultVar). One traditional variety and two newly-created ones were not under cultivation in Kwaryja village, of which *murunu* reached a weighted frequency for agreement upon its name of 10.73%, lower than the new variety *m. akapejup* (12.34%), which in turn contrasts remarkably with the other new varieties *m. jakareape ayjmirang* (4.84%), and *m. py'wi uni* (0%).

Traditional varieties under cultivation in all villages presented a correlation coefficient of $r^2_{WFreq\_\%NFcultVar}$= 0.582 (Pierce test, one tailed, significant at the 0.01 level), while for the traditional and new varieties cultivated in Kwaryja the coefficient was $r^2_{WFreq\_\%NFcultVar}$= 0.366 (Pierce test, one tailed, significant at the 0.10 level). These findings reveal two important aspects. First, although dissimilarities regarding knowledge about specific varieties do exist (as indicated

[14] Instead of using the names and corresponding weighted frequencies the informants agreed the most upon, I used weighted frequencies related to correct names for the less common peanut variety *m. siãeko'i*, and the newly created varieties *m. jakareape ayjmirang, m. ju'wi,* and *m. py'wi uni.*

by the weighted frequencies), the results demonstrate a positive association between the knowledge concerning the names for peanut varieties and their cultivation in Kaiabi fields. Second, the correlation was less strong when pooling together traditional and newly-created varieties in Kwaryja than when considering only traditional varieties cultivated in all the villages. Dissimilarities regarding the knowledge about the names for the less common traditional varieties and for the set of new peanut varieties for Kwaryja residents were more exacerbated.

However, conclusions based on these aggregated figures may be misleading. A quarter of the total nuclear families never cultivated a peanut field, for which youngsters accounted for 60%. In 2006, only about 40% of NF had a peanut field, a third of them comprised of youngsters. Although with one exception, all expanded families already cultivated a peanut field, and 75% of them had the crop under cultivation in 2006. In addition, about 60% of all EF were cultivating less than half of the total number of traditional varieties, corresponding to only 21% of NF cultivating peanuts in 2006. Therefore, although I found a positive correlation between agreement upon the names for peanut varieties and their presence in the fields, such data must be examined cautiously, with particular attention paid to differences among subgroups of individuals.

Knowledge Transmission Processes

A semi-quantitative survey

During the interviews for the knowledge tests, I asked Kaiabi individuals a set of questions about how and when they learned the names for the peanut varieties (Table 5-38). The vast majority of respondents (260; 91%) declared that for the most part they had learned the names at two main age intervals: 8-11 years old (28%) and 12-15 years old (25%). Disaggregating the data by age category showed that elders of both sexes and middle aged men learned at the early interval, while young and middle aged women learned at the later interval. Young men, however, learned the name of the varieties in equal proportion at 12-15 years and after this age (19% for each interval). Noteworthy, half of the very young men indicated they learned at the earlier interval and the other half claimed that they had never learned the names. Having completed a substantial part of the survey, a portion of the informants told me that they started to learn at a given age, but they felt confident in a later age. Thus, I explored the theme in subsequent interviews (n=76). Most respondents (55%) declared that they had learned at once, and this pattern was consistent across all age categories.

Regarding the opportunity in which people learn the name of the varieties, more than half of the respondents (52%) declared to have learned them when accompanying the family working in the fields. Caring for the garden and harvesting were the most important opportunities (19 and 16%, respectively). However, a great proportion of elder and middle aged women (respectively 38 and 24%) mentioned that they had learned during the operation of shelling peanuts just prior to the sowing time. In contrast, none of the young women indicated they had learned the name of the varieties when shelling, declaring instead that harvesting was the main opportunity for learning the names of peanut varieties. Harvesting was also important for elders and young women, while male informants declared planting and harvesting as opportunities with similar importance. Other less prominent opportunities (summing only 2%) included visiting the parents when already married, cooking, observing others working, and orientation received during seclusion.

Most informants (64%) declared that adults taught them names by showing them specific peanut varieties and telling them their names. Following, with a similar proportion, a few respondents declared to have learned by observing adults working (6%) or asking them about the names (5%). Two percent pointed to a combination of being told and asking, while about 3%

said they learned by simply accompanying their families when gardening. Most commonly, parents (49%) taught their children the names for the varieties. The same pattern of answers was obtained across all age categories except for *kunumiuga*, the very young adult men, who pointed to other family members as the source of apprenticeship. Although some informants said that boys learned from their fathers and girls from their mothers, qualitative evidence indicates that more commonly women teach boys and girls. According to the respondents, parents are second to grandparents (9%) and other family members (8%). In addition, about 4% mentioned they had learned from parents and grandparents while about 3% mentioned they were taught by parents and other family members. About 4% of the farmers claimed to have learned by themselves. Finally, less than 2% said they had learned from the spouse, mother or father –in-law, or from somebody external to her/his expanded family (3 cases). School was not mentioned as a source of knowledge about peanut varieties by any Kaiabi informant.

In agreement with these interviews, only one of my key informants indicated he had learned agricultural work and the name for peanut varieties by observing his father. All the other informants were unanimous in saying that first the parents and in their absence or combined with them, grandparents or other members of the expanded family were the sources for teaching the children. Nobody is in charge of teaching other people's children. As one informant said:

> Esse filho da pessoa que aprendeu com o pai, ele tem que saber. Tem que pegar o modelo que o pai dele vem fazendo com ele, desde que ele era criança. Assim ele vai mostrar pro filho dele quando ele crescer. Ele tem que fazer a mesma coisa que o pai dele ensinou para ele. Ele aprende porque o pai vai mostrando o caroço e contando os nomes. (…) tem cada história que seu pai vai contar , na hora vai explicando também.[15]

[15] "The son who learned with the father, he must know. He must follow the model his father showed him since he was a child. He will show exactly the same to his child when he grows up. He is supposed to do the same thing as his father taught him. He learns because his father shows him the seeds and tells him the names (for the varieties). (Also,) the father tells stories (about peanuts) while he is explaining the names." Owapena Kaiabi, Capivara village teacher. My translation from Portuguese.

However, those who lost parents at an early age occasionally did not learn everything, including the names for the varieties. My informants also agreed that the main opportunity for learning is through accompanying the family while working in the fields. As I explained in Chapter 3, children at an early age go to the fields and are tested on whether they are "specialists", i.e. those who yield good harvests when sowing a crop.

Finally, it is noteworthy that a great proportion of young women and men, and very young male respondents, claimed to not have learned the names for peanut varieties when asked about the age they acquired this knowledge. However, such a claim came after they had answered a previous question affirming that they had learned the names for the varieties. This apparent contradiction points to situations in which people acquire and lose knowledge over time, depending on their contact with the actual plants, and through social interaction that allows for information to circulate.

Knowledge Transmission Processes in Perspective

The survey with villagers and interviews with key informants revealed that the main venue for knowledge transmission remains apprenticeship from parents or grandparents, which mainly takes place via explanations when accompanying the family when working in the fields. In addition, harvesting was indicated as the most important opportunity in which people can learn the names for varieties, whereas a significant part of older women mentioned shelling. Most respondents pointed to having learned the names for the varieties at once, between the ages of 8 and 15 years old. Most key informants mentioned that children at an early age are commonly tested to perform a role as a specialist for sowing specific crops, when they are also taught the names for the varieties.

Despite developing a reference terminology about knowledge transmission, Cavalli-Sforza and Forman (1981) outlined a mechanistic approach that does not take in account the dynamics of knowledge within an indigenous society. In doing so, the authors neglected historical, social, cultural and cosmological forces that permeate the processes of apprenticeship, as observed by Atran (1999, 2001); Nazarea (2005), and Athayde et al (2009). Concerning crop varieties, and particularly peanuts in the case of the Kaiabi, it is vital to incorporate such forces when analyzing the current mechanisms for knowledge transmission, apprenticeship and retention of knowledge.

First, as mentioned in previous chapters, the nuclear family is the basic economic unit within the Kaiabi society. Hence, ideally every individual learns all the skills required to care for her/his family and in order to raise their children. Although maintaining strong cooperative ties with the expanded family, nuclear families are expected to contribute work and food production, and exchange knowledge among generations (Grünberg, 2004). As time goes by, young adults gradually are put in charge of economic production, and should provide for the elders as compensation for the time they spent feeding and teaching them. Agriculture is one of the required activities to fulfill this role.

Despite these social rules, as previously demonstrated, a great proportion of young adults have never cultivated a peanut field and many were not cultivating any fields in 2006. My informants were unanimous in pointing to the history of contact with Brazilian society and the increasing penetration of non-indigenous culture into Kaiabi lives as the major change from their childhood time to now. In old times, it was mandatory for men and women to know everything in order to get married. Today, getting a paid job is almost a requirement for the youngsters to marry. Young people, they said, do not value Kaiabi culture anymore, and are not willing to perform agriculture because it entails hard work and does not yield monetary gains. Indeed, many of those farmers who did not have agricultural fields in 2006 mentioned that they were busy with some non-indigenous work-related meeting (*reunião sobre trabalho de branco*) at the time of preparing and sowing the fields. Besides work, young men are generally accused of abandoning Kaiabi values because of their involvement in soccer tournaments, Brazilian dancing (forró), and other entertainment activities. Moreover, the vast majority of the villages have at least one TV set and children watch whatever show is on display whenever there is electricity available to power the TV. Later, they imitate what they learned on the screen. My interviews also indicated that, unlike many older women, young women are not learning peanut varieties names during the shelling operation. In association with the virtual abandonment of the practice of identifying new peanut varieties, which usually takes place during shelling and harvesting, I interpret this finding as indication that women are also facing transformations in the way they learn the names of varieties. In doing so, issues related to Kaiabi culture are neglected by both young men and women. Altogether, entertainment and money-earning work derived from direct and indirect cross-cultural interactions are taking time away from contact with farming in general, and more specifically with crop varieties. Such inter-ethnic interactions are mentioned as partial determinants for decline in agrodiversity (Brush, 2004; van Etten, 2006).

Likewise, village schools also play a role in decreasing crop diversity maintenance by taking time away from interaction with plants (Zimmerer, 1996; Salick, 1997). Although none of the interviewees mentioned school as a source of apprenticeship for crop diversity and variety names, village teachers told me that the school has a role in encouraging children and their families to carry out agricultural activities. Indeed, according to the school calendar, there are no classes during critical periods of the cropping season. Nevertheless, some key informants mentioned that school subtracted time for children to participate in farming along with their families. Furthermore, some informants posed criticism to schooling when talking about the alleged lack of commitment of the youngster to their culture. An important leader expressed it with the following words:

> Ah, se interessar pelas coisas nossas, acho que é o primeiro lugar que os meninos não estão dando valor. Não é dar o valor. É falta deles entender que tem que cuidar disso, que eles fazem parte disso, que eles dependem disso. Se eles entenderem tudo o que é deles para serem chamados de índios, tudo o que faz parte do que o índio faz, se ele entender essa parte, ele tem mais cuidado. (...) Senão, o que ele vai ser? Você é índio, você sabe, conhece tudo. Sabe a regra do índio? Eu vejo o menino que participa do curso, o estudante. Ele chega na reunião e fala: sou universitário, eu sei tudo. Mas quando você pede para ele mostrar, aí ele se perde. (...) Não entende bem nem o branco nem o índio, fica no meio do caminho, perdido. Essa é uma preocupação grande.[16]

In parallel to this criticism about schooling and indigenous identity, at the same time that the youngsters are blamed for such transformations, elders also welcome the school. As explained earlier, while criticizing the new generations for promoting changes in the economy and social organization, elders also want industrialized goods and encourage the search for paid jobs (Senra, 2001; Oakdale, 1996). While they express that it represents a threat to old values, elders and leaders are fully aware that schooling is a pathway to obtain a better, well paid "non-indigenous jobs". Hence, the actual focus of discussion is not whether having a job is desirable, but how to perform the available jobs (teacher, health service, staff of the association, etc) in order to better serve the indigenous society while earning personal advantages. Thus, although school teachers expressed interest in taking an active role in agricultural knowledge transmission, and some actually took some action, there was no systematic work on this issue so

[16] "Oh, to be interested in our stuff, this is the first thing the boys are not giving the proper value. It is not exactly valuing them. It is a lack of understanding that they need to take care of it, that they are part of it, that they depend on it. If they realize everything that is theirs to be called an Indian, if they realize that, everything that takes part in being Indian, if they realize this, they would take care of this. (...) Otherwise, what will he be? You are Indian, you know everything. Do you know the Indian rules? I see the boy that takes courses, the student. He comes to the meetings and speaks out: I am in College, I know everything. But if you ask him to display his knowledge, then he gets lost. He does not understand the white people's nor the Indians' way of life, he got stuck in the middle way, lost. That is a huge concern." Mairawy Kaiabi, ATIX's former President. My translation from Portuguese.

far. Therefore, school involvement in agricultural knowledge transmission is a projection for the future rather than a current practice.

Based on indigenous perspectives, indigenous leaders and external advisors can articulate actions to address pressing issues related to the challenges of inter-ethnic interactions (Posey, 1984; 1996; Moran, 1995; Schwartzman et al, 2000; Maffi, 2001, Nazarea, 2005; Viveiros de Castro, 2008). In this context, the implementation of carefully designed culturally relevant education initiatives could help to disseminate plant-related knowledge to broad audiences (Zimmerer, 1996; Zarger, 2002). In the Kaiabi case, I myself carried out workshops about crop diversity management, the Health Service promoted events for discussing food security and children's nutrition, and other events were offered by supporting organizations. Altogether, these initiatives provided tools for the Kaiabi to reflect on their situation. However, the results of these events fall short of pointing the Kaiabi in a direction to follow.

In summary, I identified two interconnected levels of potential problems about Kaiabi agricultural knowledge transmission. The first level concerns opportunities to learn through interacting with crops and varieties, and the second issue is related to the retention of knowledge. Most youngsters declared to have learned the names for peanut varieties between late childhood and early adulthood. Also, most informants told me children learn the names for the varieties through adults' explanations based on interactions with actual seeds and plants when working in the fields. However, only a small proportion of youngsters already had cultivated peanuts on their own. Moreover, most peanut varieties were unevenly distributed in the fields of nuclear families, but might be present in fields belonging to the expanded family. Therefore, there were opportunities for the youngsters to interact with peanut varieties, although not necessarily with all of them. Another possibility is related to the existence of more diversified fields at the time of informants' childhood / adolescence. However, most youngsters performed poorly in the knowledge tests. Hence, people either actually learned and forgot the names for the varieties, or they did not take advantage of opportunities to interact with the crop and varieties for learning. If people told the truth when declaring to have learned the names for the varieties, these findings suggest that instead of a crisis in knowledge transmission mechanisms, the issue is more related to retaining learned knowledge. Constant practice allows for the retention of the names for peanut varieties, which the Kaiabi were not exercising to its full potential. Engagement in farming is linked to the degree to which agriculture attracts the youngsters, and the demands of families for food and other materials, including industrialized goods. As I demonstrated earlier, elders coordinate decision making regarding the practice of agriculture and crop diversity within expanded families. Therefore, it is not possible to simply blame the youngsters for the current situation and future perspectives. Despite this fact, most key informants told me that the youngsters' lack of interest in agriculture can destroy Kaiabi crop diversity. However, it is not possible to obligate people to do what they do not want to do, added the interviewees. The only way around this situation, they said, would be to use all available opportunities to talk to the children and parents, in order to clarify what is at stake, and try to open their minds to reverse the circumstances.

The myth of *Kupeirup* presents her as the first teacher about agriculture, agrodiversity management, and cooking. Based on his spiritual connections, Tuiarajup developed his particular approach to crop diversity and in recent years committed himself to teach people across generations (vertical and oblique mechanisms) the foundations for the multiplication and recreation of peanut diversity carried out in Kwaryja village, and to disseminate the correct names for peanut varieties. He was also concerned with traditional Kaiabi cuisine. As commented before, he mixed oral, graphical and written strategies in diverse meetings and in his own and other villages. Above all, he exhorted people to practice agriculture, urging young and elders to keep contact with crops and their respective varieties. Although Tuiarajup is already effectively working to disseminate knowledge about the relationships between agriculture and cosmological domains, as well as the names of peanut varieties, the results from such efforts require time to appear. For now it is too early to make strong statements about his achievements. Nevertheless, at least for the newly-created varieties, preliminary results suggest that he has been more successful in spreading the seeds themselves rather than the names of varieties.

For this research, I hypothesized that agricultural knowledge transmission mechanisms had been partially replaced by institutionalized educational initiatives. The previous discussion illustrated how the old way of teaching is in crisis in the face of present challenges. Currently, the Kaiabi live in a transitional period while negotiating a new synthesis. The efforts by descendants of Jepepyri, in Kwaryja village and elsewhere, and by some leaders and residents from other villagers, represent an open potential toward this synthesis. Despite institutional support the Kaiabi receive, for now it is not clear what will replace the old knowledge transmission processes at broader scale. I foresee something in between what Tuiarajup envisioned and the possibilities offered by the inter-ethnic interactions that the Kaiabi enjoy. The nature and content of these actions are still to be fully designed, including the role of family and practice of agriculture. Nevertheless, under the current conditions, the hypothesis that agricultural knowledge transmission mechanisms had been partially replaced by institutionalized educational initiatives was not substantiated by my results.

Conclusions: Distribution of Knowledge and Varieties, and Challenges to Teach New Generations

This chapter addresses indigenous management of agrodiversity focusing on the case of Kaiabi peanuts as guided by three primary research questions: (1) How is knowledge of names for crop varieties distributed within an indigenous society? (2) How is crop diversity distributed among farmers' fields? and (3) How do changes in knowledge transmission systems impact the use and maintenance of indigenous agrodiversity?

The results of this chapter confirm what is already well documented in the literature: indigenous societies are not uniform regarding the distribution of knowledge about plants among their members, presenting variations within subgroups of individuals (Zent and Maffi, 2007). About half of the informants reached consensus upon the names for peanut varieties, providing more homogeneous answers for the knowledge test. The remaining informants, however, showed lower levels of knowledge for the names of the varieties.

For traditional peanut varieties, females, elders, and those committed to perform management practices (i.e. selection) held greater knowledge about the names for peanut varieties. Hence, the use of knowledge tests about the names for crop varieties proved to be effective as a proxy for crop diversity management knowledge and practice. On the other hand, those engaged in paid jobs, mostly youngsters, who were less experienced with the crop showed lower acquaintance with names for peanut varieties. Also, shamans and non shamans showed no differences in knowledge about the names for varieties from each other. However, one single shaman performed above average in the knowledge tests about both traditional and newly-created varieties.

It is important to note that for analyzing subgroups of individuals, quantitative approaches did not always suffice to reveal distinctiveness or similarities. Hence, it is necessary to articulate approaches involving both quantitative and qualitative methods. Moreover, life histories contributed critical facts for explaining individual decisions or behaviors related to knowledge about the name for peanut varieties and the rationale for crop diversity management (Nazarea, 2005; Heckler and Zent, 2008).

Knowledge about the names for specific traditional peanut varieties and their presence in farmers' fields presented a similar distribution pattern. Some varieties' names were well known by most informants, followed by a group of moderately known varieties, and a third group of varieties whose names were poorly known by most participants in the research. Likewise, the distribution of traditional peanut varieties in farmers' fields revealed a gradient from common to rare traditional varieties. In general the distribution of both agreement upon the names for varieties and their presence in farmers' fields varied similarly.

The distribution of varieties varied significantly across fields belonging to different families and villages, and according to the way seed management systems were organized. Moreover, while most families kept a collection of a limited number of traditional peanut varieties, there were a few families dedicated to keep most varieties (Salick et al, 1997; Brush, 2004). Remarkably, such collections are dynamic, with losses and additions (Brush, 2004; Emperaire, 2004).

Another point that deserves attention for its conceptual relevance is the unit of analysis. Addressing distinct levels of aggregation of information, this research demonstrated the intimate relationship between nuclear and expanded families for dealing with indigenous agrodiversity management (see also chapter 4). Knowledge about names for peanut varieties increased from individuals to nuclear family to expanded families with the distribution of varieties in the fields following a similar pattern. Therefore, knowledge and seeds can be mobilized for informing new generations, and for exchanging varieties through social networks. However, there is evidence indicating that the Kaiabi not do always take advantage of the information and seeds available within their expanded family, or neighbors.

In contrast to traditional peanut varieties, all the newly-created varieties showed a strong concentration in a few fields, most of them in Kwaryja village. Although this village is not the only site that is cultivating high peanut diversity, it is the origin of the most newly-created varieties. Aside from being a repository for agrodiversity, Kwaryja is also the focal point for knowledge about peanut varieties and the processes associated with creating them, which is a selection practice almost abandoned in most Kaiabi villages. There, the shaman responsible for coordinating the work for their selection gave names to them in the context of a historic event aimed at the revival of Kaiabi crop diversity. This process blends ethnic identity and history, family memory, and shamanism with agriculture, emphasizing the sacred origins of agriculture and its presence in the contemporary world (Sullivan, 1988). For this, other Kaiabi farmers tend to rely on Kwaryja as a permanent source for varieties, which would be easily obtained through exchange networks (Elias et al, 2000; Brush, 2004). The shaman fought this tendency by delivering seeds to families from other villages along with explanations of their sacred origins and by giving strict instructions on how the recipients should maintain them. Although the shaman also placed great effort on divulging the correct names for new varieties, within his village only elders and those deeply involved in the creation of new varieties and their management knew their names. Once delivered to other villages, all new varieties received distinct names outside their place of origins. In general, locals called them by the name of other morphologically similar varieties. Eventually, current naming varieties practices performed in most villages dissolve the limits between old and new varieties and contribute to the mixing of biological materials from different sources under the same variety name. Therefore, locally conceptualized varieties present in different locations may not present genetic homogeneity (Emperaire, 2005; Sadiki et al, 2007), imposing challenges for productive researchers-farmers interaction (Cleveland and Soleri, 2007b). Kaiabi peanut varieties seem to follow this trend, as suggested by Freitas et al (2007).

Nevertheless, so far the historic event for recovering agrodiversity carried out by Jepepyri's descendants succeeded in delivering seeds of traditional and newly-created varieties to other villages and pushed the debate about agrodiversity management to the forefront of Kaiabi life. As such, it spurred the desire for similar initiatives addressing other crops to be launched in other villages, which at the time I left the field were not implemented yet.

The Kaiabi are not the only indigenous farmers experiencing intense inter-ethnic interactions (Bellon and Brush, 1994; Bellon, 1996; Emperaire, 1998; Clement, 1999; Rhoades and Nazarea, 1999; Elias et al, 2000; Brush, 2004). In their specific case, new forms of entertainment and the search for paid jobs are magnified along with the weakening of seed management practices such as the selection of new peanut varieties and the delegation of production to a few families according to locally defined arrays. In this context, old knowledge transmission processes, although still operating, are facing serious dilemmas in their attempts at accommodating contemporary challenges. This situation points to an alternative that partially maintains the old model while incorporating changes brought by cooperation with external advisors (Posey, 1984; 1996; Moran, 1995; Schwartzman et al, 2000; Maffi, 2001, Nazarea, 2005; Viveiros de Castro, 2008). The initiative in Kwaryja village is trying to anticipate such changes. However, the nature of the new synthesis the Kaiabi are seeking is still unclear.

Kaiabi peanut diversity management has central implications for agrodiversity conservation. While Kaiabi farmers do not think about genetic assortment, for them crop diversity is akin to ethnic identity (Ribeiro, 1979; Rodrigues, 1993; Villas Boas and Villas Boas, 1989). Most of them praise crop diversity as the gift received from the ancestors and from the spiritual world, along with lessons about proper management. The existence of knowledge and varietal diversity keepers allows for identifying individuals and families able to take informed decisions about crop diversity and management practices. This includes keeping or discarding varieties and whether to cultivate them in separate plots or mixed together. Moreover, rare varieties are occasionally kept under cultivation by only one family, which poses threats for maintaining them. On the other hand, regular farmers concentrate on a few varieties.

As I pointed out in Chapter Four, two complementary strategies have been designed for conserving local crop diversity (Zimmerer, 1996; Qualset et al, 1997; Brush, 1999). The first relates to the crucial importance of keeping the whole indigenous society alive. This includes the co-evolutionary mechanisms that generate and maintain variability in farmers' fields, such as the natural and human-induced selection process (Altieri and Merrick, 1987; Oldfield and Alcorn, 1987; Collins and Hawtin, 1999; Cromwell and Oosterhoult, 1999; Louette, 1999; Brush, 2004), and the spiritual foundations for its performance (Ishizawa, 1999; Richards, 1985; Brush, 2004). The second strategy refers to external conservation in gene banks. However, the desirable complementarity between these strategies faces concrete obstacles. Although a backup in gene banks would ensure the preservation of rare indigenous varieties (Almenkinders and de Boef, 2000; Jarvis et al, 2000; Brush, 2004), political and technical problems may prevent its establishment (Visser and Engels, 2000; Brush, 2004; Cleveland and Soleri, 2007a). Identification of variation within varieties of the same name is a challenge to researcher-farmer interactions. Thus, sampling and costs for collecting are important issues (Sadiki et al, 2007). Also, it is unclear whether leaders and villagers would agree with such activity given the issues of farmers' rights and the benefit sharing involved (Hawtin and Hodgkin, 1997; Carneiro da Cunha and Almeida, 2000; MacGuire et al, 2003; Brush, 2005; Cleveland and Soleri, 2007a; Jarvis et al, 2008).

Stephen Brush argues that agrodiversity is not maintained because of insistence on tradition but rather "because of rational choices of farmers and because of the role that agrodiversity plays in the warp of culture" (Brush, 2004, p 256). As such, it depends on how each society makes crucial decisions about their lives, including agriculture.

Suzanne Oakdale (1996) views the future of the Kaiabi society as dependent upon the balance of opposite and complementary forces represented by the pessimistic and optimistic perspectives at play to either replace or uphold the lessons from the ancestors (see Chapter 3). From cultural, social, and spiritual standpoints, agriculture occupies a privileged position in Kaiabi life (Grünberg, 2004; Oakdale, 1996). History and management practices have shown that Kaiabi crop diversity is dynamic, with losses and additions (see Chapter 4). Less than ten years ago, most Kaiabi perceived that the gradual loss of their crop diversity would intensify, eventually leading to their complete extinction. After a period of decline, the event launched by Jepepyri's descendants demonstrates that it is possible to recover agrodiversity and spread knowledge about its management based on lessons from the ancestors, along with new directions from people on the ground. However, questions remain as to whether the Kaiabi will be able to manage the scarcity of *Terra Preta* and attract more youngsters, men and women, to at least keep current levels of agricultural knowledge and diversity. For the Kaiabi to succeed in a globalized world, it is still uncertain what specific driving forces, informed by their distinct points of view, will either stimulate or discourage the maintenance of a renewed continuity of crop diversity, its management practices, and the associated specialized knowledge.

Table 5-1. Proportion of Kaiabi respondents who were familiarized with peanut varieties and who claimed to know their names. Xingu Park, 2006.

Variety name	Familiarized	Knew the name
M. py'wi	94.43	75.87
M. takapeun	86.76	67.48
M. ayjsing	86.06	67.48
M. ayjsingĩ	82.58	61.89
M. myãpe'ĩ	81.88	59.09
M. emyamuku	80.84	51.05
M. jakareape'i	78.75	46.50
M. teikwarapypepirangĩ	78.05	45.10
M. wyraunai	78.05	44.06
M. ayjmirangĩ	75.61	42.31
M. ayjgwasiat	74.22	45.45
M. takapesingĩ	74.22	33.57
Murunu	73.17	62.24
M. teikwarapypepytangĩ	72.13	37.06
M. tapy'yjã'yt	67.94	45.10
M. wyrauna	66.90	44.06
M. takapesingĩ uu	66.55	30.77
None	0.00	7.69

Table 5-2. Number of names given to each of 17 traditional peanut varieties, according to informants from all Kaiabi villages. Xingu Park, 2006.

Variety name	Number of names
M. takapesing ĩ uu	26
M. takapesing ĩ	24
M. emyamuku	23
M. tapy'yjã'yt	23
M. wyrauna	23
M. jakareape'i	21
M. ayjgwasiat	20
M. myãpe' ĩ	20
M. ayjmirang ĩ	17
M. teikwarapypepytang ĩ	17
M. wyraunai	16
Murunu	14
M. teikwarapypepirang ĩ	14
M. takapeun	13
M. ayjsing ĩ	11
M. py'wi	9
M. ayjsing	8

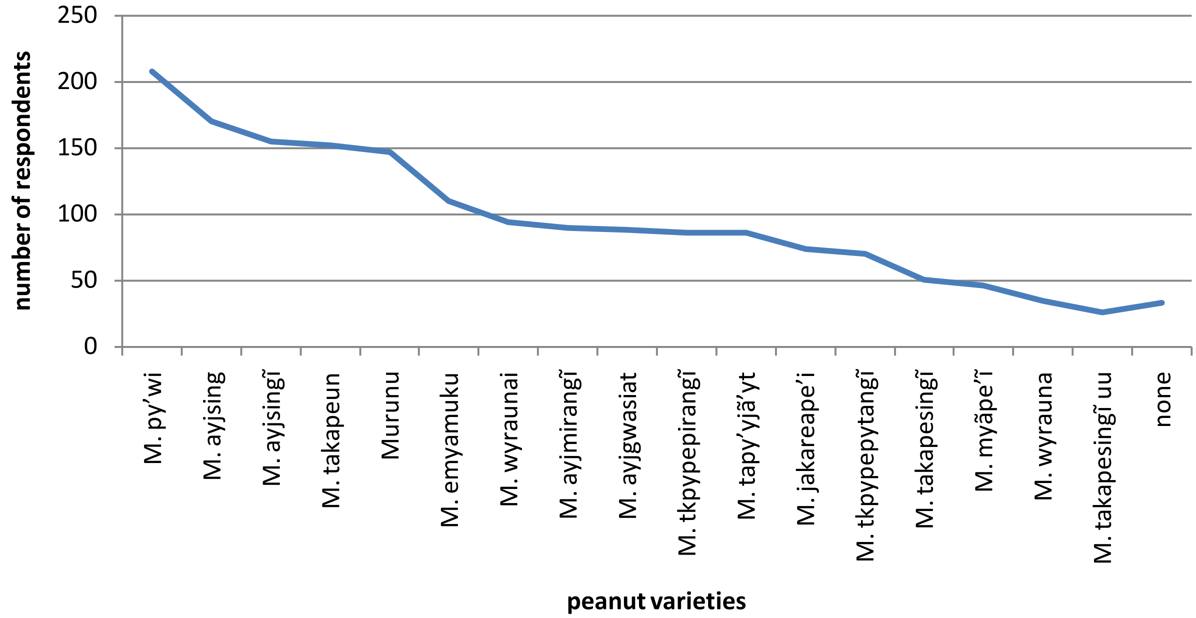


Figure 5-1. Number of Kaiabi respondents who correctly named peanut varieties.

Table 5-3. Knowledge index and frequency of Kaiabi respondents that correctly named peanut varieties. Xingu Park, 2006.

Knowledge Index	Number of varieties	Count	Frequency (%)	Cumulative Frequency (%)
1.0000	17	4	1.40	1.40
0.9412	16	6	2.10	3.50
0.8824	15	6	2.10	5.60
0.8235	14	7	2.45	8.05
0.7647	13	6	2.10	10.15
0.7059	12	11	3.85	14.00
0.6471	11	9	3.15	17.15
0.5882	10	17	5.94	23.09
0.5294	9	18	6.29	29.38
0.4706	8	20	6.99	36.37
0.4118	7	17	5.94	42.31
0.3529	6	14	4.90	47.21
0.2941	5	21	7.34	54.55
0.2353	4	22	7.69	62.24
0.1765	3	20	6.99	69.23
0.1176	2	25	8.74	77.97
0.0588	1	30	10.49	88.46
0.0000	0	33	11.54	100.00
Total	17	286	100.00	100.00

Table 5-4. Descriptive statistics for Cultural Competence Scores and Knowledge Indexes about the names for 17 peanut varieties, for informants from all Kaiabi villages. Xingu Park, 2006.

Statistics	Cultural Competence Scores (CCS)	Knowledge Indexes (ki)
N	149	286
Mean	0.5525	0.3474
Standard deviation	0.2254	0.2719
Median	0.5872	0.2941
Min	0.0018	0.0000
Max	0.9154	1.0000

Table 5-5. Count and weighted frequencies, and proportion of missing data per variety about the names for 17 peanut varieties, according to selected informants. Xingu Park, 2006.

Variety name	Count freq	Weighted freq	% Missing data
M. py'wi	138	143.19	2.10
M. ayjsing	117	132.91	3.15
M. takapeun	108	126.77	2.45
M. ayjsing ĩ	111	124.05	5.94
Murunu	101	116.57	4.55
M. emyamuku	86	102.32	8.04
M. ayjmirang ĩ	82	101.51	15.03
M. ayjgwasiat	78	97.62	10.14
M. teikwarapypepirang ĩ	71	89.96	13.99
M. tapy'yjã'yt	66	83.65	12.94
M. jakareape'i	64	79.88	13.29
M. teikwarapypepytang ĩ	60	75.39	19.58
M. takapesing ĩ	48	62.04	20.28
M. wyraunai	42	47.22	15.73
M. myãpe'ĩ	33	44.67	6.29
M. wyrauna	27	36.98	15.38
M. takapesing ĩ uu	25	34.1	15.73

Table 5-6. Analysis of variance for Cultural Competence Scores about names for peanut varieties, for subgroups of selected Kaiabi individuals. Xingu Park, 2006.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Subgroups related to characteristics of individuals						
Nuclear family	5.527	90	0.061	1.791	0.011	0.74
Error	1.989	58	0.034			
Total	7.516	148				
Age category	1.216	5	0.243	5.518	0.000	0.16
Error	6.300	143	0.044			
Total	7.516	148				
Age status	0.470	1	0.470	9.808	0.002	0.06
Error	7.046	147	0.048			
Total	7.516	148				
Area of origins	0.454	3	0.151	3.111	0.028	0.06
Error	7.061	145	0.049			
Total	7.516	148				
Area of origins without youngsters	0.257	3	0.86	1.861	0.139	0.04
Error	6.085	132	0.046			
Total	6.342	135				
Gender	0.323	1	0.323	6.601	0.011	0.04
Error	7.193	147	0.049			
Total	7.516	148				
Paid job	0.278	1	0.278	5.649	0.019	0.04
Error	7.238	147	0.049			
Total	7.516	148				
Expanded family	2.126	33	0.064	1.374	0.112	0.28
Error	5.390	115	0.047			
Total	7.516	148				
Village	1.250	19	0.066	1.354	0.162	0.17
Error	6.266	129	0.049			
Total	7.516	148				
Aware about dangerous varieties	0.062	1	0.062	1.337	0.251	0.02
Error	3.630	78	0.047			
Total	3.693	79				
Political leader	0.045	1	0.045	0.888	0.347	0.01
Error	7.471	147	0.051			
Total	7.516	148				
Shaman	0.109	1	0.109	2.171	0.143	0.01
Error	7.406	147	0.050			
Total	7.516	148				

Table 5-6. Continued.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Subgroups related to peanut management						
Still identify new peanut varieties	0.935	1	0.935	21.806	0.000	0.19
Error	4.117	96	0.043			
Total	5.052	97				
Past events for ident. new varieties	0.456	1	0.456	9.519	0.003	0.09
Error	4.596	96	0.048			
Total	5.052	97				
Seed management systems	0.565	6	0.094	1.925	0.081	0.08
Error	6.951	142	0.049			
Total	7.516	148				
Seed mgment syst without youngsters	0.984	6	0.164	3.950	0.001	0.16
Error	5.357	129	0.042			
Total	6.342	135				
Ever cultivated a peanut field	0.344	1	0.344	7.059	0.009	0.05
Error	7.171	147	0.049			
Total	7.516	148				
Peanut field in 2006	0.327	1	0.327	6.691	0.011	0.04
Error	7.189	147	0.049			
Total	7.516	148				

Table 5-7. Descriptive statistics for Cultural Competence Scores about names for peanut varieties, for subgroups of selected Kaiabi respondents. Xingu Park, 2006.

	N	Mean	Std	Median	Min	Max
Total	149	0.5525	0.2254	0.5872	0.0018	0.9154
Subgroups related to characteristics of individuals						
Age category*						
Female	94					
Wawĩ	39	0.6680	0.2019	0.6923	0.0907	0.9154
Iyruo	53	0.5408	0.2200	0.5795	0.0018	0.9154
*Kujãmuku*fet	2	0.2835	0.2756	0.2835	0.0886	0.4783
Male	55					
Iymani	24	0.5775	0.1359	0.5923	0.2611	0.8155
Iywyruu	20	0.4463	0.2431	0.4728	0.0076	0.9154
Kunumiuu	11	0.3867	0.2470	0.4101	0.0894	0.8483
Age status*						
Elder	136	0.5699	0.2167	0.5955	0.0018	0.9154
Youngster	13	0.3708	0.2422	0.4101	0.0886	0.8483
Area of origins**						
Teles Pires	38	0.6296	0.1782	0.6375	0.0959	0.8849
Kururuzinho	17	0.5949	0.2399	0.6252	0.0947	0.9154
Tatuy	14	0.5722	0.1930	0.6093	0.0945	0.8874
Xingu all informants	80	0.5034	0.2382	0.5322	0.0018	0.9154
Area of origins controlling for youngsters						
Xingu elders only	67	0.5292	0.2304	0.5446	0.0018	0.9154
Xingu youngsters only	13	0.3708	0.2422	0.4101	0.0886	0.8483
Gender**						
Female	94	0.5881	0.2247	0.6174	0.0018	0.9154
Male	55	0.4916	0.2150	0.5231	0.0076	0.9154
Paid job**						
Paid job	17	0.4321	0.2355	0.4327	0.0894	0.8483
No paid job	132	0.5680	0.2202	0.5955	0.0018	0.9154
Awareness about dangerous varieties						
Aware	69	0.6060	0.2080	0.6392	0.0018	0.9154
Non aware	11	0.5250	0.2626	0.6390	0.0907	0.7588
Political leader						
Leader	21	0.5955	0.2106	0.5785	0.0959	0.9154
Non leader	128	0.5455	0.2277	0.5891	0.0018	0.9154
Shaman						
Shaman	10	0.6535	0.1997	0.6231	0.2334	0.9154
Non shaman	139	0.5452	0.2260	0.5838	0.0018	0.9154

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-7. Continued.

	N	Mean	Std	Median	Min	Max
Subgroups related to peanut management						
Still identify new peanut varieties*						
Yes	35	0.7218	0.1715	0.7588	0.0886	0.9154
No	63	0.5179	0.2242	0.5838	0.0018	0.8874
Identified new peanut varieties in the past*						
Yes	72	0.6317	0.2205	0.6679	0.0018	0.9154
No	26	0.4772	0.2141	0.4953	0.0076	0.8874
Seed management systems***						
D	20	0.6859	0.2532	0.7684	0.0886	0.9154
Ba	19	0.5620	0.2494	0.5848	0.0076	0.8648
Bb	61	0.5562	0.2083	0.6165	0.0018	0.8874
A	6	0.5231	0.1616	0.4659	0.3501	0.7773
B/D	19	0.4934	0.2056	0.5381	0.0901	0.8465
C	10	0.4930	0.2268	0.5713	0.0907	0.6923
A/B	14	0.4680	0.2246	0.5033	0.0947	0.8127
Seed management systems controlling for youngsters						
D	14	0.7942	0.1336	0.8327	0.5230	0.9154
Ba	18	0.5883	0.2280	0.5900	0.0076	0.8648
Bb	59	0.5562	0.2083	0.6165	0.0018	0.8874
B/D	17	0.5115	0.2077	0.5440	0.0901	0.8465
C	8	0.4850	0.2491	0.5713	0.0907	0.6923
Ever cultivated a peanut field*						
Yes	133	0.5692	0.2168	0.5959	0.0076	0.9154
No	16	0.4139	0.2540	0.4527	0.0018	0.8483
Peanut field in 2006**						
Yes	78	0.5972	0.2112	0.6144	0.0076	0.9154
No	71	0.5034	0.2316	0.5446	0.0018	0.8764

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-8. Cultural Competence Scores and characteristics of nuclear families. Xingu Park, 2006.

	Mean cultural competence scores						
# NF	> 0.80	0.70-0.79	0.60-0.69	0.50-0.59	0.40-0.49	0.30-0.39	< 0.30
Nuclear families (n=92)							
N	5	17	14	24	14	6	14
%	5.4	18.5	15.2	26.1	15.2	6.5	15.2
Ever cultivated peanuts							
% NF	100.0	100.0	78.6	91.7	100	66.7	64.3
Cultivated a peanut field in 2006							
% NF	60.0	47.1	50.0	45.8	42.9	50.0	28.6
Expanded families (n=34)							
% EF	11.8	41.2	41.2	52.9	29.4	11.8	41.2
Villages (n=20)							
N	2	8	9	13	8	4	10
% villages	10.0	40.0	45.0	65.0	40.0	20.0	50.0
Number of NF from:							
Kwaryja village	4	2	1	1	2	0	2
Other villages	1	15	13	23	12	4	12
Individuals (n=149)							
N	8	30	26	39	21	9	17
% Female	88.0	63.0	69.0	64.0	57.0	56.0	50.0
% Elders	100.0	97.0	92.0	97.0	86.0	89.0	69.0
% Engaged in paid job	0.0	17.6	23.5	5.9	17.6	11.8	23.5
% Political leaders	9.5	19.0	23.8	19.0	19.0	4.8	4.8
% Shamans	10.0	30.0	10.0	30.0	0.0	10.0	10.0
% Past events for identifying new varieties[a]	100.0	89.0	85.0	53.0	50.0	0.0	70.0
% Still practice identification of new varieties[a]	100.0	52.0	35.0	11.0	25.0	0.0	10.0

a. Not all informants were interviewed about the practice of selecting new peanut varieties.

Table 5-9. Analysis of variance for means of Knowledge Indexes about names for peanut varieties, for subgroups of selected Kaiabi individuals. Xingu Park, 2006.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Subgroups related to characteristics of individuals						
Nuclear family	1.574	97	0.016	1.640	0.042	0.80
Error	0.386	39	0.010			
Total	1.960	136				
Age category	0.414	6	0.069	5.799	0.000	0.21
Error	1.546	130	0.012			
Total	1.960	136				
Age status	0.287	1	0.287	23.186	0.000	0.15
Error	1.672	135	0.012			
Total	1.960	136				
Area of origins	0.107	3	0.036	2.567	0.057	0.06
Error	1.852	133	0.014			
Total	1.960	136				
Political leader	0.091	1	0.091	6.603	0.011	0.05
Error	1.868	135	0.014			
Total	1.960	136				
Gender	0.024	1	0.024	1.655	0.200	0.01
Error	1.936	135	0.014			
Total	1.960	136				
Expanded family	0.614	35	0.018	1.317	0.146	0.31
Error	1.345	101	0.013			
Total	1.960	136				
Village	0.278	18	0.015	1.084	0.377	0.14
Error	1.681	118	0.014			
Total	1.960	136				
Paid job	0.005	1	0.005	0.331	0.566	0.00
Error	1.955	135	0.014			
Total	1.960	136				
Shaman	0.007	1	0.007	0.454	0.502	0.00
Error	1.953	135	0.014			
Total	1.960	136				
Aware about dangerous varieties	0.006	1	0.006	0.351	0.555	0.00
Error	1.475	89	0.017			
Total	1.480	90				

Table 5-9. Continued.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Subgroups related to peanut management						
Still identify new peanut varieties	0.211	1	0.211	15.223	0.000	0.13
Error	1.444	104	0.014			
Total	1.655	105				
Ever cultivated a peanut field	0.136	1	0.136	10.081	0.002	0.07
Error	1.812	134	0.014			
Total	1.948	135				
Past events for ident. new varieties	0.103	1	0.103	6.957	0.010	0.06
Error	1.552	105	0.015			
Total	1.655	106				
Seed management system	0.096	6	0.016	1.118	0.355	0.05
Error	1.863	130	0.014			
Total	1.960	136				
Peanut field in 2006	0.005	1	0.005	0.338	0.562	0.00
Error	1.955	135	0.014			
Total	1.960	136				

Table 5-10. Descriptive statistics for the Knowledge Indexes about peanut varieties names, for sub-groups of Kaiabi individuals, for all the respondents. Xingu Park, 2006.

	N	Mean	Std	Median	Min	Max
Total	137	0.1297	0.1200	0.1176	0.0000	0.5294
Subgroups related to characteristics of individuals						
Age category*						
Female	58					
Wawĩ	3	0.0980	0.0899	0.1176	0.0000	0.1765
Iyruo	43	0.1546	0.1191	0.1176	0.0000	0.4706
*Kujãmuku*fet	12	0.1225	0.1135	0.0882	0.0000	0.2941
Male	79					
Iywyruu	18	0.2353	0.1354	0.2353	0.0588	0.5294
Iymani	3	0.2157	0.2377	0.1765	0.0000	0.4706
Kunumiuu	55	0.0770	0.0807	0.0588	0.0000	0.2941
Kunumiuga	3	0.0784	0.0899	0.0588	0.0000	0.1765
Age status*						
Elder	67	0.1765	0.1315	0.1765	0.0000	0.5294
Youngster	70	0.0849	0.0877	0.0588	0.0000	0.2941
Area of origins***						
Kururuzinho	3	0.2941	0.0588	0.2941	0.2353	0.3529
Tatuy	11	0.1604	0.1443	0.1176	0.0000	0.4706
Xingu all	119	0.1246	0.1169	0.1176	0.0000	0.5294
Teles Pires	4	0.0735	0.0882	0.0588	0.0000	0.1765
Area of origins controlling for youngsters						
Xingu elders	49	0.1813	0.1438	0.2187	0.0000	0.5294
Xingu youngsters	70	0.0849	0.0640	0.1058	0.0000	0.2941
Political leader						
Leader	18	0.1961	0.1455	0.1471	0.0000	0.5294
Non leader	119	0.1196	0.1131	0.1176	0.0000	0.4706
Gender						
Female	58	0.1450	0.1162	0.1176	0.0000	0.4706
Male	79	0.1184	0.1223	0.0588	0.0000	0.5294
Paid job						
Paid job	34	0.1194	0.1233	0.1176	0.0000	0.5294
No paid job	103	0.1331	0.1194	0.1176	0.0000	0.4706
Shaman						
Shaman	132	0.1310	0.1211	0.1176	0.0000	0.5294
Non shaman	5	0.0941	0.0892	0.0588	0.0000	0.2353
Awareness about dangerous varieties						
Yes	53	0.1354	0.1348	0.1176	0.0000	0.4706
No	38	0.1192	0.1196	0.0882	0.0000	0.5294

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-10. Continued.

	N	Mean	Std	Median	Min	Max
Subgroups related to peanut management						
Still identify new peanut varieties*						
Yes	5	0.3294	0.0892	0.2941	0.2353	0.4706
No	101	0.1188	0.1188	0.0588	0.0000	0.5294
Ever cultivated a peanut field*						
Yes	77	0.1566	0.1257	0.1176	0.0000	0.5294
No	59	0.0927	0.1026	0.0588	0.0000	0.4706
Identified new peanut varieties in the past**						
Yes	35	0.1731	0.1482	0.1176	0.0000	0.5294
No	72	0.1070	0.1065	0.0588	0.0000	0.4706
Seed management systems						
D	8	0.1985	0.1174	0.2353	0.0000	0.3529
A	5	0.1647	0.0767	0.1765	0.0588	0.2353
Ba	13	0.1403	0.1006	0.1176	0.0000	0.2941
Bb	71	0.1342	0.1309	0.1176	0.0000	0.5294
A/B	7	0.1260	0.1290	0.1176	0.0000	0.3529
C	23	0.1048	0.1093	0.0588	0.0000	0.3529
B/D	10	0.0706	0.0823	0.0588	0.0000	0.2353
Peanut field in 2006						
Yes	38	0.1393	0.1131	0.1176	0.0000	0.3529
No	99	0.1260	0.1229	0.1176	0.0000	0.5294

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-11. Knowledge indexes and characteristics of nuclear families. Xingu Park, 2006.

	Mean knowledge index				
	>0.3	0.20-0.29	0.10-0.19	0.01-0.09	= 0
Nuclear families (n=98)					
N	5	23	30	29	13
%	5.1	23.5	29.6	28.6	13.3
Ever cultivated peanuts					
% NF	100.0	74	69.0	46	46
Cultivated a peanut field in 2006					
% NF	40.0	30.4	27.6	25.0	30.8
Expanded families (n=36)					
% EF	13.9	47.2	50.0	50.0	30.6
Villages (n=19)					
N	5	11	12	12	8
% villages	26.0	58.0	63.0	63.0	42.0
Number of NF from:					
Kwaryja village	1	4	1	1	1
Other villages	4	19	28	27	12
Individuals (n=137)					
N	5	31	38	45	18
% Female	20.0	52.0	42.0	44.0	28.0
% Elders	100.0	71.0	50.0	38.0	22.0
% Engaged in paid job	2.9	20.6	32.4	29.4	14.7
% Political leaders	11.1	33.3	33.3	22.2	0.0
% Shamans	0.0	20.0	20.0	40.0	20.0
% Past events for identifying new peanut varieties[a]	80.0	89.0	23.3	20.0	33.3
% Still practice identification of new peanut varieties[a]	40.0	52.0	0.0	0.0	0.0

a. Not all informants were interviewed about the practice of selecting new peanut varieties.

Table 5-12. Proportion of informants excluded from consensus analysis from all villages that correctly named peanut varieties, according to Kaiabi individuals, nuclear and expanded families, and villages of residence. Xingu Park, 2006.

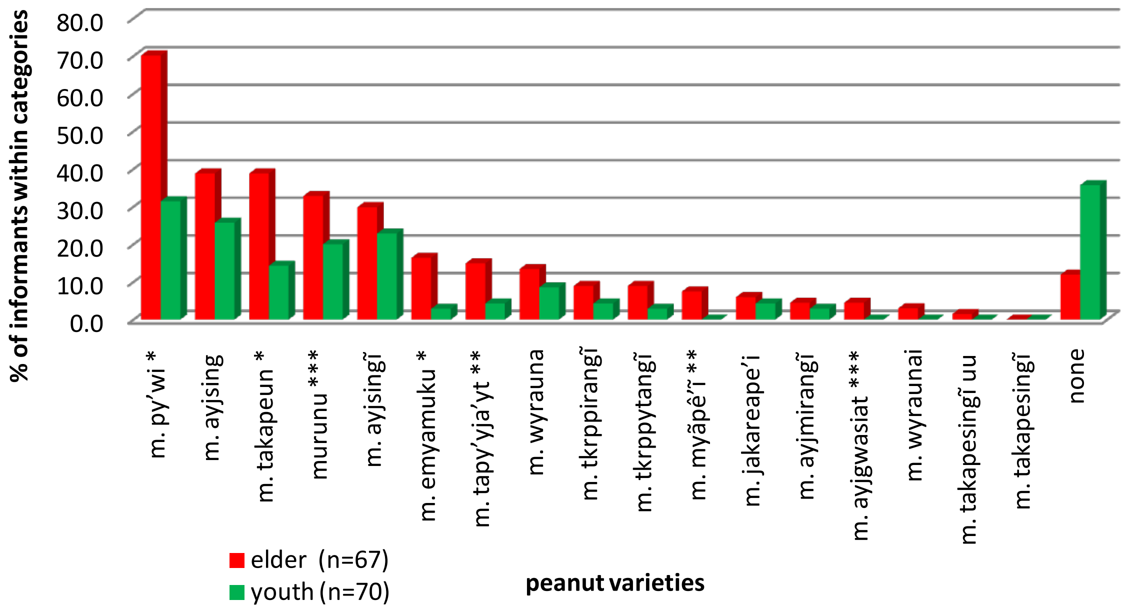
Varieties	Individual	Nuclear family	Expanded family	Village
N	137	98	36	19
M. py'wi	50.4	61.2 **	86.1**	84.2 ***
M. ayjsing	32.1	83.7	72.2	73.7
Murunu	26.3	33.7 *	58.3 ***	68.4 *
M. takapeun	26.3	33.7 ***	55.6	52.6
M. ayjsingĩ	26.3	33.7	47.2	52.6
M. wyraunai	10.9	14.3	5.6	10.5
M. tapy'yjã'yt	9.5	13.3 ***	30.6 **	36.8
M. emyamuku	9.5	13.3	25.0	42.1
M. teikwarapypepirangĩ	6.6	8.2	19.4	26.3
M. teikwarapypepytangĩ	5.8	8.2	22.2	31.6
M. jakareape'i	5.1	7.1 *	16.7	26.3 **
M. wyrauna	1.5	6.1	33.3*	47.4
M. ayjmirangĩ	3.6	5.1 ***	11.1	21.1
M. myãpe'ĩ	3.6	4.1 *	11.1	15.8
M. ayjgwasiat	2.2	3.1 **	8.3*	15.8 *
M. takapesingĩ uu	0.7	1.0	2.8	5.3
M. takapesingĩ	0.0	0.0	0.0	0.0
None variety	24.1	5.1	0.0	0.0

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-13. Proportion of respondents classified according to Kaiabi age categories that correctly named each peanut variety. Informants excluded from consensus analysis. All Kaiabi villages, Xingu Park, 2006.

Varieties	Female			Male			
	Aged *Wawĩ*	Middle aged *Iyruo*	Young *Kujãmuku*fet	Aged *Iymani*	Middle aged *Iywyruu*	Young *Kunumiuu*	Very young *Kunumiuga*[a]
N	3	43	12	3	18	55	3
M. Py'wi *	33.3	65.1	50.0	33.3	94.4	29.1	0.0
M. Takapeun **	33.3	37.2	33.3	33.3	44.4	9.1	33.3
M. Ayjsing	33.3	32.6	8.3	66.7	50.0	29.1	33.3
M. Ayjsingĩ	0.0	27.9	33.3	33.3	38.9	21.8	0.0
Murunu ***	0.0	25.6	25.0	66.7	50.0	18.2	33.3
M. Emyamuku	0.0	18.6	8.3	33.3	11.1	1.8	0.0
M. Wyrauna	0.0	11.6	16.7	0.0	22.2	7.3	0.0
M. Myãpe'ĩ	0.0	9.3	0.0	0.0	5.6	0.0	0.0
M. Tapy'yjã'yt ***	0.0	9.3	8.3	33.3	27.8	3.6	0.0
M. Teikwarapypepirangĩ	33.3	9.3	0.0	0.0	5.6	3.6	33.3
M. Ayjgwasiat	0.0	4.7	0.0	0.0	5.6	0.0	0.0
M. Jakareape'i	0.0	4.7	8.3	33.3	5.6	3.6	0.0
M. Ayjmirangĩ	0.0	2.3	8.3	33.3	5.6	1.8	0.0
M. Teikwarapypepytangĩ **	33.3	2.3	8.3	0.0	22.2	1.8	0.0
M. Wyraunai	0.0	2.3	0.0	0.0	5.6	0.0	0.0
M. Takapesingĩ uu	0.0	0.0	0.0	0.0	5.6	0.0	0.0
M. Takapesingĩ	0.0	0.0	0.0	0.0	0.0	0.0	0.0
None variety	33.3	14.0	25.0	33.3	0.0	38.2	33.3

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level



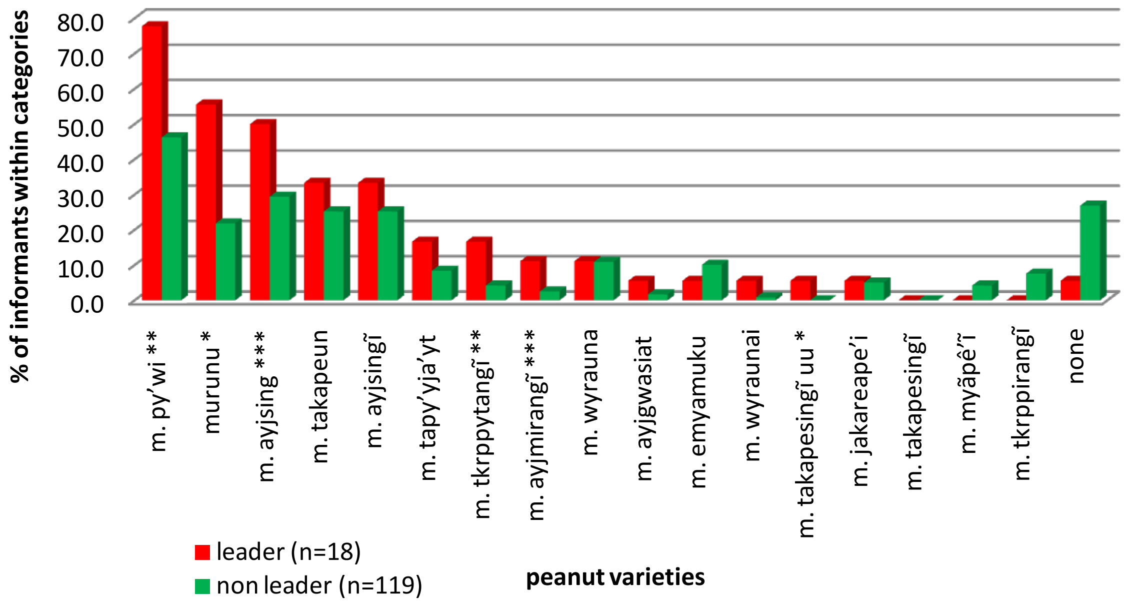
* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Figure 5-2. Proportion of respondents classified according to their age status that correctly named peanut varieties. All Kaiabi villages, Xingu Park, 2006.

Table 5-14. Proportion of respondents classified according to their area of origins that correctly named peanut varieties. All Kaiabi villages, Xingu Park, 2006.

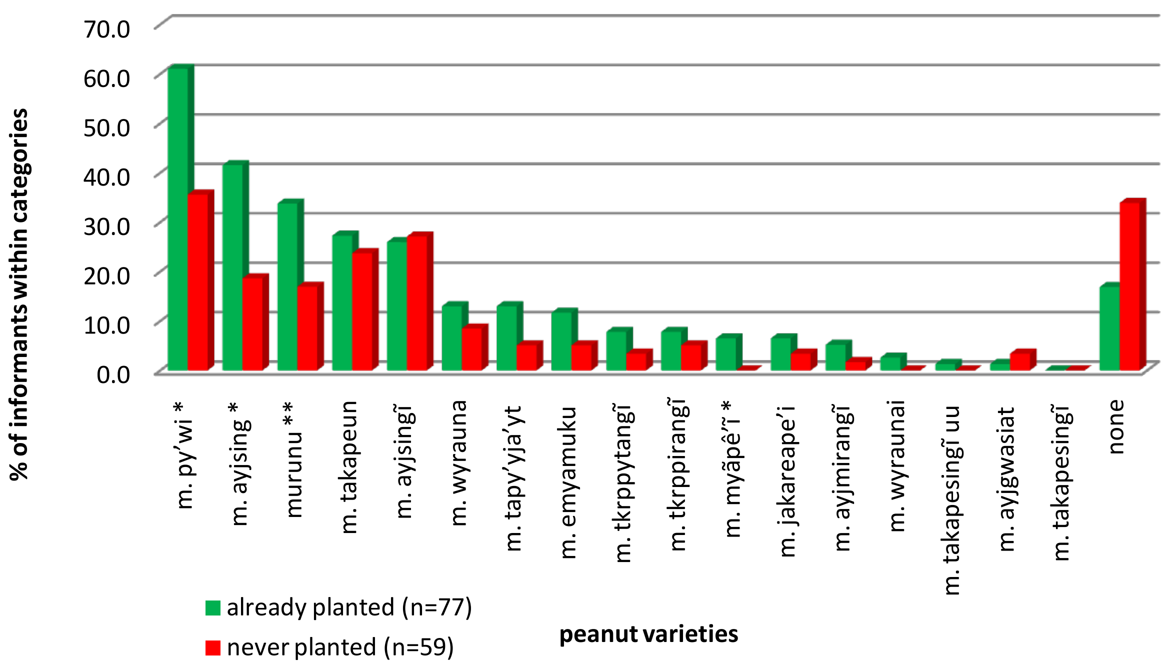
	T. Pires	Kururuzinho	Tatuy	Xingu
N	4	3	11	119
M. py'wi	50.0	100.0	72.7	47.1
M. takapeun **	0.0	100.0	27.3	25.2
Murunu **	25.0	100.0	27.3	24.4
M. tapy'yjã'yt *	0.0	66.7	18.2	7.6
M. ayjsing	25.0	33.3	36.4	31.9
M. wyrauna	0.0	33.3	18.2	10.1
M. jakareape'i	0.0	33.3	9.1	4.2
M. teikwarapypepytangĩ	0.0	33.3	0.0	5.9
M. ayjsingĩ	25.0	0.0	36.4	26.1
M. emyamuku	0.0	0.0	18.2	9.2
M. ayjmirangĩ	0.0	0.0	9.1	3.4
M. teikwarapypepirangĩ	0.0	0.0	0.0	7.6
M. myãpe'ĩ	0.0	0.0	0.0	4.2
M. ayjgwasiat	0.0	0.0	0.0	2.5
M. wyraunai	0.0	0.0	0.0	1.7
M. takapesingĩ uu	0.0	0.0	0.0	0.8
M. takapesingĩ	0.0	0.0	0.0	0.0
None variety	50.0	0.0	18.2	24.4

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level



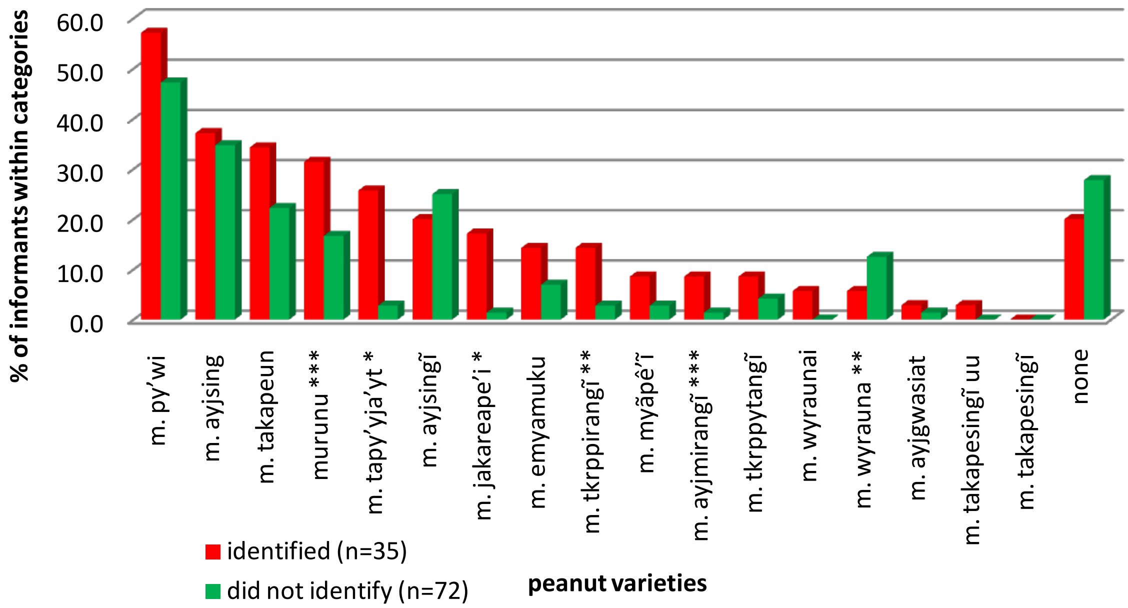
* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Figure 5-3. Proportion of respondents classified according to whether they were political leaders that correctly named peanut varieties. All Kaiabi villages, Xingu Park, 2006.



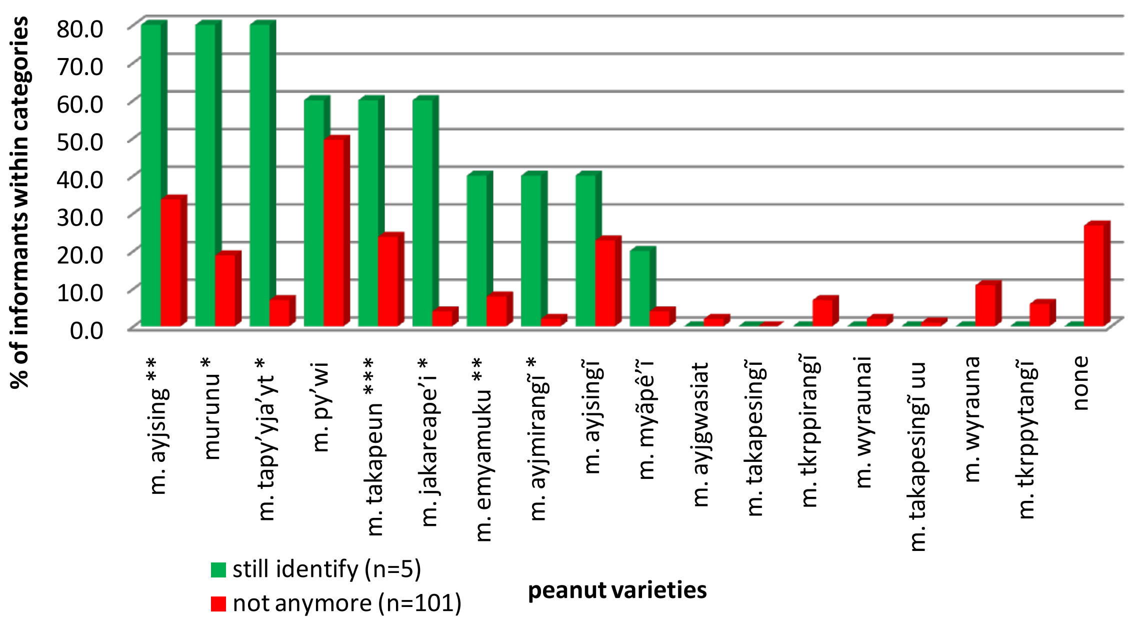
* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Figure 5-4. Proportion of respondents classified according to whether they ever cultivated a peanut field that correctly named peanut varieties. All Kaiabi villages, Xingu Park, 2006.



* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Figure 5-5. Proportion of respondents classified according to whether they had participated at least in one opportunity in events including the identification of new peanut varieties that correctly named peanut varieties. All Kaiabi villages, Xingu Park, 2006.



* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Figure 5-6. Proportion of respondents classified according to whether they still perform the practice of identifying new peanut varieties that correctly named peanut varieties. All Kaiabi villages, Xingu Park, 2006.

Table 5-15. Number of names given to each of peanut variety included in the knowledge test applied exclusively for Kwaryja village residents. Xingu Park, 2006.

Variety name	Number of names
Munuwi ju'wi	12
Munuwi siãeko'i	9
Munuwi jakareape ayjmirang	8
Munuwi jakareape ayjpinimĩ	8
Munuwi tapy'yjãyriĩ	5
Munuwi akapejup	4
Munuwi py'wi uni	4
Munuwi wyraunajup	4
Munuwi jakareape ayjun	3
Munuwi py'wiuu	2
Munuwi py'wi ii	2
Munuwi teikwarapype ayjuni	2

Table 5-16. Descriptive statistics for Cultural Competence Scores and Knowledge Indexes about the names for all 27 peanut varieties (ki_kwa_all), for the 17 traditional ones (ki_kwa_trad), and for the 10 newly-created ones (ki_kwa_new). Kwaryja village, Xingu Park, 2006.

Statistics	Cultural Competence Scores (n=14)	Knowledge Indexes (n=27)		
		Ki_kwa_all	Ki_kwa_trad	Ki_kwa_new
Average	0.6861	0.4595	0.5969	0.2259
Standard deviation	0.2131	0.2772	0.3179	0.2669
Median	0.7477	0.4815	0.5882	0.1000
Min	0.1738	0.0370	0.0588	0.0000
Max	0.9182	0.9630	1.0000	1.0000

Table 5-17. Correlation coefficients between Cultural Competence Scores and Knowledge Indexes about the names for all 27 peanut varieties (ki_kwa_all), for the 17 traditional ones (ki_kwa_trad), and for the 10 newly-created ones (ki_kwa_new). Kwaryja village, Xingu Park, 2006.

Statistics	Knowledge Indexes		
	Ki_kwa_all	Ki_kwa_trad	Ki_kwa_new
Competence Scores	0.947*	0.982*	0.687*
Ki_kwa_all		0.730*	0.728*
Ki_kwa_trad			0.688*

* significant at the 0.01 level.

Table 5-18. Frequency, weighted frequency and proportion of missing data per variety about the names for 27 peanut varieties. Kwaryja village, 2006.

Variety name	Frequency	Weighted frequency	% missing data
Traditional varieties			
Munuwi py'wi	14	14.00	0.00
Munuwi tapy'yjã'yt	14	14.00	0.00
Munuwi ayjgwasiat	13	13.75	0.00
Munuwi takapeun	13	13.75	0.00
Munuwi ayjsingĩ	13	13.75	7.14
Munuwi takapesingĩ	12	13.19	14.29
Munuwi ayjsing	12	12.57	0.00
Munuwi teikwarapypepirangĩ	11	12.41	14.29
Munuwi emyamuku	11	12.02	7.14
Munuwi jakareape'i	11	11.81	14.29
Munuwi ayjmirangĩ	10	11.56	21.43
Munuwi wyrauna	10	11.19	21.43
Murunu	10	10.73	14.29
Munuwi teikwarapypepytangĩ	9	10.37	21.43
Munuwi myãpe'ĩ	8	9.07	7.14
Munuwi takapesingĩ uu	7	8.29	21.43
Munuwi uni	6	7.11	7.14
Munuwi ayjmirangĩ (*m. siãeko'i*)	5	5.71	7.14
Newly-created varieties			
Munuwi py'wi uu	11	12.34	0.00
Munuwi teikwarapype ayjuni	8	9.31	14.29
Munuwi py'wi ii	8	8.75	28.57
Munuwi akapejup	8	8.72	28.57
Munuwi teikwarapypepytangĩ (*m. ju'wi*)	6	7.41	7.14
Munuwi wyrauna (*m. py'wi uni*)	5	4.94	14.29
Munuwi jakareape ayjmirang	4	4.84	7.14
Munuwi jakareape ayjpinimĩ	3	3.82	28.57
Munuwi tapy'yjãyrii	3	3.73	28.57

Table 5-19. Analysis of variance for Cultural Competence Scores about names for peanut varieties, according to subgroups of Kaiabi individuals from Kwaryja village, 2006.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Peanut field in 2006	0.163	1	0.163	4.579	0.054	0.28
Error	0.427	12	0.036			
Total	0.590	13				
Nuclear family	0.287	6	0.048	1.100	0.445	0.49
Error	0.304	7	0.043			
Total	0.590	13				
Expanded family	0.170	2	0.085	2.227	0.154	0.29
Error	0.420	11	0.038			
Total	0.590	13				
Owned a peanut field	0.111	1	0.111	2.775	0.122	0.19
Error	0.480	12	0.040			
Total	0.590	13				
Age category	0.109	4	0.027	0.508	0.732	0.18
Error	0.482	9	0.054			
Total	0.590	13				
Political leader	0.078	1	0.078	1.823	0.202	0.13
Error	0.513	12	0.043			
Total	0.590	13				
Shaman	0.058	1	0.058	1.308	0.275	0.10
Error	0.532	12	0.044			
Total	0.590	13				
Still identify new peanut varieties	0.024	1	0.024	0.503	0.492	0.04
Error	0.567	12	0.047			
Total	0.590	13				
Gender	0.005	1	0.005	0.100	0.758	0.01
Error	0.586	12	0.049			
Total	0.590	13				
Age status	0.003	1	0.003	0.062	0.807	0.01
Error	0.587	12	0.049			
Total	0.590	13				
Paid job	0.003	1	0.003	0.062	0.807	0.01
Error	0.587	12	0.049			
Total	0.590	13				

Table 5-20. Descriptive statistics for Cultural Competence Scores about the names for peanut varieties, according to subgroups of individuals from Kwaryja village, 2006.

	N	Mean	Std	Median	Min	Max
Total	14	0.6861	0.2131	0.7477	0.1738	0.9182
Subgroups related to characteristics of individuals						
Gender						
Female	10	0.6743	0.2370	0.7705	0.1738	0.8914
Male	4	0.7156	0.1633	0.7032	0.5376	0.9182
Age status						
Elder	12	0.6921	0.2261	0.7705	0.1738	0.9182
Youth	2	0.6500	0.1590	0.6500	0.5376	0.7624
Age category						
Wawĩ	4	0.7601	0.1353	0.7833	0.5825	0.6440
Iyruo	6	0.6171	0.2834	0.7210	0.1738	0.8615
Iymani	1	0.6440				
Iywyruu	1	0.9182				
Kunumiuu	2	0.6500	0.1590	0.6500	0.5376	0.8914
Nuclear family						
Parisum	1	0.8336				
Tuiarajup	4	0.8094	0.1542	0.8685	0.5825	0.9182
Juikã	1	0.8080				
Arupajup	2	0.6885	0.0629	0.6885	0.6440	0.7330
Aramut	3	0.6777	0.1663	0.6339	0.5376	0.8615
Sirawan	2	0.4681	0.4162	0.4681	0.1738	0.7624
Jamut	1	0.3798				
Expanded family						
Parisum	1	0.8336				
Tuiarajup	5	0.8091	0.1336	0.8456	0.5825	0.9182
Arupajup	8	0.5908	0.2232	0.6390	0.1738	0.8615
Area of origins						
Xingu	9	0.7312	0.1778	0.8080	0.3798	0.9182
Teles Pires	3	0.6532	0.0757	0.6440	0.5825	0.7330
Kururuzinho	2	0.5326	0.5074	0.5326	0.1738	0.8914
Paid job						
Paid job	2	0.6500	0.1590	0.6500	0.5376	0.7624
Non paid job	12	0.6921	0.2261	0.7705	0.1738	0.9182
Political leader						
Leader	4	0.8040	0.1265	0.8269	0.6440	0.9182
Non leader	10	0.6389	0.2272	0.6835	0.1738	0.8615
Shaman						
Shaman	1	0.9182				
Non shaman	13	0.6682	0.2106	0.7330	0.1738	0.8914

Table 5-20. Continued.

Subgroups related to peanut management						
Peanut field in 2006***						
Cultivated	9	0.7665	0.1344	0.8336	0.5376	0.9182
No field	5	0.5413	0.2659	0.5825	0.1738	0.8080
Still identify new peanut varieties						
Not anymore	1	0.5376				
Still identify	13	0.6975	0.2173	0.7624	0.1738	0.9182
Ever cultivated a peanut field						
Cultivated	12	0.7224	0.1669	0.7705	0.3798	0.9182
Did not cultivate	2	0.4681	0.4162	0.4681	0.1738	0.7624

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-21. For all peanut varieties, analysis of variance for Knowledge Indexes about names for varieties, according to subgroups of Kaiabi individuals from Kwaryja village, 2006.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Age status	0.161	1	0.161	11.191	0.007	0.51
Error	0.158	11	0.014			
Total	0.318	12				
Gender	0.096	1	0.096	4.718	0.053	0.30
Error	0.223	11	0.020			
Total	0.318	12				
Still identify new varieties	0.096	1	0.096	4.719	0.053	0.30
Error	0.223	11	0.020			
Total	0.318	12				
Age category	0.207	5	0.041	2.619	0.121	0.65
Error	0.111	7	0.016			
Total	0.318	12				
Nuclear family	0.098	9	0.011	0.148	0.989	0.31
Error	0.220	3	0.073			
Total	0.318	12				
Peanut field in 2006	0.034	1	0.034	1.332	0.273	0.11
Error	0.284	11	0.026			
Total	0.318	12				
Expanded family	0.029	2	0.014	0.497	0.622	0.09
Error	0.290	10	0.029			
Total	0.318	12				
Paid job	0.006	1	0.006	0.209	0.656	0.02
Error	0.312	11	0.028			
Total	0.318	12				

Table 5-22. For all peanut varieties, descriptive statistics for Knowledge Indexes about the names for varieties, according to subgroups of individuals from Kwaryja village, 2006.

All	N	Mean	Std	Median	Min	Max
Total	13	0.2593	0.1629	0.2593	0.0370	0.6667
Subgroups related to characteristics of individuals						
Gender***						
Female	6	0.35187	0.1885	0.2778	0.1481	0.6667
Male	7	0.1799	0.0867	0.1852	0.0370	0.2963
Age status*						
Elder	4	0.42595	0.1876	0.3889	0.2593	0.6667
Youth	9	0.185189	0.0807	0.1852	0.0370	0.2963
Age category						
Wawĩ	1	0.4815				
Iyruo	2	0.4815	0.2619	0.4815	0.2963	0.6667
*Kujãmuku*fet	3	0.22223	0.0642	0.2593	0.1481	0.2593
Iywyruu	1	0.2593				
Kunumiuu	5	0.17778	0.0922	0.1852	0.0370	0.2963
Kunumiuga	1	0.1111				
Nuclear family						
Arupajup	1	0.4815				
Maraja	2	0.3519	0.4453	0.35185	0.0370	0.6667
Sirawan	1	0.2963				
Mairi	1	0.2593				
Parisum	1	0.2593				
Aritu	2	0.2222	0.1048	0.2222	0.1481	0.2963
Jamut	1	0.1852				
Juikã	1	0.1852				
Tafareiup	1	0.1852				
Tarirua	2	0.1852	0.1048	0.1852	0.1111	0.2593
Expanded family						
Arupajup	8	0.2963	0.1980	0.2778	0.037	0.6667
Parisum	4	0.2037	0.0710	0.22225	0.1111	0.2593
Tuiarajup	1	0.1852				
Paid job						
No paid job	12	0.26544	0.1685	0.2593	0.0370	0.6667
Paid job	1	0.1852				
Subgroups related to peanut management						
Still identify new peanut varieties***						
Still identify	7	0.33864	0.1756	0.2593	0.1481	0.6667
Not anymore	6	0.16667	0.0869	0.1852	0.0370	0.2963
Ever cultivated a peanut field						
Cultivated	10	0.27038	0.1807	0.22225	0.0370	0.6667
Did not cultivate	3	0.22223	0.0980	0.2593	0.1111	0.2963
Peanut field in 2006						
Cultivated	6	0.3148	0.2280	0.2778	0.0370	0.6667
No field	7	0.2117	0.0631	0.1852	0.1111	0.2963

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-23. For traditional peanut varieties, analysis of variance for Knowledge Indexes about names for varieties, according to subgroups of Kaiabi individuals from Kwaryja village, 2006.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Age category	0.471	5	0.094	3.040	0.090	0.68
Error	0.217	7	0.031			
Total	0.688	12				
Age status	0.351	1	0.351	11.488	0.006	0.51
Error	0.336	11	0.031			
Total	0.688	12				
Gender	0.246	1	0.246	6.123	0.031	0.36
Error	0.442	11	0.040			
Total	0.688	12				
Still identify new peanut varieties	0.236	1	0.236	5.747	0.035	0.34
Error	0.452	11	0.041			
Total	0.688	12				
Nuclear family	0.243	9	0.027	0.182	0.980	0.35
Error	0.445	3	0.148			
Total	0.688	12				
Peanut field in 2006	0.090	1	0.090	1.650	0.225	0.13
Error	0.598	11	0.054			
Total	0.688	12				
Expanded family	0.084	2	0.042	0.691	0.523	0.12
Error	0.604	10	0.060			
Total	0.688	12				
Paid job	0.041	1	0.041	0.697	0.421	0.06
Error	0.647	11	0.059			
Total	0.688	12				
Owned a peanut field	0.006	1	0.006	0.089	0.770	0.01
Error	0.682	11	0.062			
Total	0.688	12				

Table 5-24. For traditional peanut varieties, descriptive statistics for Knowledge Indexes about the names for varieties, according to subgroups of individuals from Kwaryja village, 2006.

trad	N	Mean	Std	Median	Min	Max
Total	13	0.3710	0.2394	0.3529	0.0588	0.9412
Subgroups related to characteristics of individuals						
Gender**						
Female	6	0.5196	0.2589	0.4412	0.2353	0.9412
Male	7	0.2437	0.1334	0.2353	0.0588	0.4706
Age status*						
Elder	4	0.6177	0.2609	0.5883	0.3529	0.9412
Youth	9	0.2614	0.1286	0.2353	0.0588	0.4706
Age category***						
Wawĩ	1	0.7059				
Iyruo	2	0.7059	0.3328	0.7059	0.4706	0.9412
*Kujãmuku*fet	3	0.3333	0.0899	0.3529	0.2353	0.4118
Iywyruu	1	0.3529				
Kunumiuu	5	0.2353	0.1500	0.2353	0.0588	0.4706
Kunumiuga	1	0.1765				
Nuclear family						
Arupajup	1	0.7059				
Maraja	2	0.5000	0.6240	0.5000	0.0588	0.9412
Sirawan	1	0.4706				
Aritu	2	0.3530	0.1664	0.3530	0.2353	0.4706
Mairi	1	0.3529				
Parisum	1	0.3529				
Tarirua	2	0.2942	0.1664	0.2942	0.1765	0.4118
Jamut	1	0.2353				
Juikã	1	0.2353				
Tafareiup	1	0.1765				
Expanded family						
Arupajup	8	0.4338	0.2829	0.4118	0.0588	0.9412
Parisum	4	0.2794	0.1213	0.2647	0.1765	0.4118
Tuiarajup	1	0.2353				
Paid job						
No paid job	12	0.3873	0.2425	0.3529	0.0588	0.9412
Paid job	1	0.1765				
Subgroups related to peanut management						
Still identify new peanut varieties**						
Still identify	7	0.4958	0.2446	0.4118	0.2353	0.9412
Not anymore	6	0.2255	0.1363	0.2059	0.0588	0.4706
Ever cultivated a peanut field						
Cultivated	10	0.3824	0.2663	0.2941	0.0588	0.9412
Did not cultivate	3	0.3333	0.1480	0.3529	0.1765	0.4706
Peanut field in 2006						
Cultivated	6	0.4608	0.3210	0.4118	0.0588	0.9412
No field	7	0.2941	0.1176	0.2353	0.1765	0.4706

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-25. For new peanut varieties, analysis of variance for Knowledge Indexes about names for varieties, according to subgroups of Kaiabi individuals from Kwaryja village, 2006.

Source	Sum of Squares	df	Mean Square	F	*p*-value	η2
Paid job	0.019	1	0.019	4.145	0.067	0.28
Error	0.049	11	0.004			
Total	0.068	12				
Nuclear family	0.048	9	0.005	0.795	0.654	0.70
Error	0.020	3	0.007			
Total	0.068	12				
Age category	0.013	5	0.003	0.334	0.878	0.19
Error	0.055	7	0.008			
Total	0.068	12				
Owned a peanut field	0.005	1	0.005	0.882	0.368	0.07
Error	0.063	11	0.006			
Total	0.068	12				
Age status	0.005	1	0.005	0.967	0.347	0.07
Error	0.062	11	0.006			
Total	0.068	12				
Expanded family	0.001	2	0.001	0.109	0.898	0.02
Error	0.066	10	0.007			
Total	0.068	12				
Peanut field in 2006	0.000	1	0.000	0.012	0.915	0.00
Error	0.068	11	0.006			
Total	0.068	12				
Gender	0.000	1	0.000	0.012	0.915	0.00
Error	0.068	11	0.006			
Total	0.068	12				
Still identify new peanut varieties	0.000	1	0.000	0.012	0.915	0.00
Error	0.068	11	0.006			
Total	0.068	12				

Table 5-26. For new peanut varieties, descriptive statistics for Knowledge Indexes about the names for varieties, according to subgroups of individuals from Kwaryja village, 2006.

	N	Mean	Std	Median	Min	Max
Total	13	0.0692	0.0751	0.1000	0.0000	0.2000
Subgroups related to characteristics of individuals						
Paid job***						
No paid job	12	0.0583	0.0669	0.0500	0.0000	0.2000
Paid job	1	0.2000				
Gender						
Female	6	0.0667	0.0816	0.0500	0.0000	0.2000
Male	7	0.0714	0.0756	0.1000	0.0000	0.2000
Age status						
Elder	4	0.1000	0.0816	0.1000	0.0000	0.2000
Youth	9	0.0556	0.0726	0.0000	0.0000	0.2000
Age category						
Wawĩ	1	0.1000				
Iyruo	2	0.1000	0.1414	0.1000	0.0000	0.2000
*Kujãmuku*fet	3	0.0333	0.0577	0.0000	0.0000	0.1000
Iywyruu	1	0.1000				
Kunumiuu	5	0.0800	0.0837	0.1000	0.0000	0.2000
Kunumiuga	1	0.0000				
Nuclear family						
Tafareiup	1	0.2000				
Arupajup	1	0.1000				
Jamut	1	0.1000				
Juikã	1	0.1000				
Mairi	1	0.1000				
Maraja	2	0.1000	0.1414	0.1000	0.0000	0.2000
Parisum	1	0.1000				
Aritu	2	0.0000	0.0000	0.0000	0.0000	0.0000
Sirawan	1	0.0000				
Tarirua	2	0.0000	0.0000	0.0000	0.0000	0.0000
Expanded family						
Tuiarajup	1	0.1000				
Parisum	4	0.0750	0.0957	0.0500	0.0000	0.2000
Arupajup	8	0.0625	0.0744	0.0500	0.0000	0.2000
Subgroups related to peanut management						
Still identify new peanut varieties						
Still identify	7	0.0714	0.0756	0.1000	0.0000	0.2000
Not anymore	6	0.0667	0.0816	0.0500	0.0000	0.2000
Ever cultivated a peanut field						
Cultivated	10	0.0800	0.0789	0.1000	0.0000	0.2000
Did not cultivate	3	0.0333	0.0577	0.0000	0.0000	0.1000
Peanut field in 2006						
Cultivated	6	0.0667	0.0816	0.0500	0.0000	0.2000
No field	7	0.0714	0.0756	0.1000	0.0000	0.2000

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-27. Proportion of Kaiabi farmers cultivating peanut varieties in their fields, according to nuclear and expanded families, and village of residence. Xingu Park, 2006.

	Nuclear family (n=61)	Expanded family(n=29)	Village (n=21)
M. py'wi	70.49*	79.31	90.48
M. jakareape'i	57.38*	68.97	80.95
M. ayjmirang ĩ	47.54*	58.62	66.67
M. takapesing ĩ	34.43*	51.72	57.14**
M. wyraunai	32.79 [a]	48.28	52.38
M. ayjsing ĩ	32.79*	48.28	61.9
M. tapy'yjã'yt	24.59*	41.38	42.86
M. ayjgwasiat	22.95[a]	37.93	47.62**
M. teikwarapypepirang ĩ	29.51*	37.93	47.62
M. teikwarapypepytang ĩ	24.59*	37.93	42.86
M. ayjsing	19.67 [a]	34.48	42.86
M. takapesing ĩ uu	8.20*	17.24	23.81
M. takapeun	34.43*	48.28*	52.38
M. myãpe'ĩ	18.03*	31.03*	28.57*
M. emyamuku	40.98*	44.83***	52.38*
M. wyrauna	24.59*	37.93**	42.86**
Murunu	6.56*	3.45*	19.05*

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

a. No variance within groups; statistics for these varieties could not be computed.

Table 5-28. Analysis of variance for the number of traditional peanut varieties under cultivation by nuclear families, according to subgroups of individuals. Xingu Park, 2006.

Source	SSS	df	Mean Sq	F	*p*-value	η2
Expanded family	440.305	28	15.725	2.059	0.025	0.64
Error	244.383	32	7.637			
Total	684.689	60				
Village	322.600	20	16.130	1.782	0.059	0.47
Error	362.089	40	9.052			
Total	684.689	60				
Seed management system	175.095	6	29.183	3.092	0.011	0.26
Error	509.593	54	9.437			
Total	684.689	60				
Peanut field in 2006	33.906	1	33.906	3.074	0.085	0.05
Error	650.782	59	11.030			
Total	684.689	60				
Aware about dangerous varieties	28.448	1	28.448	2.241	0.145	0.07
Error	393.552	31	12.695			
Total	422.000	32				
Past events for ident. new varieties	29.977	1	29.977	2.155	0.151	0.06
Error	486.833	35	13.910			
Total	516.811	36				
Area of origins	36.420	3	12.140	1.067	0.370	0.05
Error	648.269	57	11.373			
Total	684.689	60				
Male age categ	9.632	2	4.816	0.414	0.663	0.01
Error	675.057	58	11.639			
Total	684.689	60				
Paid job	8.257	1	8.257	0.720	0.399	0.01
Error	676.431	59	11.465			
Total	684.689	60				
Shaman	2.628	1	2.628	0.227	0.635	0.00
Error	682.061	59	11.560			
Total	684.689	60				
Still identify new peanut varieties	0.926	1	0.926	0.063	0.804	0.00
Error	515.885	35	14.740			
Total	516.811	36				
Male age status	0.197	1	0.197	0.017	0.897	0.00
Error	684.491	59	11.602			
Total	684.689	60				
Political leader	0.018	1	0.018	0.002	0.968	0.00
Error	684.670	59	11.605			
Total	684.689	60				

Table 5-29. Comparison of means for the number of traditional peanut varieties included in the knowledge test under cultivation by nuclear families, according to subgroups of individuals. Xingu Park, 2006.

	N	Mean	Std	Median	Min	Max
Total	61	5.30	3.38	5.00	1	14
Subgroups related to characteristics of individuals						
Village ***						
B. Alto	1	13.00		13	13	13
Iguacu	1	10.00		10	10	10
Muitara	1	10.00		10	10	10
Caiçara	2	9.00	0.00	9	9	9
Tres Buritis	1	9.00		9	9	9
Ilha Grande	1	8.00		8	8	8
Mupada	1	8.00		8	8	8
Kwaryja	7	7.71	3.04	8	3	13
Ipore	3	6.67	3.51	7	3	10
Tres Irmãos	1	6.00		6	6	6
Paranaita	2	5.50	0.71	5.5	5	6
Sobradinho	10	5.00	2.75	5	2	10
Capivara	11	4.18	3.95	2	1	14
Maraka Novo	1	4.00		4	4	4
Diauarum	7	3.86	2.67	4	1	9
Tres Patos	2	3.50	2.12	3.5	2	5
Faz. Kaiabi	1	3.00		3	3	3
Tuiarare	4	3.00	1.83	3	1	5
Itai	2	2.50	0.71	2.5	2	3
Pequizal	1	1.00		1	1	1
Samauma	1	1.00		1	1	1
Age status (male)						
Youth	19	5.21	3.75	3	1	13
Elder	42	5.33	3.24	5	1	14
Age categories (male)						
Iymani	16	5.94	3.97	5.5	1	14
Iywyruu	26	4.96	2.72	5	1	10
Kunumiuu	19	5.21	3.75	3	1	13
Area of origins						
Teles Pires	13	6.38	3.55	9	1	10
Xingu	33	5.36	3.26	5	1	13
Tatuy	9	4.56	4.30	2	1	14
Kururuzinho	6	3.67	1.37	4	2	5
Paid job						
No paid job	42	5.05	3.04	4	1	10
Paid job	19	5.84	4.06	5	1	14

Table 5-29. Continued.

	N	Mean	Std	Median	Min	Max
Expanded family **						
Tymafari	1	13.00		13	13	13
Kawe	1	10.00		10	10	10
Mairata	1	10.00		10	10	10
Jowyt	3	9.33	4.51	9	5	14
Amaypo	2	9.00	0.00	9	9	9
Parisum	1	9.00		9	9	9
Arupajup	4	8.50	3.11	7.5	6	13
Tamanauu	1	8.00		8	8	8
André	2	7.00	2.83	7	5	9
Kawitaii	5	6.20	3.11	7	3	10
Kaipa	1	6.00		6	6	6
Inamurap	2	5.50	0.71	5.5	5	6
Tuiarajup	2	5.50	3.54	5.5	3	8
Itapaje	2	5.00	5.66	5	1	9
Sirawe	10	5.00	2.75	5	2	10
Jerua	1	4.00		4	4	4
Juru	1	4.00		4	4	4
Myau'i	1	4.00		4	4	4
Myauo	2	4.00	0.00	4	4	4
Tarumani	2	3.50	2.12	3.5	2	5
Tuim	3	2.67	2.08	2	1	5
Peru	2	2.50	0.71	2.5	2	3
Kwat	4	2.25	0.50	2	2	3
Jyapa	1	2.00		2	2	2
Kupejani	1	2.00		2	2	2
Myau	1	2.00		2	2	2
Jawari	2	1.50	0.71	1.5	1	2
Kuni	1	1.00		1	1	1
Masia	1	1.00		1	1	1
Political leader						
Leader	22	5.32	3.12	5	1	10
Non leader	39	5.28	3.55	4	1	14
Shaman						
Shaman	6	4.67	3.27	4	1	9
Non shaman	55	5.36	3.41	5	1	14
Aware about dangerous varieties						
Aware	29	5.34	3.73	5	1	14
Non aware	4	2.50	1.29	2.5	1	4

Table 5-29. Continued.

	N	Mean	Std	Median	Min	Max
Subgroups related to peanut management						
Seed management system **						
A	3	9.33	1.15	10	8	10
C	3	9.00	3.61	8	6	13
D	7	7.71	3.04	8	3	13
A/b	6	5.00	2.45	5	2	9
B/d	10	5.00	2.75	5	2	10
Ba	11	4.64	3.44	3	1	10
Bb	21	3.95	3.23	3	1	14
Peanut field in 2006 ***						
Cultivated	56	5.52	3.31	5	1	14
No field	5	2.80	3.49	1	1	9
Past events for ident. new varieties						
Participated	22	6.50	3.60	6.5	1	14
Did not participate	15	4.67	3.92	3	1	13
Still identify new peanut varieties						
Still identify	11	6.00	3.85	6	1	14
Not anymore	26	5.65	3.84	5	1	13

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-30. Significance for comparison of means for the number of nuclear families growing each traditional peanut variety, according to subgroups of individuals. Xingu Park, 2006.

	Seed management systems	Expanded families	Village of residence	Field in 2006
M. Ayjgwasiat	0.421	0.217	0.028**	0.209
M. Takapesingĩ	0.049**	0.154	0.012**	0.487
M. Py'wi	0.503	0.205	0.834	0.009*
M. Takapeun	0.139	0.000*	0.130	0.789
M. Myãpe'ĩ	0.158	0.004*	0.006*	0.281
M. Emyamuku	0.004*	0.054***	0.003*	0.328
M. Teikwarapype pirangĩ	0.685	0.316	0.742	0.136
M. Ayjsing	0.411	0.110	0.161	0.985
M. Wyrauna	0.009*	0.038**	0.011**	0.189
M. Takapesingĩ uu	0.606	0.999	0.885	0.494
M. Ayjmirangĩ	0.008*	0.143	0.106	0.730
M. Jakareape'i	0.679	0.335	0.351	0.421
M. Wyraunai	0.048**	0.173	0.143	0.725
Murunu	0.133	0.000*	0.000*	0.544
M. Tapy'yjã'yt	0.154	0.280	0.106	0.808
M. Ayjsingĩ	0.135	0.105	0.137	0.533
M. Teikwarapypepytangĩ	0.935	0.858	0.644	0.189

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-31. Number and proportion of unique traditional peanut varieties under cultivation by Kaiabi expanded families. Xingu Park, 2006.

Expanded family	Villages	Number	Proportion
Jowyt	Capivara	16	94.12
Arupajup	Kwaryja	15	88.24
Kawitaii	Ipore / Faz. Kaiabi / Mupada	14	82.35
Sirawe	Sobradinho	14	82.35
Tymafari	B. Alto	13	76.47
André	Três Buritis / Diauarum	11	64.71
Tuiarajup	Kwaryja	10	58.82
Kawe	Iguaçu	10	58.82
Mairata	Muitara	10	58.82
Amaypo	Caiçara / Diauarum	9	52.94
Itapaje	Diauarum	9	52.94
Parisum	Kwaryja	9	52.94
Tamanauu	I. Grande	8	47.06
Tuim	Samauma / Diauarum / Tuiarare	7	41.18
Inamurap	Paranaita	6	35.29
Kaipa	Três Irmãos	6	35.29
Kwat	Itai / Diauarum	6	35.29
Tarumani	Três Patos	6	35.29
Perũ	Capivara	5	29.41
Jerua	Maraka Novo	4	23.53
Juru	Capivara	4	23.53
Myaui	Tuiarare	4	23.53
Myauo	Diauarum	4	23.53
Jawari	Capivara	3	17.65
Jyapã	Capivara	2	11.76
Kupejani	Capivara	2	11.76
Myau	Capivara	2	11.76
Kuni	Pequizal	1	5.88
Masi’a	Tuiarare	1	5.88

Table 5-32. Descriptive statistics for 17 traditional, 20 traditional, newly-created, and all unique peanut varieties cultivated by Kaiabi farmers. Xingu Park, 2006.

Group		Peanut varieties[a]			
of farmers	Statistics	17 Traditional	20 Traditional	New	All varieties
All Kaiabi farmers					
NF	Mean	5.30	5.41	1.31	6.72
7	St. Dev.	3.38	3.40	3.29	5.14
	Minimum	1	1	0	1
	Maximum	14	14	18	26
EF	Mean	7.41	7.45	2.28	9.72
4	St. Dev.	4.54	4.51	5.69	8.35
	Minimum	1	1	0	1
	Maximum	16	16	28	40
Elders	Mean	5.33	5.43	1.29	6.71
1	St. Dev.	3.24	3.28	3.32	4.80
	Minimum	1	1	0	1
	Maximum	14	14	18	26
Youngsters	Mean	5.21	5.37	1.37	6.74
10	St. Dev.	3.75	3.76	3.32	5.97
	Minimum	1	1	0	1
	Maximum	13	13	11	24
Kwaryja villagers					
All NF	Mean	7.71	8.14	7.71	15.86
9	St. Dev.	3.04	2.61	5.77	6.82
	Minimum	3	5	2	9
	Maximum	13	13	18	26
EF	Mean	11.33	12.33	15.33	27.67
6	St. Dev.	3.22	3.51	11.15	12.01
	Minimum	9	9	7	16
	Maximum	15	16	28	40
Elders	Mean	7.67	7.67	9.33	17.00
3	St. Dev.	1.53	1.53	7.77	8.54
	Minimum	6	6	3	9
	Maximum	9	9	18	26
Youngsters	Mean	7.75	8.50	6.50	15.00
12	St. Dev.	4.11	3.42	4.65	6.48
	Minimum	3	5	2	9
	Maximum	13	13	11	24

a) 17 traditional varieties refer to those included in the survey based on physical samples whereas 20 traditional include other varieties declared by farmers.
NF = nuclear family; EF = expanded family.

Table 5-32. Continued.

Group of farmers	Statistics	Peanut varieties[a] 17 Traditional	20 Traditional	New	All varieties
All farmers except Kwaryja villagers					
All NF	Mean	4.98	5.06	0.48	5.54
8	St. Dev.	3.32	3.35	1.54	3.50
	Minimum	1	1	0	1
	Maximum	14	14	6	14
EF	Mean	6.81	6.88	0.77	7.65
5	St. Dev.	4.31	4.31	1.86	4.84
	Minimum	1	1	0	1
	Maximum	16	16	6	20
Elders	Mean	5.15	5.26	0.67	5.92
2	St. Dev.	3.28	3.32	1.78	3.47
	Minimum	1	1	0	1
	Maximum	14	14	6	14
Youngsters	Mean	4.53	4.53	0.00	4.53
11	St. Dev.	3.48	3.48	0.00	3.48
	Minimum	1	1	0	1
	Maximum	13	13	0	13
All Kaiabi farmers					
All villages	Mean	8.48	8.76	2.86	11.62
13	St. Dev.	4.37	4.65	8.52	11.66
	Minimum	1	1	0	1
	Maximum	16	19	39	58

a) 17 traditional varieties refer to those included in the survey based on physical samples whereas 20 traditional include other varieties declared by farmers.
NF = nuclear family; EF = expanded family.

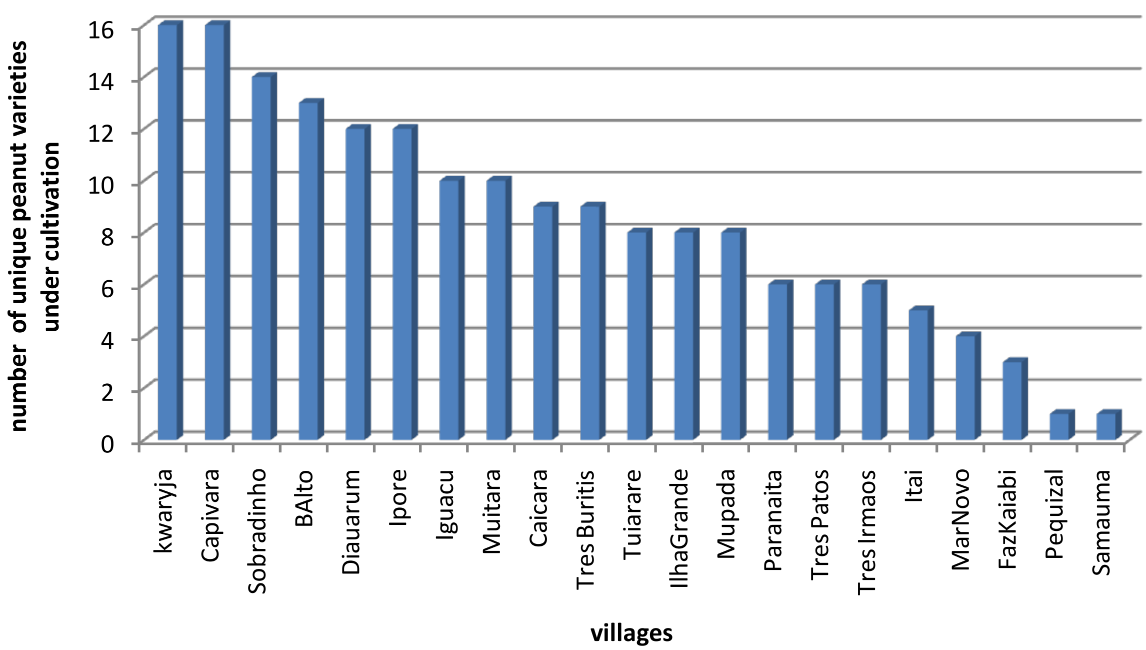


Figure 5-7. Number of traditional peanut varieties surveyed in 2006 under cultivation in Kaiabi villages. Xingu Park, 2006.

Table 5-33. Significance for comparison of means for the number of traditional, newly-created, and all unique peanut varieties cultivated by Kaiabi farmers. Xingu Park, 2006.

Group of farmers	Peanut varieties[a]			
	17Traditional	20 Traditional	New	All
All Kaiabi farmers				
NF x EF	0.015**	0.015**	0.312	0.039**
Elders x youngsters	0.897	0.950	0.928	0.987
Kwaryja villagers				
NF x EF	0.041**	0.067***	0.178	0.077***
Elders x youngsters	0.975	0.714	0.569	0.737
All farmers except Kwaryja villagers				
NF x EF	0.040**	0.041**	0.467	0.029**
Elders x youngsters	0.543	0.483	0.156	0.193
Kwaryja villagers x remaining farmers				
NF x NF	0.043**	0.023**	0.000*	0.000*
EF x EF	0.024**	0.045**	0.000*	0.000*
Elders X elders	0.200	0.224	0.000*	0.000*
Youngsters x youngsters	0.131	0.058***	0.000*	0.000*
All Kaiabi villages				
NF x village	0.001*	0.001*	0.237	0.010
EF x village	0.411	0.320	0.774	0.506

* Significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level.
NF = nuclear family; EF = expanded family.
a. 17 traditional varieties refer to those included in the survey based on physical samples whereas 20 traditional include other varieties declared by farmers.

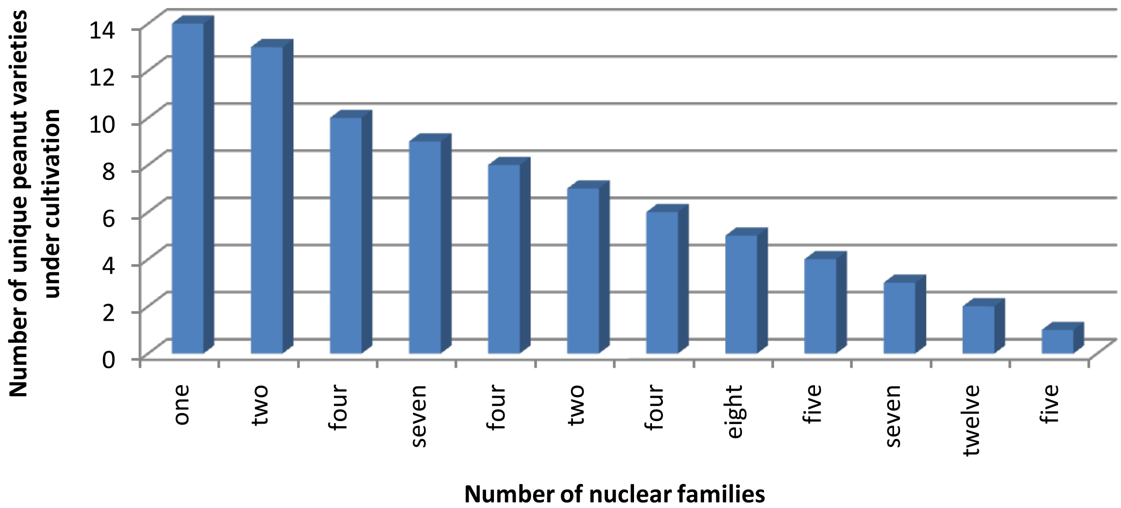


Figure 5-8. Number of Kaiabi nuclear families that were cultivating unique peanut varieties. Xingu Park, 2006.

Table 5-34. Proportion of Kaiabi nuclear families (NF) cultivating peanut varieties, according to peanut seed management systems. Xingu Park, 2006.

	A	A/B	Ba	Bb	C	D	B/D
Expanded families							
Total (n)	4	4	7	27	3	3	1
Cultivating peanut fields 2006 (n)	3	4	6	14	3	3	1
%	75.0	100.0	85.7	51.9	100.0	100.0	100.0
Nuclear families							
Total (n)	7	9	17	67	16	13	14
Cultivating peanut fields 2006 (n)	3	6	11	21	3	7	10
%	42.9	66.7	64.7	31.3	18.8	53.8	71.4
Varieties (n)	16	15	16	16	14	16	14
M. ayjgwasiat	33.3	33.3	27.3	9.5	66.7	28.6	20.0
M. takapesingĩ **	66.7	50.0	36.4	14.3	66.7	71.4	20.0
M. py'wi	100.0	83.3	81.8	57.1	66.7	85.7	60.0
M. takapeun	33.3	33.3	18.2	38.1	66.7	71.4	10.0
M. myãpe'ĩ	33.3	0.0	18.2	19.0	66.7	28.6	0.0
M. emyamuku *	66.7	16.7	45.5	14.3	33.3	71.4	80.0
M. teikwarapypepirangĩ	33.3	16.7	18.2	23.8	33.3	42.9	50.0
M. ayjsing	66.7	16.7	9.1	23.8	33.3	14.3	10.0
M. wyrauna *	33.3	16.7	27.3	14.3	66.7	71.4	0.0
M. takapesingĩ uu	33.3	0.0	0.0	9.5	0.0	14.3	10.0
M. ayjmirangĩ *	100.0	33.3	18.2	33.3	100.0	71.4	70.0
M. jakareape'i	66.7	66.7	45.5	52.4	100.0	71.4	50.0
M. wyraunai **	100.0	50.0	9.1	23.8	66.7	28.6	40.0
Murunu	33.3	16.7	18.2	0.0	0.0	0.0	0.0
M. tapy'yjã'yt	0.0	16.7	27.3	14.3	66.7	57.1	20.0
M. ayjsingĩ	33.3	33.3	27.3	19.0	0.0	28.6	30.0
M. teikwarapypepytangĩ	100.0	16.7	36.4	28.6	66.7	14.3	30.0

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-35. Proportion of Kaiabi farmers cultivating peanut varieties in their fields, according to expanded families. Xingu Park, 2000 and 2006.

	Expanded families	
Peanut varieties	2000 (n=29)	2006 (n=29)
M. py'wi	100.00	79.31
M. jakareape'i	48.28	68.97
M. ayjmirangĩ	79.31	58.62
M. takapesingĩ	51.72	51.72
M. takapeun	48.28	48.28*
M. ayjsingĩ	--	48.28
M. wyraunai	51.72	48.28
M. emyamuku	65.52	44.83***
M. tapy'yjã'yt	41.38***	41.38
M. wyrauna	27.59	37.93**
M. ayjgwasiat	31.03	37.93
M. teikwarapypepirangĩ	62.07	37.93
M. teikwarapypepytangĩ	--	37.93
M. ayjsing	44.83*	34.48
M. myãpe'ĩ	51.72	31.03*
M. takapesingĩ uu	--	17.24
Murunu	17.24***	3.45*
M. teikwarapypesingĩ	34.48**	--
M. jakareape ete	20.69*	--
Murunujũ	3.45***	--

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level
a. No variance within groups; statistics for these varieties could not be computed.

Table 5-36. Number of traditional, newly-created, and all unique peanut varieties cultivated by less than 20% of the farmers, those cultivated by only one, and varieties not under cultivation. Xingu Park, 2006.

	Peanut varieties[a]								
	Traditional			New			All		
Groups of farmers	< 20 %	One farmer	No cult	< 20 %	One farmer	No cult	< 20 %	One farmer	No cult[b]
All Kaiabi farmers									
NF (n=61)	7	1	0	41	32	0	48	33	0
EF (n=29)	5	2	0	41	32	0	46	34	0
Kwaryja villagers									
NF (n=7)	6	6	1	33	32	2	39	38	4
EF (n=3)	0	7	1	24	34	2	24	41	4
All farmers except Kwaryja villagers									
NF (n=54)	6	1	1	11	4	31	17	5	32
EF (n=26)	3	2	1	10	3	31	14	5	32

NF = nuclear family; EF = expanded family.

a) For each group of farmers: < 20 %= number of varieties cultivated by less than 20 % of the farmers; One farmer = number of varieties cultivated under cultivation by only one farmer; No cult = number of varieties that were not under cultivation by any farmer.

b) Includes one variety that came from the city that is not cultivated in Kwaryja village.

Table 5-37. Weighted frequency from cultural agreement about the correct names for 17 traditional peanut varieties and for 18 traditional peanut varieties and 9 newly-created varieties and proportion of nuclear families cultivating each variety, respectively for informants from all Kaiabi villages and from Kwaryja village. Xingu Park, 2006.

Variety name	All villages[a]		Kwaryja village[b]	
	Weighted frequencies	% NF / variety	Weighted frequencies	% NF / variety
N	149	92	14	7
Traditional varieties				
M. Py'wi	143.19	70.49	14.00	71.43
M. Ayjsing	132.91	19.67	12.57	14.29
M. Takapeun	126.77	34.43	13.75	57.14
M. Ayjsing ĩ	124.05	32.79	13.75	14.29
Murunu	116.57	6.56	10.73	0.00
M. Emyamuku	102.32	40.98	12.02	57.14
M. Ayjmirang ĩ	101.51	47.54	11.56	57.14
M. Ayjgwasiat	97.62	22.95	13.75	28.57
M. Teikwarapypepirang ĩ	89.96	29.51	12.41	42.86
M. Tapy'yjã'yt	83.65	24.59	14.00	42.86
M. Jakareape'i	79.88	57.38	11.81	71.43
M. Teikwarapypepytang ĩ	75.39	24.59	10.37	14.29
M. Takapesing ĩ	62.04	34.43	13.19	57.14
M. Uni / Wyraunai	47.22	32.79	7.11	14.29
M. Myãpe'ĩ	44.67	18.03	9.07	28.57
M. Wyrauna	36.98	24.59	11.19	57.14
M. Takapesing ĩ uu	34.1	8.2	8.29	14.29
M. Siãeko'i	--	--	3.82	14.29
New varieties				
M. Py'wi uu	--	--	12.34	42.86
M. Teikwarapype ayjuni	--	--	9.31	14.29
M. Py'wi i'i	--	--	8.75	14.29
M. Akapejup	--	--	8.72	57.14
M. Jakareape ayjmirang	--	--	4.84	0.00
M. Jakareape ayjpinim ĩ	--	--	3.82	28.57
M. Tapy'yjãyri ĩ	--	--	3.73	14.29
M. Ju'wi	--	--	1.18	14.29
M. Py'wi uni	--	--	0.00	0.00

a. $r^2_{WFreq\_\%NFcultVar} = 0.582$, significant at the 0.01 level.
b. $r^2_{WFreq\_\%NFcultVar} = 0.366$, significant at the 0.10 level.

Table 5-38. Knowledge transmission processes for the names for peanut varieties, according to Kaiabi age categories. Xingu Park, 2006.

	female			male				
	Aged	Middle aged	Young	Aged	Middle aged	Young	Very young	
Age category	*Wawĩ*	*Iyruo*	*Kujãmuku*fet	*Iymani*	*Iywyruu*	*Kunumiuu*	*Kunumiuga*	Total
Did you learn the names for the varieties? *								286
Yes	100.00	94.79	85.71	96.30	100.00	74.24	66.67	
At what age did you learn?*							70.73	203
< 7 years	15.38	5.97	25.00	20.00	17.86	0.00	0.00	9.36
8-11 years	53.85	25.37	0.00	35.00	39.29	13.46	50.00	28.08
12-15 years	15.38	34.33	37.50	20.00	25.00	19.23	0.00	25.12
> 15 years	15.38	19.40	0.00	15.00	7.14	19.23	0.00	15.76
Does not know the age	0.00	4.48	0.00	5.00	3.57	3.85	0.00	3.45
Does not know the names	0.00	10.45	37.50	5.00	7.14	44.23	50.00	18.23
When did you feel confident you learned the names? **								76
Learned at once	87.50	68.42	33.33	87.50	75.00	27.59	0.00	55.26
12-15 years	0.00	0.00	0.00	0.00	12.50	3.45	0.00	2.63
> 15 years	12.50	5.26	0.00	0.00	12.50	0.00	0.00	3.95
Does not know the names	0.00	26.32	66.67	12.50	0.00	68.97	100.00	38.16
In what opportunity did you learn? *								129
Accompanying family	62.50	55.26	50.00	80.00	76.47	31.71	0.00	52.71
Gardening	6.25	21.05	16.67	50.00	17.65	17.07	0.00	19.38
Harvest	31.25	15.79	33.33	0.00	29.41	4.88	0.00	15.50
Planting	12.50	2.63	0.00	30.00	29.41	9.76	0.00	11.63
Harvest/shelling or planting	12.50	15.79	0.00	0.00	0.00	0.00	0.00	6.20
Shelling	37.50	23.68	0.00	10.00	11.76	9.76	0.00	17.05
Others[a]	0.00	5.26	0.00	0.00	0.00	2.44	0.00	2.33
Does not know the names	0.00	15.79	50.00	10.00	11.76	53.66	100.00	27.13
Does not know how learned	0.00	0.00	0.00	0.00	0.00	2.44	0.00	0.78

a) Others: Adult visit parents/ cooking/ observing/seclusion.
* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table 5-38. Continued

	female			male				
	Aged	Middle aged	Young	Aged	Middle aged	Young	Very young	
Age category	*Wawĩ*	*Iyruo*	*Kujãmuku*fet	*Iymani*	*Iywyruu*	*Kunumiuu*	*Kunumiuga*	Total
How did you learn the names for the varieties? *								187
Told	77.27	75.81	37.50	75.00	76.92	36.17	50.00	64.17
Observing	9.09	6.45	0.00	10.00	3.85	6.38	0.00	6.42
Asking	4.55	4.84	12.50	0.00	11.54	4.26	0.00	5.35
Accompanying family gardening	4.55	0.00	12.50	10.00	0.00	2.13	0.00	2.67
Asking / told	4.55	3.23	0.00	0.00	0.00	2.13	0.00	2.14
Does not know the names	0.00	9.68	37.50	5.00	7.69	48.94	50.00	19.25
Who taught you the names for the varieties? *								191
Parents	68.00	52.38	57.14	60.00	55.56	27.66	0.00	49.21
Grandparents	8.00	12.70	0.00	5.00	11.11	8.51	0.00	9.42
Other family member	4.00	11.11	0.00	10.00	14.81	2.13	50.00	8.38
By herself-himself	8.00	6.35	0.00	5.00	0.00	2.13	0.00	4.19
Parents and grandparents	4.00	3.17	0.00	0.00	7.41	4.26	0.00	3.66
Parents and other family members	8.00	0.00	0.00	10.00	0.00	2.13	0.00	2.62
Spouse	0.00	0.00	14.29	5.00	3.70	0.00	0.00	1.57
Other	0.00	4.76	0.00	0.00	0.00	0.00	0.00	1.57
Mother/father-in-law	0.00	0.00	0.00	0.00	0.00	4.26	0.00	1.05
Does not know the names	0.00	9.52	28.57	5.00	7.41	48.94	50.00	18.32

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

CHAPTER 6
CONCLUSIONS

The broad goal of this dissertation has been to address the relations among social dynamics, culture, and crop diversity management by indigenous swidden cultivators in a globalized world. The main objective of this study was to analyze the role of historical and socio-cultural forces involved in the creation, use and management of crop resources among indigenous peoples living in the Amazonian region. Specifically, my research is a contribution to the study of indigenous peanut diversity management close to the center of origins for the crop, which is under-represented in the literature. To this end, I put forward research questions related to (1) the creation and management of crop diversity from an indigenous point of view; (2) the role performed by initiatives for recovering crop diversity based upon a historic event within the context of indigenous cultural revival; (3) patterns and factors influencing crop varieties movements among families and places; (4) the distribution of knowledge about names for crop varieties, and the distribution of peanut varieties present in farmers' fields; and (5) changes in knowledge transmission systems involving indigenous agrodiversity. Research questions were answered throughout the chapters of this dissertation, not always in linear sequence. Together they allowed me to discuss the hypotheses of the study, and comment on the implications of my results for crop diversity conservation and development schemes.

In this research, I concentrated on peanut diversity management performed by Kaiabi farmers while paying attention to other crops, particularly manioc. I studied the history of the group focusing on selected cultural features and, as much as possible, on agriculture. Then I looked at transformations in Kaiabi farming system, including environmental issues. Building upon this background, I discussed peanut diversity management and its variations among families and places, looking at the supernatural foundations for specific practices. I addressed the management and naming practices for both traditional and newly-created varieties while putting in evidence an historic event designed to recover crop diversity propelled by family memory, identity, and spiritual connections through shamanism. Following, I set out formal tests to unveil the distribution of knowledge about the names for peanut varieties as a proxy for knowledge about crop diversity management. Also, I investigated the distribution of varieties in farmers' fields through structured interviews. Finally, I examined the mechanisms of intergenerational transmission of knowledge for crop varieties and their names.

Summary of Test of Hypothesis

H1. Peanut diversity knowledge is unevenly distributed within the Kaiabi society. I hypothesize that although elders, particularly women, hold greater knowledge about crop diversity, shamans also exhibit great knowledge of peanut diversity, use and management.

The findings of Chapter 5 confirmed that indigenous societies are not uniform regarding the distribution of knowledge about plants among their members, presenting variations within subgroups of individuals (Zent and Maffi, 2007). For traditional peanut varieties, I identified two broad groups of individuals regarding their performance in the knowledge tests, each containing about half of the total number of informants. The main differences regarding knowledge about the names for peanut varieties for both groups of informants were due to membership to specific nuclear families and whether individuals were still practicing the selection of new peanut varieties.

In general, females and elders held greater knowledge of the names for traditional peanut varieties. However, differences in age were less strong for the more knowledgeable individuals, while gender was a weak marker of knowledge among those showing a lower level of knowledge for the names of the varieties. Qualitative analysis also showed the influence of age over differences in knowledge among subgroups of individuals related to area of origin and engagement in paid jobs. Moreover, experience with the crop showed weak differences regarding the knowledge level of individuals. Along with the strong sensitivity of knowledge related to involvement in selection practices, these results suggest a positive correlation between the use of knowledge tests about the names for crop varieties and diversity management knowledge and practice, in which the first can be effectively used for gauging the latter.

Concerning the knowledge of the names for new peanut varieties, tests carried out in Kwaryja village showed that only age status (elders x youngsters), and participation in events for selecting new peanut varieties showed significant differences. However, shamans as a category showed no differences in knowledge of the names for either old or new varieties. Only a single shaman performed above average in the knowledge tests, which was coordinating the selection of new varieties in Kwaryja village. This finding emphasizes the importance of articulating quantitative and qualitative approaches for analyzing subgroups of individuals, paying particular attention to their life histories for explaining individual decisions or behaviors related to knowledge about the name for peanut varieties and the rationale for crop diversity management (Nazarea, 2005; Heckler and Zent, 2008).

Altogether, the results show that the hypothesis does not hold completely, but also cannot be discarded entirely. In general elders and women held more knowledge than youngsters and men, and the condition of being shaman does not guarantee greater knowledge of the names for crop varieties. Clearly, the life history of specific individuals leads them to acquire and maintain differential knowledge about crops.

H2. There are differences in variety repertoire among Kaiabi families and villages. I hypothesize that the history of each specific variety (whether traditional or newly-created) is differently appropriated by individuals and families from different villages.

The distribution of traditional peanut varieties in farmers' fields revealed a gradient from common to rare traditional varieties. The distribution of varieties varied significantly across fields belonging to different families and villages, and according to the way seed management systems were organized. Moreover, in agreement with the literature (Salick et al, 1997; Brush, 2004; Emperaire, 2005), while most families kept a collection of a limited number of traditional peanut varieties, there were a few families dedicated to collecting most varieties. Contrasting with the traditional peanut varieties, all the newly-created varieties showed a strong concentration in only few fields, mostly belonging to Kwaryja villagers and those who received new varieties from this village. It is remarkable that only one farmer mentioned the cultivation of a single non-indigenous variety.

While there was consensus about the names for peanut varieties, part of the population living in different villages applied distinct names for peanut varieties. This practice was pronounced particularly for new varieties, even among people knowledgeable of the names for traditional varieties. In addition to naming practices, perception about the history of varieties informed farmers' decisions about management practices related to cultivating them in separated areas, or mixing similar varieties in the same plot. Therefore, the origins and previous management history of varieties may be lost, thus exposing the fluidity of indigenous crop resources (Emperaire, 2005, and Sadiki et al, 2007). This finding suggests that genetic makeup of local varieties is not static but rather evolves over time (Brown, 2000). Although apparently contradictory, these naming and management practices do not imply a denial of the ancestral origins for traditional varieties, nor of the sacred origins for the newly-created peanut varieties. Instead, it reflects both a loss of knowledge in the names for traditional varieties, and a trend to classify new varieties according to the names of those varieties already known. Moreover, it points to the enlargement of the political and economic autonomy of some families and villages, in this case to include claims for the legitimate right to name varieties.

In short, results showed that the history of traditional and newly-created varieties is differentially appropriated by individuals and families from different villages, validating my second hypothesis.

H3. After migration and intensification of inter-ethnic interactions, cultural revival efforts can reshape seed circulation systems. I hypothesize that old mechanisms were partially replaced by new ways of exchanging seed among Kaiabi families and villages.

Ideally, Kaiabi families keep the seeds of the same varieties received from parents and grandparents. Nevertheless, the biological material faces changes over time (Sadiki et al, 2007). I interpret this highly appreciated social value as aiming to strengthen the relative autonomy of the expanded family and its constituent nuclear families. Accordingly, results from Chapters 4 and 5 point to a limited circulation of peanut seeds among families and villages in recent years. However, narratives from elders referred to an active system for seed exchanges. This situation is influenced by the current weakening of the practice of inviting people from other villages to collaborate in key phases of the cropping system (*mosirup*). Also there is a general lack of interest in agriculture today, which impacts peanut cultivation. As such, it seems that the availability of peanut varieties has diminished. It is noted that members of a given family or village do not always take advantage of seeds available to increase diversity in their fields. Broad socio-cultural transformations affecting old and new generations have a role in this process (Rodrigues, 1993; Oakdale, 1996). In addition, seed exchanges are also deterred in some villages due to limited agricultural performance linked to poor land quality (depleted *Terra Preta* spots).

All mechanisms for seed exchange imply that the recipient is available to provide seeds back to those in need of them. Exchange of seeds within expanded families was the venue involving the greater number of single events for the circulation of varieties. However, in 2006 this mechanism was exercised in only a few villages. This pattern tended to circulate the same set of varieties locally, unless complemented by other mechanisms. Seed donations have represented the most important source for the re-entrance of traditional varieties and the arrival of new materials. Seed gifts played a similar role, but nowadays this mechanism is becoming uncommon. Taking seeds from the kitchen when serving as a staff member for political and educational meetings seems to be secondary, a compensatory mechanism partially replacing other means for acquiring seeds.

Nonetheless, the initiative for recovering peanut diversity underway in Kwaryja village has strengthened the practice of *mosirup*, thus promoting seed circulation. Although the village received only five peanut varieties in recent years, it was the major single source of old and new peanut varieties as donations to other families and villages, both in 2006 and preceding years. Moreover, delivering seeds was part of the strategy to divulge the connections between agriculture and the supernatural world, and the foundations for management practices. The drawback of such an approach to diversity management is the risk of other families relying on the village as a permanent source of seeds. Kwaryja fought this trend based on the moral imperatives demanding that each family is responsible to keep their own seeds, and the openness to deliver seeds to those in need. Overall, the strategies put forward by Kwaryja villagers point to a renewed continuity of old peanut circulation systems. In recent years, although contributing to reshaping seed exchange mechanisms, the initiative for recovering peanut diversity was concentrated in delivering varieties in the form of seed donations. In other villages, despite socio-cultural changes, old mechanisms are still kept operative although with seemingly less intensity now than in the past. Therefore, I found no evidence of replacement of mechanisms for seed exchanges, invalidating my hypothesis.

H4. According to their history of contact and inter-cultural interactions, indigenous peoples may face changes in their processes for agricultural knowledge transmission. I hypothesized that currently, organic knowledge transmission mechanisms have been partially replaced by institutionalized educational initiatives.

In Chapter 4 I emphasized the spiritual foundations for indigenous crop diversity, which are translated into human domains as guidelines for crop diversity management. Ideally, these relationships require the intermediation of a shaman, who can inform ordinary people about them (Travassos, 1984). In addition, shamans are entitled to urge people to follow the model prescribed by primordial beings when applying technology to their agricultural fields (Sullivan, 1988). Nevertheless, variation in agricultural technology is normally found in the villages. However, in Chapter 5 I demonstrated that inter-ethnic interactions and indigenous agency are accelerating changes in Kaiabi life in general (Oakdale, 1996) and agriculture particularly, as a result of new forms of entertainment, wage labor, transformation in social organization (weakening of *mosirup*) and changes in diversity management practices (selection of new varieties and concentration of peanut production in the hands of few families), among other characteristics.

In this context, old knowledge transmission processes, although still operating, seem to be facing serious obstacles as they are adapted to contemporary challenges. Two interconnected levels of potential problems surface. The first level relates to whether people actually learn the names for varieties and appropriate management of crops, and the second level is associated with the retention of knowledge. Results suggest that people learned and forgot the names for the varieties because they did not take advantage of opportunities to interact with crops and varieties afterwards. Thus, the problem is linked to lack of retention of knowledge by children or adolescents, which exposes a crisis in processes of knowledge transmission and maintenance. Currently the Kaiabi live a transitional period while negotiating a new synthesis for such processes. To address these issues, indigenous leaders are implementating intervention actions in cooperation with external advisors, including natural resources management (Posey, 1984; 1996; Rhoades and Nazarea, 1999; Moran, 1995; Schwartzman et al, 2000; Maffi, 2001; Nazarea, 2005; Viveiros de Castro, 2008). Specifically concerning agrodiversity, the initiative for recovering peanut varieties in Kwaryja village is also an attempt to anticipate such changes. The shaman in particular has devoted great effort to divulge knowledge about spiritual foundations for agriculture, crop diversity management and naming practices for varieties, mixing old processes and new elements when teaching his lessons. Actions exercised in Kwaryja village and by some leaders and residents from other villages, represent an open potential toward the new synthesis of agricultural knowledge transmission systems the Kaiabi are looking for.

Despite the institutional support that the Kaiabi have received in recent years, the nature of the new synthesis is still to be fully designed, including the role of families and the future of agriculture. I foresee something in between what the shaman in Kwaryja village envisioned and the possibilities offered by inter-ethnic interactions the Kaiabi enjoy. Nevertheless, under the current conditions, the hypothesis that agricultural knowledge transmission mechanisms had been partially replaced by institutionalized educational initiatives proved to not be substantiated.

Implications for Conservation and Development

The way the Kaiabi currently manage peanut diversity has important consequences for agrodiversity conservation. The rationale behind seed selection and the current pattern for seed circulation seems to promote genetic diversity, represented by local variants of the same peanut varieties (Freitas et al, 2007). However, pushed by both internal and external forces, the Kaiabi are facing a relative loss of importance in agriculture and their traditional diet as well as a dilemma for accommodating the demands imposed by the limited availability of *Terra Preta* for a growing population. The ultimate outcome of this process is reflected in agricultural technology transformations that include operations linked to the management of peanut diversity, which may result at least in the partial loss of these local variants of peanut varieties. Nonetheless, the Kaiabi are involved in an ongoing movement of ethnic resistance (Senra, 2001; 2004) that includes agriculture, which also values the role of primordial beings present in their cosmology and mythology. Moreover, crop diversity contributes to strengthen ethnic identity (Ribeiro, 1979; Villas Boas and Villas Boas, 1989; Rodrigues, 1993; Zimmerer, 1996; Perreault, 2005; Valdez et al, 2004; van Etten, 2006). Specifically, families and individuals are actively committed to conserving and expanding their patrimony of varieties. In this context, the shaman and other Kwaryja village residents are playing a remarkable role as keepers and re-creators of peanut diversity, and as disseminators of seeds and knowledge. However, there is also a risk involved in concentrating most of the diversity in one or a few fields. Ideally, an external backup system would be in place to more efficiently protect especially rare varieties (Almenkinders and de Boef, 2000; Jarvis et al, 2000; Brush, 2004). However, spiritual values, social organization and the knowledge associated with managing peanut diversity, which are essential components of the indigenous seed management system, cannot be captured by ex situ approaches (Ishizawa, 1999; Richards, 1985; Brush, 2004). Hence, a combination of *in situ* and *ex situ* approaches would be most suitable to promote the conservation of agrodiversity (Zimmerer, 1996; Qualset et al, 1997; Brush, 1999). Furthermore, indigenous varieties may contribute to enhance commercial varieties, bringing economic benefits to farmers and better supply of products for the society (Maxted et al, 2000; Freitas, 2007). Of course, it must be recognized that issues about germplasm ownership may deter the collection of indigenous varieties (Hawtin and Hodgkin, 1997; Carneiro da Cunha and Almeida, 2000; MacGuire et al, 2003; Bystrom, 2004; Brush, 2005; Soleri et al, 2007a; Jarvis et al, 2008). Moreover, current naming practices imply in a collaborative effort involving local people and scientists for identifying and collecting variation within varieties (Sadiki et al, 2007; Soleri et al, 2007). Therefore, political and technical issues demand attention in the collection of indigenous germplasm (Visser and Engels, 2000; Brush, 2004; Cleveland and Soleri, 2007a). For now, it is impossible to predict whether Kaiabi farmers will agree to deposit their varieties in gene banks, and under which conditions. To conserve indigenous agrodiversity and to maintain a productive physical environment for indigenous peoples, it is essential to promote policies that enhance the chances of upholding the socio-cultural settings and the landscape in which such diversity is generated, managed, and evolves through time (Altieri and Merrick, 1987; Oldfield and Alcorn, 1987; Collins and Hawtin, 1999; Cromwell and Oosterhoult, 1999; Louette, 1999; Brush, 2004).

Farmers keep crop varieties when it makes sense to them in their own cultural contexts (Bellon and Brush, 1994; Bellon, 1996; Rhoades and Nazarea, 1999; Brush 2004; Nazarea, 2005). It imperative to balance the influences of a globalized world while ensuring the application of appropriate mechanisms for benefit sharing over the use of indigenous crop diversity and the associated knowledge as inputs for modern agriculture. It is a good start for promoting conservation of crop resources and development of their indigenous keepers.

APPENDIX A
PREVIOUS AND INFORMED CONSENT

CONSENTIMENTO PRÉVIO E INFORMADO

Título da pesquisa: **Manejo local da agrobiodiversidade pelo povo Kaiabi, Parque Indígena do Xingu, MT**

1. Identificação do pesquisador:

Geraldo Mosimann da Silva, RG 2.092.3592-PR, CPF 428.532.739-20. Endereço: Rua Treze de Maio, 1158, apt 21, Curitiba, PR, 80.040-230, fone (41) 232.5004, e-mail: gerams@ufl.edu.

2. Instituição responsável pela pesquisa:

Universidade da Florida, Departamento de Geografia.
Endereço: University of Florida, Caixa Postal 117315, Gainesville, FL 32611-7315, Estados Unidos da America.

3. Locais onde serão realizadas as atividades:

Parque Indígena do Xingu, principalmente na aldeia Kwaryja Kaiabi, e pontualmente em outras aldeias Kaiabi.

4. Tempo previsto para realização dos trabalhos:

A primeira etapa acontecerá do final de maio até o início de agosto de 2004. Uma segunda etapa está prevista para a mesma época do ano, em 2005. Mais tarde, passarei cerca de um ano no Parque, mas a data ainda não está definida.

5. Objetivos da pesquisa:

A pesquisa envolve o modo como as pessoas trabalham para recuperar e conservar as variedades de plantas agrícolas. Isto inclui:

a) a caracterização das variedades das plantas da roça;
b) os cuidados dados para as variedades (manejo);
c) os trabalhos para recuperar e conservar estes materiais;
d) aspectos da organização social nas aldeias e famílias, incluindo o levantamento das relações de parentesco;
e) os aspectos relacionando as plantas agrícolas com a cultura do povo Kaiabi;
f) o mapeamento do uso da terras na aldeia Kwaryja Kaiabi;
g) o levantamento e cruzamento de informações sobre saúde / desnutrição e diversidade de roças.

1

6. Consentimento prévio e informado: Antes de iniciar o trabalho nas aldeias, a proposta de pesquisa foi apresentada para o Conselho de Caciques do Povo Kaiabi, na sede da Associação Terra Indígena Xingu, no PI Diauarum, em 23 de maio de 2004. Na reunião foi explicado o planejamento dos trabalhos, como base para a tomada de decisão sobre a autorização da pesquisa. Estiveram presentes Makupa Kaiabi – presidente da ATIX, Kamani Trumai – chefe do PI Diauarum/FUNAI, Mairawe Kaiabi, ex-presidente da ATIX, e as seguintes pessoas:

NOME	CARGO	ALDEIA
Kwatyra Kaiabi	Represetante	Barranco Alto
Yefuká Kaiabi	Cacique/ aux enfermagem	Capivara
Kupeap Kaiabi	Participante	Capivara
Yuwapan Kaiabi	Participante	Capivara
Ywaret Kaiabi	Participante	Capivara
Ame Suiá	Coord. Artesanato/ ATIX	Diauarum
Cleber Kaiabi	Participante	Diauarum
Itaikaré Kaiabi	Participante	Diauarum
Machado Kaiabi	Participante	Diauarum
Tumairu Kaiabi	Participante	Diauarum
Tarupi Kaiabi	Prof./ Diretor Executivo Adj	Diauarum
Alupá Kaiabi	Vice-Presidente	Diauarum
Siraju Kaiabi	Representante	Ilha Grande
Kamintai'i Kaiabi	Cacique	Kururu
Inamurap Kaiabi	Participante	Kururu
Tuiarajup Kaiabi	Cacique	Kwaruja
Arupajup Kaiabi	Participante	Kwaruja
Sirawan Kaiabi	Participante	Kwaruja
Yarete Kaiabi	Participante	Maraká
Yurumuk Kaiabi	Representante	Maraká
Mairatá Kaiabi	Representante	Moitara
Yapariwa Kaiabi	Professor	Pequizal
Piú Kaiabi	Participante	Sobradinho
Matari Kaiabi	Professor	Sobradinho
Muatari Kaiabi	Representante	Tres Irmãos
Tymaí Kaiabi	Auxiliar de Enfermagem	Tuiararé
Macia Kaiabi	Participante	Tuiararé
Tangeakatu Kaiabi	Participante	Tuiararé
Ypeu`ík Kaiabi	Participante	Tuiararé
Aturi Kaiabi	Professor	Tuiararé
Tafut Kaiabi	Participante	Yekwaí
Pyfaí Kaiabi	Representante	Yekwaí
André V. Boas	Coord. Programa Xingu	ISA
Paulo Junqueira	Coord. Adjunto Prog Xingu	ISA
Geraldo M Silva	Colaborador	UFI/ISA
Simone F. Athayde	Colaboradora	ISA

Em 21 de junho de 2004, a proposta de pesquisa foi apresentada e debatida na aldeia Kwaryja Kaiabi, com a presença dos homens Tuiarajup Kaiabi - cacique, Arupajup Kaiabi, Sirawan Kaiabi - professor e agente de manejo de recursos naturais, Parisome Panara, Juika Kaiabi, Arutari Kaiabi - agente de saúde, Aritu Kaiabi, apicultor, Jamut Kaiabi, apicultor; e as mulheres Karu Kaiabi, Wisi'o Kaiabi, Jepoi'i Kaiabi, Kyriyp Kaiabi, Irejup Kaiabi, Kwariup Kaiabi, Kwareajup Kaiabi, Juwekatu Kaiabi, Katu'i Kaiabi.

Em de 27 de julho de 2004 foi feita a leitura explicada do Termo de Compromisso do pesquisador, na aldeia Kwaryja. Estiveram presentes dos homens Tuiarajup Kaiabi - cacique, Arupajup Kaiabi, Sirawan Kaiabi - professor e agente de manejo de recursos naturais, Parisome Panara, Juika Kaiabi, Arutari Kaiabi - agente de saúde, Aritu Kaiabi, apicultor, Jamut Kaiabi, apicultor, Tararejup Kaiabi Panara, Peyape Kaiabi Suya - professor; e as mulheres Karu Kaiabi, Wisi'o Kaiabi, Jepoi'i Kaiabi, Wisi'o Kaiabi, Jepoi'i Kaiabi, Kyriyp Kaiabi, Irejup Kaiabi, Kwariup Kaiabi, Kwareajup Kaiabi, Juwekatu Kaiabi, Uteri Kaiabi, Katu'i Kaiabi.

Finalmente, em primeiro de agosto de 2004, o Termo de Compromisso do pesquisador e o presente documento foram debatidos na sede da ATIX, no PI Diauarum, com lideranças Kaiabi. Na ocasião, foi confirmada a autorização para a pesquisa. Nesta reunião estiveram presentes Makupa Kaiabi – presidente da ATIX, Kamani Trumai – chefe do PI Diauarum/FUNAI, Tuiarajup Kaiabi – cacique da aldeia Kwaryja, além das seguintes pessoas, que assinam este documento:

NOME	CARGO	ALDEIA
Tangeakatu Kaiabi	Participante	Barranco Alto
Kwatyra Kaiabi	Representante	Barranco Alto
Yefuká Kaiabi	Cacique/ aux enfermagem	Capivara
Jawari Kaiabi	participante	Capivara
Mazinho Kaiabi	aux enfermagem	Diauarum
Ame Suyá	Coord. Artesanato/ ATIX	Diauarum
Pipala Kaiabi	Lancheiro ATIX	Diauarum
Para Kaiabi	participante	Diauarum
Tumairu Kaiabi	Participante	Diauarum
Tarupi Kaiabi	Prof./ Diretor Executivo Adj	Diauarum
Jaikatu Kaiabi	representante	Ilha Grande
Kawitai'i Kaiabi	Cacique	Kururu
Arupajup Kaiabi	Participante	Kwarujá
Yapariwa Kaiabi	Professor	Pequizal
Oscar Kaiabi	Cacique	Tuiarare
André Kaiabi	Participante	Tuiarare
Chupe Kaiabi	participante	Tuiarare
Jepyk Kaiabi	participante	Tuiarare
Pasiyp	participante	Tuiarare
Sirawejup Kaiabi	participante	Tuiarare
Maci'a Kaiabi	Participante	Tuiararé
Tafut Kaiabi	Participante	Yekwaí
Pyfaí Kaiabi	Representante	Yekwaí
Geraldo M Silva	Colaborador	UFI/ISA

3

Makupa abriu a reunião, em língua Kaiabi, expondoseu objetivo e passando a palavra para o pesquisador, que leu e explicou o Termo de Compromisso. Após, pediu aos presentes se manifestassem. Inicialmente, Oscar ponderou que e difícil de entender o que uma pesquisa, que sempre precisa de esclarecimentos, para evitar confusões. Ele não tem acompanhado de perto os trabalhos no Kwaryja, mas no futuro vai querer acompanhar. Sugere que os índios participem ativamente do trabalho, para aprender a fazer.Fala que mais tarde talvez o pesquisador pode apoiar algum trabalho de interesse da comunidade. Aprova a pesquisa e diz que o termo de Compromisso pode servir de exemplo para o trabalho de outros não índios. O cacique Yefuka relembra uma conversa ocorrida na véspera da reunião, sobre os trabalhos na aldeia Kwaryja com ciência da roça, e sobre pesquisas no Xingu. Diz que precisa conhecer bem o trabalho do pesquisador para saber até onde pode autorizar, o que depende de cada tipo de pesquisa, como por exemplo, sobre sementes, redes, peneiras, parentesco, a proposta da EMBRAPA. Preocupa-se com propostas de pesquisa sobre medicina tradicional e pajelança. Diz que é preciso entender o que é pesquisa, e que existem alguns pesquisadores interessados em ajudar os índios, enquanto que outros trabalham apenas em benefício próprio. Preocupa-se com a exploração dos povos indígenas, e que as comunidades hoje tem interesse no dinheiro. Isto pode gerar brigas entre parentes. Diz que o Termo de Compromisso é bom para fiscalizar o pesquisador, principalmente quando é explicado ao vivo para o pessoal, para todos ouvirem. O trabalho no Kwaryja já vem sendo feito para apoiar as atividades do cacique Tuiarajup, por causa da história de seu pai. Agora, com a aprovação de projeto do PD-PI, o trabalho fica fortalecido, pode melhorar ainda mais. Diz que quando algum trabalho mexe com o patrimônio do povo todo, tem que beneficiar a todos. Diz que Tuiat levou o trabalho com sacrifícios no começo, mas ele é um cientista indígena, agora vai ficar mais fácil o trabalho dele. A proposta de pesquisa é boa, mas tem que saber até onde autorizar. Precisa sempre esclarecer como as pesquisas são feitas.

Yapariwa comenta que nem sempre é fácil para os mais jovens que entendem português explicarem para os velhos e para a comunidade nas aldeias as propostas que chegam. Kawitai'i fala em Kaiabi, dizendo que sente um pouco de ciúmes que pesquisadores levem o conhecimento, mas conhece o pesquisador Geraldo há anos e que aprova a pesquisa. Makupa faz uma consulta para alguns participantes, que manifestam-se favoráveis a pesquisa proposta, mas não fazem maiores comentários. Depois chama a responsabilidade de todos para as decisões tomadas coletivamente, que não é apenas o presidente da associação que toma decisões sozinho. Fala que, pelas manifestações dos presentes, entende que a pesquisa está autorizada, mas é bom o pesquisador Geraldo passar também por outras aldeias além do Kwaryja. Os participantes concordam com esta afirmação. O Termo De Compromisso é bom, Makupa conclui, dizendo que hoje o papel é a arma dos índios. O cacique Yefuka explica ainda a proposta para o levantamento dos tipos de sementes existentes em todas as aldeias Kaiabi, a ser realizado em maio de 2005, com participação do pesquisador Geraldo. Tuiarajup pede a palavra e explica o histórico de seu trabalho, incluindo a sua relação de trabalho conjunto com o pesquisador Geraldo desde 2000. Por isso, entende que é importante essa nova fase dos trabalhos, ele continuará seu trabalho na aldeia, com sua família, em parceria com o pesquisador, que trabalhará pela universidade. Tendo sido finalizados os comentários e debates, encerrou-se a reunião.

Diauarum, Primeiro de agosto de 2004.

Makupa Kaiabi
Pres. Assoc. Terra Indígena Xingu

Tuiarajup Kaiabi
Tuiarajup Kaiabi
Cacique da aldeia Kwaryja Kaiabi

Demais participantes
Sirawan Kaiabi
Arupa Kaiabi
Arutá kaiabi

APPENDIX B
QUESTIONS USED FOR INTERVIEWS AND KNOWLEDGE TESTS.

a) Interviews with key informants:

Do you know the work on recovering peanut varieties under way in Kwaryja village? Can you tell me your opinion about this initiative?
What are the relationship between this work and Kaiabi culture?
Can this work bring benefits for other villages? How?
How do you see the future of this initiative?
What a child must learn about agriculture in order to be an efficient adult?
How do children learn the names for peanut varieties?
At what age should they learn?
Are there differences between the time of your childhood and today? Can you expand on this? What changed, how, why?
Village schools have a role in teaching agriculture for children? Can you expand on this? What changed, how, why?
Would you like to provide any other comment about peanut cultivation you think is relevant for understanding how the Kaiabi manage the crop?

b) Knowledge tests about the names for each peanut variety (based on free examination of physical samples of each variety)

Are you familiarized with this peanut variety? (Yes or No.)
Do you know the name foe this variety? (Yes or No.)
What is the name for this variety?

c) Survey of crop diversity under cultivation in family fields

c.1) For each peanut variety, based on physical samples: Do you have this variety in your field? (Yes or No.) Can you add the name of any variety you know and was not included in this survey?
c.2) For manioc varieties, based on a list of varieties presented to each farmer: Do you have this variety in your field(s)? (Yes or No.) Can you add the name of any variety you know and was not included in this survey?

d) Unstructured interviews with villagers

Have you ever cultivated a peanut field on your own?
Did you have a peanut field (for the 2006 cropping season)?
Are you aware about the existence of dangerous peanut varieties?
Did you ever participate in events for selection new peanut varieties?
Do you still perform this practice?
When you do not have a variety of interest, from where do you get it?
Why are you interested in keeping these varieties in your field(s)?
Do you grow varieties with the specific purpose of multiplying them?
Can you talk about this work?

Did you receive seeds of any peanut variety from other farmer(s) during the last year? Can you name the varieties?
Did you provide seeds of any peanut variety for other farmer(s) during the last year? Can you name the varieties?
Would you like to provide any other comment about peanut cultivation you think is relevant for understanding how the Kaiabi manage the crop?

e) Focus group with women, in Kwaryja village

Can you talk about the uses for peanuts?
Are there any differences in use according to specific varieties?
How do you organize the distribution of available food among the members of your family?
When you do not have a variety of interest, from where do you get it?
What is the role of female works related to crop seeds?
Do you use to participate in *mosirup*?
Would you like to provide any other comment about peanut cultivation you think is relevant for understanding how the Kaiabi manage the crop?

f) Knowledge transmission dynamics

Did you learn the names for peanut varieties?
At what age did you learn the names for peanut varieties?
When did you feel confident you learned the names?
Who taught you the names for peanut varieties?
How were you taught the names for peanut varieties?
In what opportunity did you learn the names for peanut varieties?

APPENDIX C
KAIABI POPULATION

Table C-1. Kaiabi population according to age intervals and gender. Xingu Park, 2007. Source: DSEIX (2007).

		Age intervals (years)							
		<10	10 - <15	15 - 24	25 - 34	35 - 44	45 - 59	60 +	total
All places*	Total	411	171	195	123	65	51	38	1210
	Male	201	77	104	57	34	26	17	591
	Female	236	86	93	66	30	25	21	626
Diauarum**	Total	73	30	32	27	15	10	4	191
	Male	37	13	19	13	10	4	1	97
	Female	43	17	13	14	5	6	3	101
Tuiarare	Total	61	28	29	17	10	11	7	163
	Male	33	11	18	7	4	5	5	83
	Female	31	17	11	10	6	6	2	83
Capivara***	Total	39	24	38	18	8	12	5	144
	Male	19	9	24	10	4	7	2	75
	Female	20	15	14	8	4	5	3	69
Sobradinho	Total	39	21	9	14	3	4	5	95
	Male	18	10	5	6	1	2	3	45
	Female	21	11	4	8	2	2	2	50
Kwaryja	Total	38	19	13	13	4	3	2	92
	Male	19	10	7	6	3	2		47
	Female	20	9	6	7	1	1	2	46
Ilha Grande	Total	29	9	12	9	4	3	2	68
	Male	9	6	7	5	0	2	1	30
	Female	21	3	5	4	4	1	1	39
Três Irmãos	Total	21	7	9	10	2	4	1	54
	Male	13	3	3	5	2	1	1	28
	Female	12	4	6	5	0	3		30
Ipore	Total	18	6	11	7	2	2	2	48
	Male	10	3	5	2	2	1	1	24
	Female	10	3	6	5	0	1	1	26
Paranaita	Total	16	8	8	3	5	1	2	43
	Male	6	5	1	1	2	1		16
	Female	11	3	7	2	3	0	2	28
Três Patos	Total	15	6	11	0	2	2	2	38
	Male	7	3	6	0	1	1	1	19
	Female	8	3	5	0	1	1	1	19
Muitara	Total	18	4	8	2	3	1	0	36
	Male	7	1	4	1	2	0		15
	Female	12	3	4	1	1	1		22
Maraka	Total	11	7	9	3	3	0	1	34
	Male	2	2	6	1	2	0		13
	Female	9	5	3	2	1	0	1	21

* The table does not count residents of the Tujuju Post (16 persons) who were not interviewed for this research.
** Diauarum population includes residents of Samauma and Três Buritis villages.
*** Data for Capivara village were collected in 2006.

Table C-1. Continued.

		Age intervals (years)							
		<10	10 - <15	15 - 24	25 - 34	35 - 44	45 - 59	60 +	total
B. Alto	Total	16	2	6	5	2	1	0	32
	Male	8	0	1	3	0	1		13
	Female	10	2	5	2	2	0		21
Pequizal	Total	10	5	4	4	0	4	2	29
	Male	4	2	3	2	0	2	1	14
	Female	7	3	1	2	0	2	1	16
Caiçara	Total	4	3	6	0	2	0	4	19
	Male	1	2	2	0	1	0	2	8
	Female	4	1	4	0	1	0	2	12
Iguaçu	Total	6	1	7	0	1	1	0	16
	Male	4	1	3	0	0	1		9
	Female	2	0	4	0	1	0		7
Mupada	Total	4	2	4	0	2	0	2	14
	Male	1	1	2	0	1	0	1	6
	Female	5	1	2	0	1	0	1	10
Onze	Total	3	1	5	1	1	1	1	13
	Male	2	1	3	0	0	1		7
	Female	1	0	2	1	1	0	1	6
Itai	Total	6	1	2	1	0	1	1	12
	Male	4	0	1	0	0	1		6
	Female	2	1	1	1	0	0	1	6
Faz Kaiabi	Total	4	1	3	1	1	0	0	10
	Male	0	1	2	0	1	0		4
	Female	4	0	1	1	0	0		6

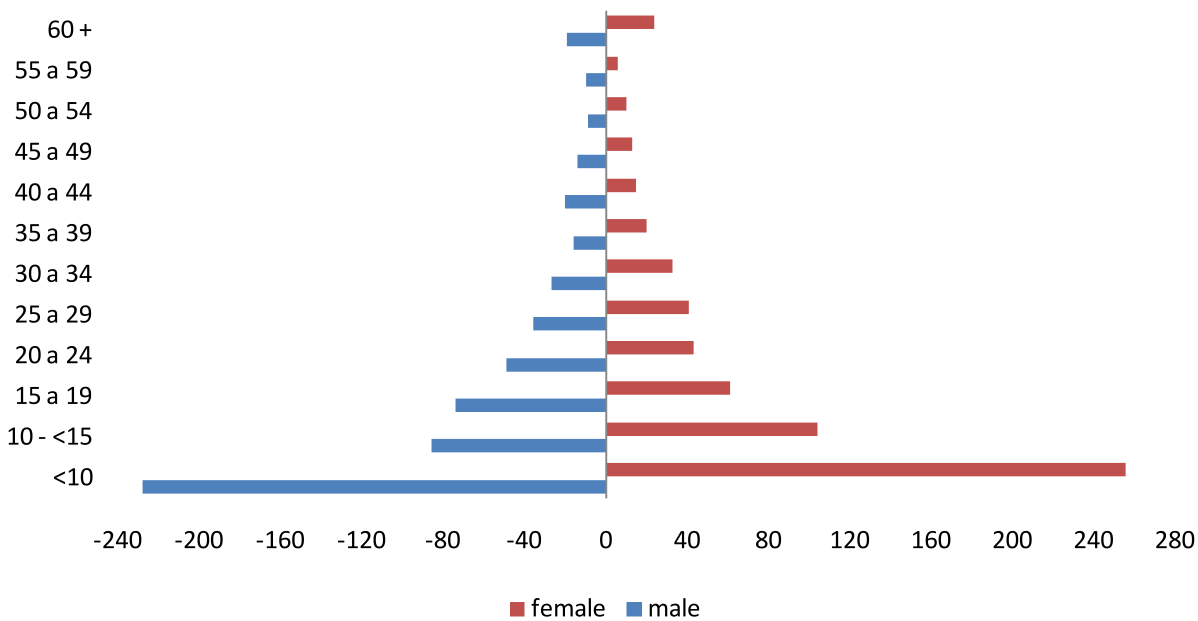


Figure C-1. Kaiabi population pyramid. Xingu Park, 2007. Source: DSEIX (2007).

APPENDIX D
KUPEIRUAEM PORONGYTA (MYTH OF *KUPEIRUP*)

By Matari, Jemy, Aturi, Eroit, Awatat, Awasiu, Sirawan e Tangeu'i Kaiabi[1]

In the beginning of time, there was no such food as maize, manioc, peanuts, beans, peppers, yams, sweet potatoes, gourds, and cotton. The Kaiabi people were hungry, feeding only on wild fruits such as palm fruits (such as inajá, tucum, buriti), Brazilian nuts, cacao, wild bananas and honey. Kaiabi people used to settle in sites with abundant concentration of inajá and tucum palms; staying there for a long time. Kaiabi people also planted these palms as crops, and the place where they buried the palm fruits were considered to be their swidden garden plots.

For years and years, Kaiabi people endured this situation. Until a widow, named *Kupeirup*, felt a desire to better feed her sons. Her sons went searching for honey but found just a little honey. They went to gather fruits; but fruits were hard to find. The palms they had planted took too long to produce fruits. So, *Kupeirup* got tired of seeing her sons starving, and she started to think about a better way for her sons to have a better life. *Kupeirup* approached her sons saying:

- Oh, my sons! I feel so sorry for you, you always try hard but you are not succeeding in getting fruits and honey. The trees you planted grow slowly and take too long to produce fruits. Now I want you to work, you must slash down trees and open a big garden field. When the day to burn the slashed down trees arrives, you must take me to the center of this field and set fire. I will burn and food will appear.

Her sons listened carefully to her words and became sad. They replied:

- How can we do this evil to you? You are our mother, we need you! How can we do such a thing to you?

The mother, *Kupeirup*, replied:

- If you do not burn me, you will never have food.

The sons say:

- We strongly feel lack of food, but we are not going to burn the field; that is bad for us.

But their mother insistently stated:

- My sons, I know you are concerned with me but there is nothing to worry about; you can burn me. I will revive and we will be together again. In the day you are going to burn the field you cannot walk by the area nor look back at it. You must keep joy because I will do it for you.

The sons then accepted their mothers's request. Though they were still sad, they cleared the field. After the sons had finished their task, *Kupeirup* explained an additional task to them.

- My sons, it is time to burn the garden. You will burn me too, but you are not supposed to be afraid to cause me harm; I will live again. I will take the shape of an agouti and I will be at the border of the field. You need to prepare a trap to catch me. Do not let me escape, otherwise I will not return to you. When you start burning the field, call my name loudly. I will listen and send the food to the garden. After burning the field, you must go to someplace far away. Look

[1] Village teachers, Xingu Park. This narrative was collected by Estela Wurker, and published in Silva and Athayde (2002). Explanation for crop species and names for food dishes mentioned in the myth can be found in chapters two and three.

for a place with plenty of fruits and stay there until you see a sign in the sky. First, a *curica*[2] will fly over, and then you will know that maize is blooming. A little later you will see a second sign; a pack of *curica* will fly over. When that occurs, you can come back to see the garden; produce will be ready for harvesting and ready to eat. You will never starve again because a lot of food will be there.

Kupeirup also taught her sons how to prepare and how to eat the soon-to-be food, explaining:

- When the plants sprout and produce fruits in the garden, you cannot eat them immediately. Maize you can roast or boil, but do not eat it raw because it is bad for your health. Women can prepare porridge mixing maize and peanuts. First, pound maize and peanut, each at a time, in a wooden mortar, then add water and put it to boil in a cooking pot. You need to cook it well. After cooling down, shred sweet potato and add it to sweeten the porridge. Manioc you need to soak in water. Once it is softened, sundry it and then pound it in a mortar. Afterwards, sieve and roast in a flat pan. Done; you will have manioc flour! You can prepare beiju (cassava bread) and kanape. You can use manioc flour and cassava bread while eating meat and fish. You must shred sweet manioc and squeeze out the juice. Throw away the mass and put the juice to boil. Cook it well, and then add sieved pounded maize that is not ripe yet. That is delicious! You can eat fava beans cooked, or prepare mutap with fish and pepper. Pepper is to seasoning the food; you can use it when preparing mutap of meat and fish. Yams and taro can be eaten boiled or roasted or you can prepare a beverage of it. You can also prepare mutap with cocoyam and meat and fish. Sweet potatoes you can eat cooked and roasted, or to prepare *kawĩ*.

Gourds can be used as plate; you split the gourd into two halves, and then let them soak in water. After the inner part is softened, sun dry the two halves. Then, burnish them and paint the inside to look nice, and use it to eat and to drink *kawĩ*. *Janyrũ* (another kind of gourd) can be used to store tucum and inajá palm oil. Women may use cotton, to make yarn and hammocks for you to sleep.

Kupeirup further stated: from now on you will never starve, because you, my children, and your descendants, will have food in abundance. You will no longer need to rely on wild fruits only.

Nowadays, we continue following the lessons of *Kupeirup*. *Kupeirup* also taught her sons how to take care of crop seeds, in order for them to have plentiful material. She taught them how to harvest and properly store the seeds.

Kupeirup said:

- Do not spoil the food. If you take care of the seeds, they will last forever and all the people on earth will know them.

Kupeirup spent several days explaining and giving directions about all activities involved in farming. At the end she said:

- Now it is time to burn the garden. Take my hammock to the center of the field; I will be lying down in the center. So did her sons. They took their mother and her hammock to the center of the garden. There she asked them to burn the field. Her sons started a fire at the edge of the garden plot while shouting her name:

- *Orokoapy ore enee waip Kupeiruiruwa ko,o,o,o,o*. (Lady *Kupeirup*, we are burning the garden for you).

---

[2] *Curica* is a parrot-like bird of the family Psittacidae.

She heard her sons calling her, and she sent food into the garden. While the garden plot was burning, her sons looked into the fire. From the center of the garden, from the middle of the flames, they heard a strong outburst similar to the strike of thunder. The sons of Lady *Kupeirup* left crying. Then they searched for a place with abundant fruits and waited for the sign their mother had foretold.

Days and months went by. When the first sign arrived (a *curica* flying over their heads) they became happy and said:

- Our food is almost ready, maize and fava beans are blooming.

After two months. A flock of *curica* parrots flew over their heads. They knew now that the produce was ripe, and they marched to the garden. Upon arriving at the garden, they saw all types of food: maize, yams, manioc, fava beans, taro, cocoyam, peanuts, gourds and *janyrũ*, and cotton. The sons of *Kupeirup* got really happy to see such an abundance of food, and said:

- Our mother planted all these things for us. Now we need to find her to complete our joy.

The sons looked for the agouti and found it in a hole at the edge of the garden plot. They made a trap to catch the agouti. However, at that time there was a transformer named *Maramu'jangat*. *Maramu'jangat* used to transform people into animals because there were almost no animals, and he wanted to increase the animal population. When the sons were setting the trap for the agouti, *Maramu'jangat* approached them and asked:

- What are you guys doing?

The sons of *Kupeirup* replied:

- We want to catch our mother.

Maramu'jangat said:

- Let me do this for you, *Maramu'jangat* offered.

The sons of *Kupeirup* replied:

- No, we are going to catch our mother by ourselves. The brothers said.

Then *Maramu'jangat* said farewell to the brothers and left. In reality, *Maramu'jangat* did not leave, but rather he was hiding nearby. When the brothers were almost about to catch their mother, *Maramu'jangat* suddenly appeared and asked again:

- What are you guys doing?

The power of *Maramu'jangat* scared the brothers which resulted in their mother's escape. Their mother *Kupeirup* run away crying like an agouti:

- *We, we, we, we, we.*

Maramu'jangat had transformed *Kupeirup* into an agouti, and he added:

- From now on, agouti will inhabit old fallows and gardens to eat maize.

That is why nowadays agouti likes to live in old fallows and to eat maize in the gardens. In times long ago, elders did not let children eat agouti meat; only elders could eat agouti meat. When children will eat agouti, this will cause sickness. Children will get a wound similar to a burn wound; because agouti was burned in the first garden. Nowadays we still do not allow our children to eat agouti meat.

Afterwards, the brothers (sons of *Kupeirup*) left the garden plot and roasted maize to eat. But the brothers did not show maize to other people. The brothers always ate maize without other people knowing it. Until one day, people found out that the brothers had food, and they ask them to share it. The brothers were married. One time they went to the garden to eat maize along with their wives, and while they were roasting maize, *Maramu'jangat* approached them again, saying:

- You are eating maize.

The brothers replied:

- We are eating what our mother planted for us.

The brothers offered nothing to *Maramu'jangat*. *Maramu'jangat* said farewell and walked a little far from them. *Maramu'jangat* was out of sight, yet watching the brothers. Suddenly he shouted:

- You are eating maize!

With his power, *Maramu'jangat* transformed the brothers and their wives into monkeys, and he said:

- Monkeys will be found torning apart men's arrows.

Then *Maramu'jangat* left. From now on, these brothers did not enjoy the food their mother *Kupeirup* had planted for them, only other people enjoyed the food.

The following food appeared like this, every part of *Kupeirup*'s body transformed into produce:

- Her teeth transformed into maize;
- Her hair turned into maize hair and cotton;
- Her nails turned into peanuts;
- Her legs transformed into manioc;
- Her hands turned into manioc leaves;
- Her head turned into gourd;
- Her brain transformed into yams, and gourd's inner part (that is why gourd's inner part resembles the human brain);
- Her fingers turned into pepper;
- Her thighs transformed into sweet manioc;
- Her breast milk turned into sweet manioc juice;
- Her liver transformed into taro and cocoyam;
- Her vagina transformed into fava beans;
- Her heart turned into sweet potato.

APPENDIX E
KAIABI CROPPING PATTERNS

This Appendix explains Table 3-2.

Indigenous farming systems in the Amazon can accommodate different arrangements in cropping patterns, including dynamic combinations to better explore environmental, dietary and even market opportunities in specific cultural settings (Beckerman, 1987; Denevan, 2001). Agronomically speaking, the Kaiabi perform all the variations in crop arrays found in the literature. It is essential to keep in mind that Kaiabi farmers carefully select microenvironments where to plant each crop / combination in order to take maximum benefits and to expose their multicropping systems to minimum detrimental ecological relations, considering all factors involved. Based on this framework their gardens may feature the following arrays[3]:

Mixed cropping means that the crops do not follow a strict array. There are three subgroups in this type of array: beans and favas are commonly planted close to burned trunks, and are commonly scattered in the middle of maize. Squash and gourd ordinarily are placed in the borders of the field, where eventually favas are also grown. These two groups of crops are the first to be planted. Papaya seeds are tossed on the ground, or birds drop it, thus it can grow in any place. All these crops are exclusive for *Terras Pretas*.

Small patches includes minor crops which are planted in small quantities, in general in one, two or three short row arrays, scattered in the swidden. Some of them, such as peppers, ginger and curcuma, can be present in home gardens. Pineapple eventually is planted in this way. All these crops but pineapple are exclusive for *Terras Pretas*.

Row cultivation includes several crops that are found both intercropped and in relay arrays. Cotton is usually planted in relatively small quantities in two or three rows, associated with other crops such as manioc/macaxeira, maize, and sweet potato. Pineapple is almost exclusively arranged in monocrop rows, sometimes in the border of an internal trail, or where other crops are present in low densities. Water melon is among the first crops to be sowed, in rows, where later in general maize and manioc can be interplanted. Although bitter and sweet manioc yield well in red soils, in villages where there are *Terras Pretas* enough available, these crops are found also in multicropping systems. Bitter and sweet manioc, cotton and bananas can be found dividing patches of different varieties of peanut.

Monocrop patches refers to cluster dominated by just one crop. While some crops can be planted in patches, they also appear in associations, such as maize, sweet potato, manioc/macaxeira, and bananas. Other crops are found almost exclusively as monocrop, such as yams, taro/cocoyam, peanut and sugar cane. Sugar cane frequently is put in a border of the garden, adjacent but somewhat apart from other crops. These arrays are more commonly found on *Terras Pretas*.

There are two groups of plants in *relay array*: the taller, such as cotton, maize, manioc / macaxeira, and banana, and the plants which stand close to ground, such as sweet potato and peanut. Note that maize can be in a relative position, being harvested before manioc, which still then grows alone for one year, or so, or being harvested before shorter plants such as peanut or

[3] Berta Ribeiro (1979) and the Villas Boas brothers (1989) presented the first descriptions of the Kaiabi agricultural system. I consider the differences on their information and mine to be part of the inherent variation in agricultural practices among the Kaiabi families from different villages, and due to the specific focus of their publications.

sweet potato. The above comment on *Terras Pretas* for row cultivation is valid here. These arrays are exclusive to *Terras Pretas*.

Ratoon: usually cotton is harvested in the first year, cut down and left to grow for the second year, and eventually provides a third harvest. Banana can also be considered to have a ratoon array because after the harvest the plant is renewed to produce for more 3 to 4 years. Kaiabi farmers normally let rice to grow a second time after the main harvest.

Monocropping strictu sensu is mainly practiced in large fields with manioc /macaxeira on red soils. Rice, arrow cane and maize are generally planted on *Terras Pretas*. Rice plots usually are sowed in a separated field, with modest size. Wuy'wa, or arrow cane, is an uncommon crop that, due to its aggressive behavior, is planted in sole stand. Maize eventually is sowed as monocrop, but even in these circumstances most commonly some minor crops accompany it.

APPENDIX F
AREA OF PLOTS FOR PEANUT VARIETIES SOWED BY NUCLEAR AND EXPANDED FAMILIES IN KWARYJA VILLAGE.

Table F-1. Area of plots for each peanut variety sowed according to nuclear (NF) and expanded families (EF). Kwaryja village, Xingu Park, 2006-2007 cropping season.

Plot #	Varieties	Sower	NF	EF	Area (m^2)
1	*M. Takapeun*	Wisi'o	Aramut	Arupajup	118.80
2	*M. Takapesingĩ*	Kwareaiup	Aramut	Arupajup	133.25
3	*M. Ayjsing*	Jepo'oi	Aramut	Arupajup	167.75
4	*M. Ayjgwasiat*	Witare	Aramut	Arupajup	165.71
5	*M. Py'wi*	Arutari	Aramut	Arupajup	115.00
6	*M. Ayjmirangĩ*	Katuaiup	Aramut	Arupajup	180.75
7	*M. Wyrauna*	Toperyp	Aramut	Arupajup	139.68
8	*M. Uni*	Kwareaiup	Aramut	Arupajup	122.16
9	*M. Tapy'yjã'yt*	Tymakari	Aramut	Arupajup	93.56
10	*M. Myãpe'ĩ*	Toperyp	Aramut	Arupajup	147.64
11	*M. Jakareape'i*	Tawaritu	Aramut	Arupajup	116.92
12	*M. Py'wi uu*	Witare	Aramut	Arupajup	141.45
13	*M. Akapejup*	Tymakari	Aramut	Arupajup	138.24
14	*M. Jakareape ayjun*	Katuaiup	Aramut	Arupajup	109.98
15	*M. Wyraunajup*	Jepo'oi	Aramut	Arupajup	135.00
16	*M. Jakareape ayjpinimĩ*	Kwareaiup	Aramut	Arupajup	138.87
17	*M. Emyamuku ayjmirang*	Tuatari	Aramut	Arupajup	154.23
18	*M. Ayjapeywet*	Wisi'o	Aramut	Arupajup	123.92
19	*M. Py'wi pytun*	Kwariup	Aramut	Arupajup	115.67
20	*M. Emyamuku pytun*	Toperyp	Aramut	Arupajup	169.31
21	*M. Apepang*	Wisi'o	Aramut	Arupajup	156.83
22	*M. Takapesingĩ uu*	Witare	Aramut	Arupajup	146.39
23	*M. Teikwarapypepirangĩ*	Katuaiup	Aramut	Arupajup	135.20
24	*M. Ju'wi*	Tuiarajup	Aramut	Arupajup	135.24
1	*M. Emyamuku*	Katuaiup	Aritu	Arupajup	92.83
2	*M. Teikwarapypepirangĩ*	Toperyp	Aritu	Arupajup	97.79
3	*M. Wyrauna*	Arupajup	Aritu	Arupajup	72.22
4	*M. Jakareape'i*	Katumait	Aritu	Arupajup	67.70
5	*M. Py'wi pytun*	Muna'i	Aritu	Arupajup	89.92
6	*M. Akapejup*	Toperyp	Aritu	Arupajup	80.99
7	*M. Py'wi*	Arupa	Aritu	Arupajup	58.87
8	*M. Takapesingĩ*	Kwariup	Aritu	Arupajup	61.82
9	*M. Ayjmirangĩ*	Jerap	Aritu	Arupajup	77.80
10	*M. Emyamuku ayjmirang*	Toperyp	Aritu	Arupajup	58.26
11	*M. Tapy'yjã'yt*	Katuaiup	Aritu	Arupajup	58.52
12	*M. Teikwarapypesingĩ*	Jare'i	Aritu	Arupajup	59.30

Table F-1. Continued

Plot #	Varieties	Sower	NF	EF	Area (m^2)
1	*M. Wyrauna*	Arupa	Arupa	Arupajup	26.24
2	*M. Teikwarapypepirangĩ*	Katumait	Arupa	Arupajup	32.11
3	*M. Py'wi*	Kwari	Arupa	Arupajup	34.97
4	*M. Emyamuku ayjmirang*	Ju'ikã	Arupa	Arupajup	39.13
5	*M. Emyamuku*	Jare'i	Arupa	Arupajup	37.78
6	*M. Py'wi pytun*	Jepo'oi	Arupa	Arupajup	42.24
7	*M. Akapejup*	Jerap	Arupa	Arupajup	51.79
8	*M. Ayjmirangĩ*	Arupa	Arupa	Arupajup	41.61
9	*M. Jakareape'i*	Kyriupa	Arupa	Arupajup	53.90
1	*M. Takapeun*	Jepo'oi	Maraja	Arupajup	107.91
2	*M. Py'wi*	Jywa'i	Maraja	Arupajup	89.81
3	*M. Takapesingĩ*	Tare'i	Maraja	Arupajup	84.36
4	*M. Py'wiuu*	Awarua	Maraja	Arupajup	108.58
5	*M. Jakareape'i*	Jaci	Maraja	Arupajup	99.40
6	*M. Emyamuku*	Awari	Maraja	Arupajup	119.04
7	*M. Jakareape ayjpinimĩ*	Maraja	Maraja	Arupajup	100.36
8	*M. Teikwarapypepytangĩ*	Tare'i	Maraja	Arupajup	80.33
9	*M. Ayjmirangĩ*	Tyrywa	Maraja	Arupajup	76.59
1	*M. Wyrauna*	Tui	Parisum	Parisum	82.77
2	*M. Py'wiuu*	Jope	Parisum	Parisum	104.92
3	*M. Ayjmirangĩ*	Arupa	Parisum	Parisum	72.57
4	*M. Takapeun*	Tarirua	Parisum	Parisum	78.90
5	*M. Takapesingĩ*	Tawaritu	Parisum	Parisum	99.75
6	*M. Py'wi akapeun*	Katumait	Parisum	Parisum	131.31
7	*M. Wyraunajup*	Maturi	Parisum	Parisum	159.08
8	*M. Akapejup*	Tymakari	Parisum	Parisum	80.27
9	*M. Py'wi*	Morekatu	Parisum	Parisum	83.24
10	*M. Emyamuku*	Kwariup	Parisum	Parisum	113.46
11	*M. Teikwarapypepytangĩ*	Jerap	Parisum	Parisum	79.05
12	*M. Ayjmiranguu*	Tui	Parisum	Parisum	83.23
13	*M. Ayjsing ayjun*	Arupa	Parisum	Parisum	101.76
14	*M. Py'wi pytun*	Jare'i	Parisum	Parisum	132.96
15	*M. Uni*	Jepo'oi	Parisum	Parisum	157.77
16	*M. Tapy'yjã'yt*	Morekatu	Parisum	Parisum	80.03
1	*M. Takapeun*	Wisi'o	Arutari	Tuiarajup	99.00
2	*M. Ayjgwasiat*	Eteuu	Arutari	Tuiarajup	70.88
3	*M. Jakareape'i*	Tairi'i	Arutari	Tuiarajup	93.50
4	*M. Uu'jup = m. ju'wi*	Ukaraiup	Arutari	Tuiarajup	99.00
5	*M. Teikwarapype ayjuni*	Eteuu e Tua	Arutari	Tuiarajup	115.00
6	*M. Teikwarapype ju'wi*	Tuiarajup	Arutari	Tuiarajup	107.63
7	*M. Takapeuni*	Tayware	Arutari	Tuiarajup	108.00

Table F-1. Continued

Plot #	Varieties	Sower	NF	EF	Area (m^2)
8	*M. Teikwarapypesingĩ Pytun*	Jerap	Arutari	Tuiarajup	121.00
9	*M. Jakareape ete*	Arutari	Arutari	Tuiarajup	59.50
10	*M. Ayjsing ayjgwasiat*	Wisi'o	Arutari	Tuiarajup	62.25
11	*M. Siãeko'i*	Tymakari	Arutari	Tuiarajup	72.00
12	*M. Uu'i*	Arutari	Arutari	Tuiarajup	60.75
13	*M. Py'wi ii*	Witare	Arutari	Tuiarajup	58.50
14	*M. Wyrauna uu*	Wisi'o and Jywaitari	Arutari	Tuiarajup	72.00
end14	*M. Tapy'yjãyriĩ*	Wisi'o	Arutari	Tuiarajup	12.00
1	*M. Emyamuku*	Jerap	Tuiarajup	Tuiarajup	175.24
2	*M. Takapeun*	Tamakari	Tuiarajup	Tuiarajup	253.02
3	*M. Takapesingĩ*	Yawari	Tuiarajup	Tuiarajup	256.22
4	*M. Ayjsingĩ*	Morekatu	Tuiarajup	Tuiarajup	241.96
5	*M. Py'wi*	Katumait	Tuiarajup	Tuiarajup	148.99
6	*M. Wyrauna*	Aruti	Tuiarajup	Tuiarajup	151.18
7	*M. Tapy'yjã'yt*	Jepo'oi	Tuiarajup	Tuiarajup	275.11
8	*M. Myãpe'ĩ*	Kwariup	Tuiarajup	Tuiarajup	241.92
9	*M. Py'wi uu*	Arupa	Tuiarajup	Tuiarajup	283.34
10	*M. Akapejup*	Toperyp	Tuiarajup	Tuiarajup	266.66
11	*M. Jakareape ayjun*	Jare'i	Tuiarajup	Tuiarajup	188.89
1	*M. Py'wi ayjmirang*	Tymakari	Wisi'o	Tuiarajup	21.75
2	*M. Akapepiren*	Wiure	Wisi'o	Tuiarajup	10.97
2	*M. Wyrauna ysejan*	Wiure	Wisi'o	Tuiarajup	10.97
3	*M. Uni ayjwep*	Tamakari	Wisi'o	Tuiarajup	21.53
4	*M. Teikwarapype piru'i*	Ju'ikã	Wisi'o	Tuiarajup	19.18
5	*M. Re'mari*	Urukari	Wisi'o	Tuiarajup	24.34
6	*M. Emy erut*	Aruti	Wisi'o	Tuiarajup	23.12
7	*M. Uni ayj ju'wi*	Eteuu	Wisi'o	Tuiarajup	41.51
8	*M. Re'nun*	Kwariup	Wisi'o	Tuiarajup	17.15
9	*M. Re'ta*	Kwariup	Wisi'o	Tuiarajup	17.15
10	*M. Ejup*	Jerap	Wisi'o	Tuiarajup	26.36
10	Unnamed 4	Tawaritu	Wisi'o	Tuiarajup	50.43
11	Unnamed 1	Tymakari	Wisi'o	Tuiarajup	12.54
11	Unnamed 2	Wiure	Wisi'o	Tuiarajup	12.54
11	Unnamed 3	Aruti	Wisi'o	Tuiarajup	12.54

APPENDIX G

NAMES GIVEN FOR PEANUT VARIETIES INCLUDED IN KNOWLEDGE TESTS.

Table G-1. Names given by all Kaiabi respondents for each traditional peanut variety surveyed in the knowledge test. Xingu Park, 2006.

Surveyed varieties	Names given for each variety
Murunu	*Ayjmirangĩ, ayjmytangĩ, ayjpirangĩ, inamusing, murunu, munuwi ii, murunuju, myãpe'ĩ, py'wi, py'wi' ii, takape'i, takapeju'wi, tapy'yjã'yt, wyraunai.*
M. Ayjgwasiat	*Akapesing, apegwasiat, ayjgwasiat, ayjmirang, ayjpara'i, ayjparap, ayjparaparamĩ, ayjpinimĩ, ayjsing, ayjsing ayjpinimĩ, ayjsing japoĩ, ayjsing jarĩ, ayjsingmarap, aysing peape, jakareape, jakareape ikotejap, munuwiuu, sisimae, tapy'yjã'yt, teikwarapypeĩ, ikotejap.*
M. Ayjmirangĩ	*Ayjmirangĩ, ayjmytangĩ, ayjpirangĩ, ayjpytangĩ, ayjuni, emyamuku, jakareape, munuwi ipe, munuwi ii, piru'i, piuni, py'wi, tapy'yjã'yt, teikwarapypeĩ, teikwarapypepirangĩ, tukura posit, ywapurĩ.*
M. Ayjsing	*Apeywit, ayjparasing, ayjsing, akapesing, ayjsing, jakareape, munuwiuu, piru'i.*
M. Ayjsingĩ	*Awai ii, ayjkwasiari, ayjparasingĩ, ayjsingĩ, jakareape, jakareape'i, py'wi, takapesingĩ, teikwarapypeĩ.teikwarapypesingĩ, wyrauna.*
M. Emyamuku	*Ayjmirang, ayjpara'i, ayjpiranguu, ayjsing, emyamuku, emykwara, jakareape, jakupesing, munuwiuu, peapemuku, pewi, piamuku, piru'i, pyreremuu, pyretetemuuu, pyreteten, pyrewuu, py'wi, py'wiuu, sinkoa, takapeayjpirangĩ, takapesingĩ, takapeun.*
M. Jakareape'i	*Ape'i, awai ii, ayjmirangĩ, ayjmiranguu, ayjpirangĩ, ayjpirangĩ ikotejap, ayjpytangĩ, jakareape, jakareape'i, juru'em, munuwiu ii, munuwiuu, murunuju, py'wi, Tapirapé, tapy'yjã'yt, teikwarapypeĩ, teikwarapypeĩ ete, teikwarapypemirangĩ, teikwarapypepirangĩ, teikwarapypepytangĩ.*
M. Myãpe'ĩ	*Akapeuni, ayjmirangĩ, ayjuni, kunumi ii, murunu, morunuju, munuwi u'wi, munuwi, murunu, murunuju, myãpe'ĩ, piuni, takapeuni, tapy'yjã'yt, teikwarapypepirangĩ, teikwarapypetangĩ, toguĩ, tukura posit, wyraunai, wyraunai ikotejap.*
M. Py'wi	*Akapesing, ayjpirangĩ, ayjsingĩ, emyamuku, munuwi ete, py'wi, takapea'i, takapeju'wi, takapesingĩ.*
M. Takapesingĩ	*Awai ii, ayj sipemi, ayjgwasiat, ayjmarap, ayjmirangĩ, ayjmirangĩ kwasiari, ayjmytang, ayjsing para'i, ayjsingĩ, emyamuku, jakareape, jakareape'i, munuwiuu, pewi, piru'i, pyreteten, py'wi, siãeko'i, siari, sipemi, takapesingĩ, takapeun, tapy'yjã'yt, teikwarapypeĩ.*
M. Takapesingĩ uu	*Ayjmarap, ayjmirangĩ, ayjpara'i, ayjparaparami, ayjpirangĩ, ayjsing ikotejap, ayjsingĩ, emyamuku, emyamuku ikotejap, jakareape, jakareape ayjagwasiat, jakareape'i, jakupesing, munuwiuu, myãpe'ĩ, opejanĩ, piru'i, pyretetemuu, pyreteten, py'wi, siãeko'i, sipemi kotejap, takapesingĩ, takapesingĩ uu, teikwarapypeĩ, teikwarapypepirangĩ.*

Table G-1. Continued.

Surveyed varieties	Names given for each variety
M. Takapeun	*Ayjsing, ayjsinguu, emyamuku, jakareape, kanaun, munuwiun, munuwiuu, piuni, py'wi ikotejap, takapesingĩ, takapesingĩ uu, takapeun, wyrauna.*
M. Tapy'yjã'yt	*Aka'i, ategwasiat, awai ii, ayjmirangĩ, ayjparap, ayjpirangĩ, ayjpytangĩ, jakareape'i, munuwi ii, murunu, myãpe'ĩ, pyreremi ii, takapeun ikotejap, takapeuni, Tapirapé, tapy'yjã'yt, teikwarapypeĩ, teikwarapypeĩ ete, teikwarapypemirangĩ, teikwarapypeuni, uruwu, wyrauna ikotejap, wyraunai.*
M. Teikwarapypepirangĩ	*Ayjmirangĩ, ayjmiranguu, ayjpirangĩ, ayjpirangĩ ikotejap, ayjuni, jakareape ayjpirangĩ, jakareape'i, juru'em, munuwi, py'wi, py'wi ikotejap, teikwarapypeĩ, teikwarapypepirangĩ, wyrapirip.*
M. Teikwarapypepytangĩ	*Apemamuku, ayjmirangĩ, ayjmirangĩ, ayjmytangĩ, ayjpirangĩ, jakareape, jakareape'i, jakareape'i pytang, piru'i, py'wi, py'wi pytangĩ, Tapirapézinho, tapy'yjã'yt, tapy'yja mae, teikwarapypeĩ, teikwarapypepytangĩ, tung'i.*
M. Wyrauna	*Apepiriruu, apeywit, ayjmirang, ayjun, emyamuku, jakareape, kanaun, kanaun ikotejap, murunu, munuwiunuu, munuwiuu, munuwiuu ikotejap, murunuju, pimomo uu, piunuu, piwewawuu, pyreremuu, pyreren, pyretetemuu, pyreteten, takapeun, takapeun ikotejap, wyrauna.*
M. Wyraunai	*Ayjmirangĩ, ayjpirangĩ, jakareape'i, ju'wi, munuwi, munuwiuni, ayjuni, murunu, myãpe'ĩ, piuni, py'wi, py'wi ii, tapy'yja'yt, teikwarapypeĩ ikotejap, wyrauna sikamae, wyraunai, wyraunai ikotejap.*

Table G-2. Names given by Kwaryja village residents for each new peanut variety surveyed in the knowledge test. Xingu Park, 2006.

Surveyed varieties	Names given for each variety
M. Akapejup	*Akapesing, apeywit, takapeun, takapeun ayjuwoo.*
M. Jakareape ayjmirang	*Apeywit ayjmirang, ayjmiranguu, ayjpirang ete, ayjpirangĩ, ayjpiranguu, emyamuku ayjmirang, jakareape ayjmirang, teikwarapypepiranguu.*
M. Jakareape ayjpinimĩ	*Apianta, ayjun, jakareape, jakareape ayjpinimĩ, jakareape ayjun, jakareape'i, py'wi, wyrauna.*
M. Jakareape ayjun	*Ayjameĩ, ayjmae, murunujup.*
M. Ju'wi	*Jakareape ete, ju'wi, munuwiu'iup, munuwi ii, parente jakareapejup, pywi ii ete, py'wiuu, tapy'jya'yt, teikwarapypeĩ, teikwarapypemytangĩ, teikwarapypepytangĩ, teikwarapypepytangĩ ikotejap, teikwarapypesingĩ.*
M. Py'wi uni	*Ayjuni, murunu, py'wi uni, wyraunai.*
M. Py'wiuu	*Jakareapeuu, py'wiuu.*
M. Py'wi ii	*Ayj ju'wi, py'wi ii.*
M. Tapy'yjãyriĩ	*Ayjuni mairaki, takapesingĩ, takapeuni, tapy'yjãyriĩ, tapy'jyã'yt ikotejap.*
M. Teikwarapypei ayjun	*Pretinho, teikwarapypei ayjun.*
M. Wyraunajup	*Akapejup, munuwiuu, takapejuwoo, wyraunajup.*
M. Siãeko'i	*Ayjmirangĩ, ayjpirangĩ, ayjpiranguu, jakareape ayjmirangĩ, jakareape'i, py'wi, siãeko'i, tapy'jyã'yt, teikwarapypepirangĩ.*

APPENDIX H
CULTURAL COMPETENCE SCORES AND RESPECTIVE KNOWLEDGE INDEX (KI) ABOUT PEANUT VARIETIES NAMES FOR INDIVIDUALS FROM ALL VILLAGES. XINGU PARK, 2006.

Table H-1. Cultural Competence Scores and the respective Knowledge Indexes (ki) about peanut varieties for individuals from all villages. Xingu Park, 2006.

Individuals	Individual ID	Cultural Competence Scores	ki
Aruejup	FBA7003	---	0.3529
Nareajup	FBA7006	---	0.1176
Juwiap	FCV6014	---	0.1765
Rymim	FCV7018	---	0.0000
Kujareaj	FCV7022	---	0.2353
Jasira	FCV7029	---	0.0588
Katupyap	FCV7031	---	0.1765
Ywete	FCV7034	---	0.0588
Rosilda	FCV7042	---	0.0000
Katue'i	FCV7048	---	0.1765
Potira	FCV7054	---	0.0588
Mutãngyu	FCV7061	---	0.0588
RyjeminC	FCV8038	---	0.2941
Luciana	FCV8040	---	0.0000
Ryuon	FCV8043	---	0.0000
Irugatu	FDI7069	---	0.2353
Etekatu	FDI7072	---	0.0000
Awirajup	FDI7073	---	0.2353
Jywata	FDI7075	---	0.1176
Edite	FDI7081	---	0.0588
Jareti	FDI7085	---	0.2353
Pissi	FDI7086	---	0.1176
MytangDI	FDI7098	---	0.1176
RyjeminD	FDI7100	---	0.1176
ReariupM	FDI7101	---	0.4706
Reuon	FDI7107	---	0.1765
Moreakat	FDI8105	---	0.0588
Eteajup	FDI8111	---	0.2941
Marina	FIG7124	---	0.2353
Tawapewi	FIG7127	---	0.2941
KujairoI	FIG7128	---	0.2353
Rywejat	FIG8121	---	0.0588

Table H-1. Continued.

Individuals	Individual ID	Cultural Competence Scores	ki
Morete	FIP7133	---	0.1765
Lucivani	FIP7138	---	0.0000
Juwekatu	FIP7143	---	0.1176
RyweweIP	FIP7144	---	0.2941
RyweweIP	FIP8141	---	0.2353
Rypojeka	FIT7129	---	0.1176
Rywerut	FIT7130	---	0.0588
JuwePA	FKW7158	---	0.2941
Katuajup	FKW8151	---	0.2353
Kujataju	FMB7177	---	0.2353
ArasiMN	FMN7187	---	0.2353
Kujairop	FMT7180	---	0.2353
MasirypS	FSB7227	---	0.1176
Ju'winaj	FSB7293	---	0.0588
Julia	FTB6242	---	0.0000
Moeteju'wi	FTB8240	---	0.1176
Kujaesague	FTI6251	---	0.1176
Jaira	FTI7244	---	0.0000
Sandra	FTI7249	---	0.1176
Clementina	FTI7252	---	0.0588
Kujari	FTI7256	---	0.0588
Iapunagu	FTI8246	---	0.0000
Kororiko	FTI8254	---	0.0588
MoiruTUI	FTU7271	---	0.1765
Aru'ITUI	FTU7280	---	0.4706
Beatriz	FTU7283	---	0.0000
Kawe	MAR2001	---	0.1176
YefukaBA	MBA3008	---	0.0588
Kupejani	MCV1035	---	0.4706
Awatat	MCV2013	---	0.3529
JuruCV	MCV2026	---	0.1765
Myau	MCV2053	---	0.2941
Pã	MCV2057	---	0.2941
Pyami	MCV2064	---	0.1765
Ywaret	MCV2065	---	0.1176
Tareai	MCV3019	---	0.0588
Myajup	MCV3024	---	0.1176
Owapena	MCV3030	---	0.1765
Koanhang	MCV3032	---	0.0588

Table H-1. Continued.

Individuals	Individual ID	Cultural Competence Scores	ki
Jyapã	MCV3033	---	0.1765
Masit	MCV3037	---	0.0000
Awe	MCV3039	---	0.0588
Pofat	MCV3041	---	0.1176
Sirakup	MCV3044	---	0.0000
YefukaCV	MCV3046	---	0.1176
Jemy	MCV3047	---	0.1765
TangueDI	MDI2074	---	0.2353
Makupa	MDI2084	---	0.5294
Jywapina	MDI2093	---	0.2353
Tymayru	MDI2095	---	0.0588
Matariowy	MDI2104	---	0.0588
Takapeju	MDI3067	---	0.1176
Tani	MDI3068	---	0.0000
Awasiuu	MDI3070	---	0.0000
Kwawuu	MDI3077	---	0.1176
Powan	MDI3088	---	0.0000
Jywaru	MDI3089	---	0.0588
Jotop	MDI3102	---	0.0588
Wareajup	MDI3108	---	0.0000
Towajani	MDI3109	---	0.1176
Tari	MDI3110	---	0.0000
Kurapa	MDI3112	---	0.0000
João	MFK2114	---	0.1176
Ka'ika	MIG3118	---	0.1765
Taraku	MIG3125	---	0.0000
Arejuwi	MIG4120	---	0.0588
Tarupi	MIP2142	---	0.2941
Loiware	MIP3137	---	0.0000
Mairery	MIP3139	---	0.1176
Tariwan	MIP3145	---	0.1176
Tafut	MIT3131	---	0.0588
Parisum	MKW2167	---	0.3529
Jamut	MKW3152	---	0.2353
Mairi	MKW3160	---	0.0000
Maraja	MKW3163	---	0.0588
Juika	MKW3169	---	0.2353
Tarirua	MKW4165	---	0.1765
Warekatu	MMB3178	---	0.2353

Table H-1. Continued.

Individuals	Individual ID	Cultural Competence Scores	ki
Jyafuku	MMT2179	---	0.3529
Awatare	MMU3192	---	0.0588
Mairawy	MOS1197	---	0.1765
Inamurap	MPN2198	---	0.0588
Mawut	MSB3212	---	0.0000
Muri	MSB3215	---	0.0588
Inata	MSB3224	---	0.1765
Koajup	MSB3231	---	0.0000
Parakatu	MSB3234	---	0.2353
Jyaka	MSB3237	---	0.0588
Jewyt	MSB3333	---	0.0000
Matare	MSB4209	---	0.0000
André	MTB1241	---	0.0000
Awa	MTI3243	---	0.0000
Jepiari	MTI3245	---	0.1176
Jyporoju	MTI3247	---	0.0000
Jywatu	MTI3248	---	0.2941
Monoi	MTI3253	---	0.0000
Myru3I	MTI3255	---	0.0000
Maikatu	MTU2268	---	0.4118
Jamanary	MTU3259	---	0.0000
Tamakari	MTU3264	---	0.0000
Tarei	MTU3276	---	0.1176
JariTUI	MTU3281	---	0.0588
Jawe	MTU3284	---	0.0000
Jepyk	MTU3285	---	0.1765
Siraweju	MTU3292	---	0.0588
Wisi'o	FKW6174	0.9154	1.0000
Toperyp	FKW7156	0.9154	1.0000
Tuiarajup	MKW2173	0.9154	1.0000
Morekatu	FKW6166	0.9073	1.0000
Pefuku	FCV6059	0.8874	0.8824
Etejuup	FKW7172	0.8868	0.9412
Jepo'oi	FKW6148	0.8849	0.9412
Zulmira	FTU6266	0.8764	0.8824
Rejupit	FCC6010	0.8648	0.8824
Jasi	FKW7162	0.8597	0.9412
Sirawan	MKW3161	0.8483	0.8824
Tame	FSB6218	0.8465	0.9412

Table H-1. Continued.

Individuals	Individual ID	Cultural Competence Scores	ki
JeruaMN	FMN6188	0.8438	0.9412
Kajup	FDI6091	0.8263	0.8824
Katuari	FDI6083	0.8262	0.8235
SiraweSB	MSB1222	0.8155	0.8824
Maru	FPN6200	0.8127	0.8235
Kwariup	FKW7170	0.8056	0.9412
Kwat	FDI6079	0.8040	0.7647
RyweteTU	FTU6273	0.7803	0.8235
ReairopK	FKW7155	0.7799	0.7647
Moreajup	FAR7002	0.7773	0.7059
RywiTUI	FTU7279	0.7773	0.8235
Kujajup	FIP6135	0.7721	0.7647
MyaoPA	MDI1092	0.7678	0.7647
ReaCAP	FCV6036	0.7588	0.8235
Ryweaiup	FPN7206	0.7582	0.7647
Karulina	FKW6171	0.7569	0.6471
Nai	FDI7096	0.7502	0.7059
Jyakatu	FDI7106	0.7445	0.7059
Kuja'emT	FTU7288	0.7429	0.7059
Kape	FSM6238	0.7417	0.7647
Ryweyi	FCC6011	0.7413	0.6471
ReajuwiT	FTU7275	0.7345	0.6471
TangueCC	MCC1012	0.7339	0.7059
Tewit	MCV1025	0.7292	0.8235
Arupajup	MKW1146	0.7281	0.8235
Pasi	MTU2272	0.7101	0.7059
Kujare	FMN7186	0.7066	0.7059
Ryte	FDI7097	0.7060	0.6471
Jarei	FKW6147	0.7032	0.7059
Miarakaja	MTU2278	0.6969	0.5882
Mo'i	FIG6116	0.6923	0.5882
Moete	FIP6136	0.6848	0.5882
Kyrima	FTU7260	0.6845	0.7059
To'om	FTU6290	0.6762	0.5882
Meiru	FIG7126	0.6752	0.5294
Tuiari	MCV2050	0.6752	0.6471
Tarumani	MMT1182	0.6745	0.6471
ReaiIG	FIG7117	0.6606	0.5882
Mairata	MMU2195	0.6593	0.5882

Table H-1. Continued.

Individuals	Individual ID	Cultural Competence Scores	ki
MyruSB	FSB6221	0.6510	0.5882
RypoTUI	FTU7258	0.6460	0.5882
Jurupere	MTU1286	0.6433	0.5882
Aruti	FTU7263	0.6408	0.7059
Pirapy	MBA3004	0.6392	0.6471
Rearejup	FDI7094	0.6390	0.5882
Kwasi	FCV6051	0.6389	0.6471
Jawaip	MSB1217	0.6361	0.5882
Atu	MDI1078	0.6252	0.7059
Moru'u	FTU6289	0.6241	0.5882
Perũ	MCV2060	0.6241	0.5294
Reakatui	FCV6021	0.6224	0.4706
Jakap	FTU6270	0.6182	0.5294
Jemoete	FCV7063	0.6165	0.5294
Mairajup	MSB1214	0.6123	0.5882
Kwasio	FPN6204	0.6094	0.6471
Tye	FSB6223	0.6048	0.5882
Aramut	MKW3154	0.5991	0.5882
Irũ	FCV6056	0.5961	0.5294
Juwyajup	FCV7023	0.5959	0.4706
Kuni	MPQ1208	0.5951	0.5294
Kaipa	MTI1250	0.5935	0.5294
Piu	MSB1226	0.5910	0.4706
Kuja'emS	FSB7213	0.5872	0.5294
PoitMN	FMN7189	0.5848	0.4118
Moreyru	FTU7277	0.5838	0.5882
MoreajuT	FTU7293	0.5838	0.5294
Katujuwi	FPN7199	0.5795	0.5294
Tuim	MSM1239	0.5785	0.5882
MariaIT	FIT6080	0.5714	0.5294
Kawitaii	MIP1134	0.5689	0.5294
PoitTUI	FTU7287	0.5542	0.4118
MariaTUI	FTU6267	0.5519	0.5294
Ina	MIG2115	0.5491	0.4706
Jywete	FDI7103	0.5446	0.4706
Remy	FSB7216	0.5440	0.4706
Amaypo	MCC1009	0.5422	0.5294
MariaSB	FSB6211	0.5381	0.4706
Kwareajup	FKW7159	0.5369	0.4706

Table H-1. Continued.

Individuals	Individual ID	Cultural Competence Scores	ki
Juina	FSB7230	0.5274	0.4118
JyapMT	FMT7181	0.5248	0.5294
Jemo	FCV7052	0.5238	0.4118
Pirafuku	MIP1140	0.5237	0.4706
Jaykatu	MIG2123	0.5231	0.4118
Juwekatu	FKW7153	0.5230	0.4706
Jawarap	MTU1282	0.5093	0.4118
MyauiTUI	MTU2269	0.5069	0.4118
Pinawi	MPN2205	0.5061	0.4118
Emara	FFK7113	0.5005	0.4118
Katuryp	FPN7203	0.4952	0.4706
Jawari	MCV1016	0.4920	0.4118
Aritu	MKW3150	0.4915	0.4706
Juwyta	FCV6027	0.4897	0.4706
ReajuwiD	FDI7066	0.4812	0.3529
Tavo	MMB1176	0.4795	0.3529
Irujuwi	FKW8164	0.4783	0.4118
Rywukat	FMU7196	0.4523	0.3529
Rywata	FCV7045	0.4497	0.2941
RyweteCA	FCV7028	0.4469	0.4118
Tete	FSB7233	0.4443	0.3529
Fui	MMN2185	0.4394	0.2941
Matari	MSB3232	0.4327	0.3529
Tawakatu	MDI2082	0.4263	0.3529
Kwasiryp	FMU7194	0.4201	0.3529
Xupe	MTU1265	0.4188	0.4118
Tangaap	FCV6017	0.4131	0.3529
Kupeap	MCV1058	0.4127	0.2941
Siraju	MIG3122	0.4101	0.4118
Jowosipep	MTU2261	0.3994	0.3529
ReaiSOB	FSB7235	0.3964	0.2941
Jyamin	MSB2210	0.3940	0.2941
Tymai	MDI2087	0.3720	0.2353
Iro	FPN7202	0.3695	0.2941
Kujajat	FMU7193	0.3501	0.2941
Karaoo	MDI1076	0.3287	0.2941
Jyirup	FSB7219	0.3214	0.2941
Sakajup	FPN7201	0.2974	0.2353
Towajuwi	MCV3062	0.2795	0.2941

Table H-1. Continued.

Individuals	Individual ID	Cultural Competence Scores	ki
Itapaje	MDI1071	0.2611	0.1765
JuwajuSB	MSB3228	0.2460	0.2353
Tymawa	MPN2207	0.2334	0.1765
Gema	FDI6099	0.2099	0.1176
Tuwikang	MCV3055	0.1243	0.0588
Tymari	MMT3184	0.0965	0.2941
Rywewy	FSB7229	0.0960	0.2353
Tymafari	MBA2007	0.0959	0.4706
MytangTU	FTU7262	0.0949	0.4706
JeruaMT	FMT7183	0.0947	0.5294
Jowyt	MCV2020	0.0945	0.4118
Tafareiup	MKW3168	0.0937	0.1765
Tameyp	FDI7090	0.0911	0.4118
Ju'we'IB	FBA6005	0.0907	0.4706
Jerowiat	FSB7225	0.0901	0.2941
Arupajup	MIP3132	0.0894	0.4706
Arasiwa	FKW8157	0.0886	0.3529
Rywajup	FMN7191	0.0880	0.5294
Maiari	MIT2128	0.0076	0.1765
ReajuTUI	FTU7291	0.0018	0.2353

APPENDIX I
COMPLEMENTARY DESCRIPTIVE STATISTICS FOR CULTURAL COMPETENCE SCORES AND KNOWLEDGE INDEXES ABOUT NAMES FOR PEANUT VARIETIES.

Table I-1. Descriptive statistics for Cultural Competence Scores about names for peanut varieties, for subgroups of selected Kaiabi respondents, according to nuclear families. Xingu Park, 2006.

Nuclear families	N	Mean	Std. Dev.	Median	Minimum	Maximum
Parisum	1	0.9073				
Tuiarajup	4	0.8686	0.0757	0.9011	0.7569	0.9154
Maraja	1	0.8597				
Makupa	1	0.8262				
Juikã	1	0.8056				
MyaoPA	2	0.7971	0.0414	0.7971	0.7678	0.8263
Kawe	1	0.7773				
ArupajupKW	3	0.7721	0.0985	0.7281	0.7032	0.8849
Aramut	3	0.7648	0.1587	0.7799	0.5991	0.9154
Kupejani	1	0.7588				
Perũ	2	0.7558	0.1862	0.7558	0.6241	0.8874
Pasi	2	0.7452	0.0496	0.7452	0.7101	0.7803
Atai	1	0.7445				
Jawaip	2	0.7413	0.1488	0.7413	0.6361	0.8465
Tangue CC	2	0.7376	0.0052	0.7376	0.7339	0.7413
Miarakaja	2	0.7371	0.0569	0.7371	0.6969	0.7773
Tarei	1	0.7345				
Tewit	1	0.7292				
Tymayru	2	0.7281	0.0313	0.7281	0.7060	0.7502
JeruaMN	2	0.7143	0.1831	0.7143	0.5848	0.8438
Amaypo	2	0.7035	0.2281	0.7035	0.5422	0.8648
Sirawan	2	0.6926	0.2202	0.6926	0.5369	0.8483
SiraweSB	3	0.6904	0.1107	0.6510	0.6048	0.8155
Jamanary	1	0.6845				
Kawitaii	3	0.6753	0.1019	0.6848	0.5689	0.7721
Taraku	1	0.6752				
Tuim	2	0.6601	0.1154	0.6601	0.5785	0.7417
Tuiari	2	0.6571	0.0257	0.6571	0.6389	0.6752
Tamakari	1	0.6408				
Pirapy	1	0.6392				
Jywapina	1	0.6390				
Maikatu	5	0.6358	0.0758	0.6241	0.5519	0.7429
Atu	1	0.6252				
Ina	2	0.6207	0.1013	0.6207	0.5491	0.6923

Table I-1. Continued.

Nuclear families	N	Mean	Std. Dev.	Median	Minimum	Maximum
Pyami	1	0.6165				
Mairajup	2	0.5998	0.0177	0.5998	0.5872	0.6123
Tarumani	2	0.5997	0.1059	0.5997	0.5248	0.6745
Juruperewi	2	0.5988	0.0630	0.5988	0.5542	0.6433
Myajup	1	0.5959				
Kuni	1	0.5951				
Kaipa	1	0.5935				
Pinawi	4	0.5922	0.1220	0.5578	0.4952	0.7582
Jepyk	1	0.5838				
Jawarap	2	0.5777	0.0967	0.5777	0.5093	0.6460
Fui	2	0.5730	0.1889	0.5730	0.4394	0.7066
Pufai	1	0.5714				
MyauiTUI	2	0.5626	0.0787	0.5626	0.5069	0.6182
Mairata	2	0.5558	0.1464	0.5558	0.4523	0.6593
Jotop	1	0.5446				
Muri	1	0.5440				
Siraju	2	0.5354	0.1771	0.5354	0.4101	0.6606
Koajup	1	0.5274				
Myau	1	0.5238				
Pirafuku	1	0.5237				
Jaykatu	1	0.5231				
Jamut	1	0.5230				
Inamurap	4	0.5148	0.2319	0.4745	0.2974	0.8127
Pa	2	0.5044	0.1297	0.5044	0.4127	0.5961
João	1	0.5005				
Aritu	1	0.4915				
Takapejuwi	1	0.4812				
Tavo	1	0.4795				
Tarirua	1	0.4783				
JuruCV	2	0.4683	0.0303	0.4683	0.4469	0.4897
Jyamin	2	0.4661	0.1019	0.4661	0.3940	0.5381
Jawari	2	0.4526	0.0558	0.4526	0.4131	0.4920
YefukaCV	1	0.4497				
Jowosipep	4	0.4474	0.3222	0.4091	0.0949	0.8764
Matari	2	0.4385	0.0082	0.4385	0.4327	0.4443
Tawakatu	1	0.4263				
Mairare	1	0.4201				
Maiari	2	0.4058	0.5631	0.4058	0.0076	0.8040
Parakatu	1	0.3964				
Tymai	1	0.3720				

Table I-1. Continued.

Nuclear families	N	Mean	Std. Dev.	Median	Minimum	Maximum
Jowyt	2	0.3585	0.3733	0.3585	0.0945	0.6224
Awatare	1	0.3501				
Mawut	1	0.3214				
Jywaju	3	0.3110	0.2538	0.2460	0.0960	0.5910
Towajuwi	1	0.2795				
Karaoo	2	0.2693	0.0840	0.2693	0.2099	0.3287
Itapaje	1	0.2611				
Tymawa	1	0.2334				
Tuwikang	1	0.1243				
Tymari	2	0.0956	0.0013	0.0956	0.0947	0.0965
Tafareiup	1	0.0937				
Tymafari	2	0.0933	0.0037	0.0933	0.0907	0.0959
Jywaru	1	0.0911				
Inata	1	0.0901				
ArupajupIP	1	0.0894				
Mairi	1	0.0886				
JuruMN	1	0.0880				
Sirawejup	1	0.0018				

Table I-2. Descriptive statistics for Cultural Competence Scores about names for peanut varieties, for subgroups of selected Kaiabi respondents, according to village of residence. Xingu Park, 2006.

	N	Mean	Std	Median	Min	Max
Village of residence	20					
Iguaçu	1	0.7773				
Caiçara	4	0.7206	0.1332	0.7376	0.5422	0.8648
Kwaryja	20	0.6859	0.2532	0.7684	0.0886	0.9154
Samauma	2	0.6601	0.1154	0.6601	0.5785	0.7417
Pequizal	1	0.5951				
Três Irmãos	1	0.5935				
Tuiarare	24	0.5857	0.2003	0.6325	0.0018	0.8764
Ilha Grande	6	0.5851	0.1105	0.6049	0.4101	0.6923
Diauarum	17	0.5532	0.2359	0.6252	0.0911	0.8263
Maraka Novo	5	0.5325	0.2899	0.5848	0.0880	0.8438
Ipore	5	0.5278	0.2637	0.5689	0.0894	0.7721
Capivara	20	0.5235	0.1982	0.5599	0.0945	0.8874
Paranaita	9	0.5179	0.1966	0.5061	0.2334	0.8127
Fazenda Kaiabi	1	0.5005	.			
Sobradinho	19	0.4934	0.2056	0.5381	0.0901	0.8465
Mupada	1	0.4795	.			
Muitara	4	0.4705	0.1329	0.4362	0.3501	0.6593
Três Patos	4	0.3476	0.2974	0.3107	0.0947	0.6745
Itai	2	0.2895	0.3987	0.2895	0.0076	0.5714
Barranco Alto	3	0.2753	0.3152	0.0959	0.0907	0.6392

Table I-3. Descriptive statistics for Cultural Competence Scores about names for peanut varieties, for subgroups of selected Kaiabi respondents, according to expanded families. Xingu Park, 2006.

	N	Mean	Std	Median	Min	Max
Expanded family	34					
Tuiarajup	6	0.8358	0.0808	0.8462	0.7345	0.9154
Makupa	1	0.8262				
Kawe	1	0.7773				
Pasi	2	0.7452	0.0496	0.7452	0.7101	0.7803
Myauo Capivara	3	0.7444	0.0958	0.7678	0.6390	0.8263
Kupejani	3	0.6910	0.0615	0.6752	0.6389	0.7588
Tuim	7	0.6906	0.0795	0.7060	0.5785	0.7773
Amaypo	5	0.6727	0.1574	0.7339	0.4812	0.8648
Arupajup Kwaryja	12	0.6632	0.2344	0.7157	0.0886	0.9154
Juruperewi	2	0.5988	0.0630	0.5988	0.5542	0.6433
Perũ	3	0.5970	0.3049	0.6241	0.2795	0.8874
Kuni	1	0.5951				
Tamanauu	7	0.5793	0.1020	0.5491	0.4101	0.6923
Jawarap	2	0.5777	0.0967	0.5777	0.5093	0.6460
Jerua	5	0.5325	0.2899	0.5848	0.0880	0.8438
Jowyt	5	0.5317	0.2498	0.6165	0.0945	0.7292
Masi’a	6	0.5301	0.2676	0.6040	0.0018	0.7429
Jowosipep	6	0.5191	0.2736	0.5298	0.0949	0.8764
Inamurap	9	0.5179	0.1966	0.5061	0.2334	0.8127
Kawitaii	7	0.5170	0.2162	0.5237	0.0894	0.7721
Pã	2	0.5044	0.1297	0.5044	0.4127	0.5961
Itapaje	2	0.5028	0.3418	0.5028	0.2611	0.7445
Sirawe	19	0.4934	0.2056	0.5381	0.0901	0.8465
Parisum	3	0.4931	0.4070	0.4783	0.0937	0.9073
Kwat	5	0.4869	0.3001	0.5714	0.0076	0.8040
Mairata	4	0.4705	0.1329	0.4362	0.3501	0.6593
Juru	2	0.4683	0.0303	0.4683	0.4469	0.4897
Jawari	3	0.4516	0.0395	0.4497	0.4131	0.4920
Myauo Diaurum	3	0.4054	0.2778	0.5069	0.0911	0.6182
Kaipa	3	0.3774	0.1964	0.3287	0.2099	0.5935
André	1	0.3720				
Tarumani	4	0.3476	0.2974	0.3107	0.0947	0.6745
Myau’i	2	0.3241	0.2825	0.3241	0.1243	0.5238
Tymafari	3	0.2753	0.3152	0.0959	0.0907	0.6392

Table I-4. Comparison of means for cultural competence scores for the names of peanut varieties within subgroups of Kaiabi individuals. Xingu Park, 2006.

Groups of farmers		p-value	Sig.
Age categories			
Wawĩ	*Iyruo*	0.006	*
Wawĩ	*Kujãmuku*fet	0.013	**
Wawĩ	*Iymani*	0.057	***
Wawĩ	*Iywyruu*	0.000	*
Wawĩ	*Kunumiuu*	0.000	*
Iymani	*Iywyruu*	0.029	**
Iymani	*Kunumiuu*	0.006	*
Iymani	*Kujãmuku*fet	0.011	**
Iyruo	*Kunumiuu*	0.043	**
Iyruo	*Kujãmuku*fet	0.112	
Iyruo	*Iymani*	0.453	
Iyruo	*Iywyruu*	0.116	
Iywyruu	*Kunumiuu*	0.521	
Iywyruu	*Kujãmuku*fet	0.381	
*Kujãmuku*fet	*Kunumiuu*	0.601	
Area of origins			
Xingu all	Teles Pires	0.004	*
Xingu all	Kururuzinho	0.154	
Xingu all	Tatuy	0.309	
Teles Pires	Tatuy	0.319	
Teles Pires	Kururuzinho	0.552	
Tatuy	Kururuzinho	0.778	
Area of origins x age status			
Xingu youngsters	Teles Pires	0.000	*
Xingu youngsters	Kururuzinho	0.002	*
Xingu youngsters	Tatuy	0.024	**
Xingu youngsters	Xingu elders	0.027	**
Xingu elders	Teles Pires	0.022	**
Xingu elders	Kururuzinho	0.301	
Xingu elders	Tatuy	0.516	

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table I-4. Continued.

Groups of farmers		p-value	Sig.
Seed management systems			
D	B/D	0.013	**
D	A/B	0.015	**
D	Bb	0.025	**
D	C	0.052	***
D	A	0.153	
D	Ba	0.132	
Bb	A/B	0.163	
Ba	A/B	0.273	
C	Bb	0.382	
Ba	B/D	0.361	
C	Ba	0.472	
Bb	B/D	0.253	
Ba	A	0.725	
B/D	A/B	0.738	
A/B	A	0.596	
Bb	A	0.707	
Bb	Ba	0.92	
C	A	0.781	
C	B/D	0.996	
C	A/B	0.792	
B/D	A	0.75	
Seed management systems without youngsters			
D	B/D	0.000	*
D	Bb	0.000	*
D	C	0.001	*
D	Ba	0.005	*
C	Bb	0.288	
Ba	B/D	0.307	
C	Ba	0.310	
Bb	B/D	0.311	
Bb	Ba	0.721	
C	B/D	0.782	

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

Table I-5. Descriptive statistics for means for Knowledge Indexes about names for peanut varieties, for selected individuals, according to nuclear families. Xingu Park, 2006.

Nuclear families	N	Mean	Std. Dev.	Median	Minimum	Maximum
Makupa	1	0.5294				
Kupejani	1	0.4706				
Maikatu	1	0.4118				
Parisum	1	0.3529				
Pirapy	1	0.3529				
Jyafuku	2	0.2941	0.0832	0.2941	0.2353	0.3529
Myau	1	0.2941				
Pa	1	0.2941				
Paat	1	0.2941				
Pirafuku	1	0.2941				
Sirawan	1	0.2941				
Tarupi	1	0.2941				
Awatat	2	0.2647	0.1247	0.2647	0.1765	0.3529
JariTUI	2	0.2647	0.2912	0.2647	0.0588	0.4706
Jaykatu	2	0.2647	0.0416	0.2647	0.2353	0.2941
Matariowy	2	0.2647	0.2912	0.2647	0.0588	0.4706
Aritu	1	0.2353				
Jamut	1	0.2353				
JeruaMN	1	0.2353				
Juikã	1	0.2353				
Jywakari	1	0.2353				
Jywapina	1	0.2353				
Oscar	1	0.2353				
Parakatu	1	0.2353				
TangueDIA	1	0.2353				
Warekatu	2	0.2353	0.0000	0.2353	0.2353	0.2353
Kai	2	0.2059	0.0416	0.2059	0.1765	0.2353
Jywatu	2	0.2059	0.1248	0.2059	0.1176	0.2941
ArupajupIP	1	0.1765				
Inata	1	0.1765				
Jemy	2	0.1765	0.0000	0.1765	0.1765	0.1765
Jepyk	1	0.1765				
JuruCV	1	0.1765				
Mairawy	1	0.1765				
Pikuruk	1	0.1765				
Pyami	1	0.1765				
Tarirua	1	0.1765				
Tariwan	2	0.1765	0.0832	0.1765	0.1176	0.2353
Tymai	2	0.1765	0.0832	0.1765	0.1176	0.2353
Masit	2	0.1471	0.2080	0.1471	0.0000	0.2941
Powan	2	0.1177	0.1664	0.1177	0.0000	0.2353
Jyapã	2	0.1177	0.0832	0.1177	0.0588	0.1765
Koanhang	2	0.1177	0.0832	0.1177	0.0588	0.1765

Table I-5. Continued.

Nuclear families	N	Mean	Std. Dev.	Median	Minimum	Maximum
Owapena	2	0.1177	0.0832	0.1177	0.0588	0.1765
João	1	0.1176				
Kaipa	1	0.1176				
Kawe	1	0.1176				
Kwawuu	2	0.1176	0.0000	0.1176	0.1176	0.1176
Maiari	1	0.1176				
Myajup	1	0.1176				
Roptxi	1	0.1176				
Takapejuwi	1	0.1176				
Tapi	1	0.1176				
Tarei	1	0.1176				
Towajani	1	0.1176				
YefukaCV	1	0.1176				
Ywaret	1	0.1176				
Wareajup	2	0.0883	0.1248	0.0883	0.0000	0.1765
YefukaBA	2	0.0882	0.0416	0.0882	0.0588	0.1176
Arejuwi	2	0.0588	0.0000	0.0588	0.0588	0.0588
Awasiuu	2	0.0588	0.0832	0.0588	0.0000	0.1176
Awatare	1	0.0588				
Inamurap	1	0.0588				
Jepiari	2	0.0588	0.0832	0.0588	0.0000	0.1176
Jewyt	2	0.0588	0.0832	0.0588	0.0000	0.1176
Jotop	1	0.0588				
Jyakã	2	0.0588	0.0000	0.0588	0.0588	0.0588
Jywaru	1	0.0588				
Loiware	2	0.0588	0.0832	0.0588	0.0000	0.1176
Mairery	2	0.0588	0.0832	0.0588	0.0000	0.1176
Maraja	1	0.0588				
Muri	1	0.0588				
Pofat	2	0.0588	0.0832	0.0588	0.0000	0.1176
Sirawejup	1	0.0588				
Tafut	2	0.0588	0.0000	0.0588	0.0588	0.0588
Tawakatu	1	0.0588				
Towajuwi	1	0.0588				
Tuwikang	1	0.0588				
Tymayru	1	0.0588				
Awa	2	0.0294	0.0416	0.0294	0.0000	0.0588
Awe	2	0.0294	0.0416	0.0294	0.0000	0.0588
Monoi	2	0.0294	0.0416	0.0294	0.0000	0.0588
Myru3I	2	0.0294	0.0416	0.0294	0.0000	0.0588
Tareai	2	0.0294	0.0416	0.0294	0.0000	0.0588
Tari	2	0.0294	0.0416	0.0294	0.0000	0.0588
André	2	0.0000	0.0000	0.0000	0.0000	0.0000
Jamanary	1	0.0000				

Table I-5. Continued.

Nuclear families	N	Mean	Std. Dev.	Median	Minimum	Maximum
Jawe	2	0.0000	0.0000	0.0000	0.0000	0.0000
Jyporojup	2	0.0000	0.0000	0.0000	0.0000	0.0000
Koajup	1	0.0000				
Kurapã	2	0.0000	0.0000	0.0000	0.0000	0.0000
Mairi	1	0.0000				
Matare	1	0.0000				
Mawut	1	0.0000				
Sirakup	2	0.0000	0.0000	0.0000	0.0000	0.0000
Tamakari	1	0.0000				
Tani	1	0.0000				
Taraku	1	0.0000				

Table I-6. Descriptive statistics for the Knowledge Indexes about peanut varieties names, for subgroups of selected Kaiabi individuals, according to village of residence. Xingu Park, 2006.

	N	Mean	Std	Median	Min	Max
Village of residence	19					
Três Patos	2	0.2941	0.0832	0.2941	0.2353	0.3529
Maraka Novo	1	0.2353				
Mupada	2	0.2353	0.0000	0.2353	0.2353	0.2353
Kwaryja	8	0.1985	0.1174	0.2353	0.0000	0.3529
Onze	1	0.1765				
Barranco Alto	3	0.1764	0.1556	0.1176	0.0588	0.3529
Ilha Grande	7	0.1513	0.1119	0.1765	0.0000	0.2941
Ipore	9	0.1503	0.1105	0.1176	0.0000	0.2941
Capivara	31	0.1366	0.1170	0.1176	0.0000	0.4706
Tuiarare	11	0.1337	0.1666	0.0588	0.0000	0.4706
Diauarum	29	0.1318	0.1349	0.1176	0.0000	0.5294
Fazenda Kaiabi	1	0.1176				
Iguaçu	1	0.1176				
Itai	3	0.0784	0.0339	0.0588	0.0588	0.1176
Sobradinho	10	0.0706	0.0823	0.0588	0.0000	0.2353
Três Irmãos	13	0.0633	0.0848	0.0588	0.0000	0.2941
Muitara	1	0.0588				
Paranaita	1	0.0588				
Três Buritis	3	0.0392	0.0679	0.0000	0.0000	0.1176

Table I-7. Descriptive statistics for Knowledge Indexes about names for peanut varieties, for subgroups of selected Kaiabi individuals, according to expanded families. Xingu Park, 2006.

	N	Mean	Std	Median	Min	Max
Expanded family	36					
Makupa	1	0.5294				
Pã	1	0.2941				
Tarumani	2	0.2941	0.0832	0.2941	0.2353	0.3529
Jawarap	2	0.2647	0.2912	0.2647	0.0588	0.4706
Parisum	2	0.2647	0.1247	0.2647	0.1765	0.3529
Jerua	1	0.2353				
Masi'a	2	0.2353	0.2496	0.2353	0.0588	0.4118
Myauo Diaurum	1	0.2353				
Jowyt	3	0.1765	0.0589	0.1765	0.1176	0.2353
Mairawy	1	0.1765				
Myauo Capivara	2	0.1765	0.1664	0.1765	0.0588	0.2941
Pasi	1	0.1765				
Tuiarajup	2	0.1765	0.0832	0.1765	0.1176	0.2353
Tymafari	3	0.1764	0.1556	0.1176	0.0588	0.3529
Arupajup	5	0.1647	0.1275	0.2353	0.0000	0.2941
Kawitaii	10	0.1588	0.1076	0.1471	0.0000	0.2941
Kupejani	9	0.1438	0.1587	0.1176	0.0000	0.4706
Tuim	10	0.1412	0.1473	0.0882	0.0000	0.4706
Tamanauu	8	0.1397	0.1086	0.1177	0.0000	0.2941
Awatat	4	0.1324	0.1689	0.0883	0.0000	0.3529
Juru	5	0.1294	0.0645	0.1765	0.0588	0.1765
Jyapã	2	0.1177	0.0832	0.1177	0.0588	0.1765
André	6	0.1176	0.1052	0.1176	0.0000	0.2353
Kawe	1	0.1176				
Sirawe	13	0.0905	0.0853	0.0588	0.0000	0.2353
Itapaje	7	0.0840	0.1119	0.0000	0.0000	0.2353
Jawari	4	0.0735	0.0563	0.0882	0.0000	0.1176
Kwat	4	0.0735	0.0294	0.0588	0.0588	0.1176
Kaipa	15	0.0706	0.0808	0.0588	0.0000	0.2941
Amaypo	2	0.0588	0.0832	0.0588	0.0000	0.1176
Inamurap	1	0.0588				
Mairata	1	0.0588				
Myau'i	1	0.0588				
Perũ	1	0.0588				
Jowosipep	2	0.0000	0.0000	0.0000	0.0000	0.0000
Kupekani	2	0.0000	0.0000	0.0000	0.0000	0.0000

Table I-8. Comparison of means for Knowledge Indexes about names for peanut varieties, according to categories within subgroups of selected individuals. Xingu Park, 2006.

Subgroups of individuals		*p*-value	Sig.
Age categories			
Wawĩ	*Iymani*	0.468	
Wawĩ	*Iyruo*	0.426	
Wawĩ	*Iywyruu*	0.110	
Wawĩ	*Kujãmukufet*	0.736	
Wawĩ	*Kunumiuga*	0.803	
Wawĩ	*Kunumiuu*	0.663	
Iyruo	*Iymani*	0.424	
Iyruo	*Iywyruu*	0.024	
Iyruo	*Kujãmukufet*	0.409	
Iyruo	*Kunumiuga*	0.285	
Iyruo	*Kunumiuu*	0.000	*
Kujãmukufet	*Kunumiuga*	0.546	
Kujãmukufet	*Kunumiuu*	0.106	
Iymani	*Iywyruu*	0.836	
Iymani	*Kujãmukufet*	0.321	
Iymani	*Kunumiuga*	0.403	
Iymani	*Kunumiuu*	0.013	**
Iywyruu	*Kujãmukufet*	0.024	**
Iywyruu	*Kunumiuga*	0.071	***
Iywyruu	*Kunumiuu*	0.000	*
Kunumiuu	*Kunumiuga*	0.976	
Area of origins			
Tatuy	Kururuzinho	0.151	
Teles Pires	Kururuzinho	0.014	**
Xingu all	Kururuzinho	0.014	**
Teles Pires	Tatuy	0.285	
Xingu all	Tatuy	0.342	
Xingu all	Teles Pires	0.390	
Area of origins without youngsters			
Xingu youngsters	Kururuzinho	0.000	*
Xingu youngsters	Tatuy	0.018	**
Xingu youngsters	Teles Pires	0.802	
Xingu youngsters	Xingu elders	0.000	*
Xingu elders	Teles Pires	0.112	
Xingu elders	Kururuzinho	0.145	
Xingu elders	Tatuy	0.640	

* significant at the 0.01 level; ** significant at the 0.05 level; *** significant at the 0.10 level

APPENDIX J
CULTURAL COMPETENCE SCORES AND KNOWLEDGE INDEXES ABOUT NAMES FOR PEANUT VARIETIES FOR KWARYJA VILLAGE RESIDENTS.

Table J-1. Cultural Competence Scores and Knowledge Indexes about all peanut varieties; the traditional ones; and the newly-created ones. Kwaryja village residents. Xingu Park, 2006.

Individuals	Cultural Competence Scores	Ki_all	Ki_q_trad	Ki_q_new
MKW2173	0.9182	0.9630	1.0000	0.9000
FKW6174	0.8914	0.8889	1.0000	0.7000
FKW7156	0.8615	0.7407	1.0000	0.3000
FKW7172	0.8456	0.7407	0.9412	0.4000
FKW6166	0.8336	0.7778	1.0000	0.4000
FKW7170	0.8080	0.9630	0.9412	1.0000
MKW3161	0.7624	0.7037	0.8824	0.4000
FKW6148	0.7330	0.6296	0.9412	0.1000
MKW1146	0.6440	0.5926	0.8235	0.2000
FKW7155	0.6339	0.5556	0.7647	0.2000
FKW6171	0.5825	0.4815	0.6471	0.2000
MKW3154	0.5376	0.4815	0.5882	0.3000
FKW7153	0.3798	0.3333	0.4706	0.1000
FKW7158	0.1738	0.1852	0.2941	0.0000
FKW7162	---	0.6667	0.9412	0.2000
FKW6147	---	0.4815	0.7059	0.1000
FKW7159	---	0.2963	0.4706	0.0000
MKW3150	---	0.2963	0.4706	0.0000
FKW8164	---	0.2593	0.4118	0.0000
FKW8157	---	0.2593	0.3529	0.1000
MKW2167	---	0.2593	0.3529	0.1000
MKW3152	---	0.1852	0.2353	0.1000
MKW3169	---	0.1852	0.2353	0.1000
MKW3168	---	0.1852	0.1765	0.2000
FKW8151	---	0.1481	0.2353	0.0000
MKW4165	---	0.1111	0.1765	0.0000
MKW3163	---	0.0370	0.0588	0.0000

LIST OF REFERENCES

Agrawal, A. 1995. Dismantling the divide between indigenous and scientific knowledge. Development and Change 26:413-439.

Agresti, A. 2003. Categorical data analysis. Second edition. Prentice Hall, New York.

Albert, B. 2000. Indigenous organizations in the Brazilian Amazonia. (verified on 11/1/05, http://www.socioambiental.org/pib/english/orgsi/amazo.shtm).

Allard, R.W. 1988. Genetic change associated with the evolution of adaptedness in cultivated plants and their wild progenitors. Journal of Heredity 79:225-238.

Almenkinders, C. and W. de Boef, 2000. Discouraging or encouraging diversity. Pages 323-325 in C. Almenkinders, and W. de Boef, eds. Encouraging diversity. The conservation and development of plant genetic resources. Intermediate Technology Publications, London.

Altieri, M. A. 1999. The ecological role of biodiversity in agroecosystems. Agriculture, Ecosystems and Environment 74(1-3):19-31.

________, and P. Koohafkan. 2002. Globally Important Ingenious Agricultural Heritage Systems (GIAHS): extent, significance, and implications for development. Globally Important Ingenious Agricultural Heritage Systems Project (GIAHS). Food and Agriculture Organization, Rome. (verified on 1/ 24/06, Project home page: http://www.fao.org/sd/giahs/documents.asp#methods).

________, and L.C. Merrick. 1987. In situ conservation of crop genetic resources through maintenance of traditional farming systems. Economic Botany 41: 86-96.

Andréws, D.J., and A.H. Kassam, 1976. The importance of multiple cropping in increasing world food supplies. Pages 237-274 in R. I. Papendick, P. A. Sánchez, and G. B. Triplett, eds. *Multiple cropping: proceedings of a symposium*. ASA Special Publication, 27. American Society of Agronomy, Madison, Wisconsin.

Athayde, S. F. 1998. Organização social, aspectos econômicos e sustentabilidade ambiental: perspectivas para a potencialização do comércio de artesanato no Parque Indígena do Xingu. Relatório Técnico. Instituto Socioambiental/The Norwegian Rainforest Foundation, São Paulo, SP, Brazil.

_______. 2003. Knowledge transmission and change Kaiabi (Tupi-Guarani) basketwork, Southern Amazonian region, Brazil. MsC thesis, University of Kent, Canterbury, Kent, UK.

_______, A. Kaiabi, K.Y. Ono, and M. N. Alexiades, 2009. Weaving power: displacement and the dynamics of basketry knowledge amongst the Kaiabi in the Brazilian Amazon. In press in M. N. Alexiades, ed. Indigenous peoples displacement and power. Oxford University Press, Oxford, U.K.

_______, G.M. Silva, J. Kaiabi, M. Kaiabi, H.R. Souza, K.Y. Ono, and E. M. Bruna. 2006. Participatory research and management of arumã (*Ischnosiphon gracilis* [Rudge] Koern., Marantaceae) by the Kaiabi people in the Brazilian Amazon. Journal of Ethnobiology 26(1):36-59.

_______, G.M. Silva, M.C. Troncarelli, E. Würker, W.C. Ballester, and M.V.C. Schmidt. 2002. Educação Ambiental e Conservação da Biodiversidade no Parque Indígena do Xingu. Pages 103-117 in N. Bensusan. Não seria melhor mandar ladrilhar? Biodiversidade: Como, por que, para quem. Universidade de Brasília, Brasília, Brazil.

Atran, S. 1999. Itzaj Maya folkbiological taxonomy: cognitive universals and cultural particular. Pages 119-203 in D. Medin and S. Atran, eds. Folkbiology. MIT Press, Cambridge, Massachusetts.

_______. 2001. The vanishing landscape of the Peten Maya lowlands. Pages 157-174 in L. Maffi, ed. On Biocultural Diversity: Linking Language, Knowledge, and the Environment. Smithsonian Institution Press, Washington, D.C.

Baldus, H. 1949. Tribos da bacia do Araguaia e o Serviço de Proteção aos Índios. Revista do Museu Paulista 2:137-168.

_______. 1970. Tapirapé, tribo Tupí no Brasil Central. Companhia Editôra Nacional, São Paulo, SP, Brazil.

Balée, W. 1989. The culture of Amazonian forests. Pages 1-21 in D.A. Posey and W. Balée, eds. Resource management in Amazonia: indigenous and folk strategies. Advances in Economic Botany, 7. New York Botanical Garden, New York.

_______. 1994. Footprints of the Forest. Ka'apor Ethnobotany. Columbia University Press, New York.

_______, and A. Gély, 1989. Managed forest succession in Amazonia: the Ka'apor case. Pages 129-158 in D.A. Posey and W. Balée, eds. Resource management in Amazonia: indigenous and folk strategies. Advances in Economic Botany, 7. New York Botanical Garden, New York.

Baumuller, H. and Tansey, G. 2008. Responding to changes. Pages 82-114 in G. Tansey and R. Tasmin, eds. The future control of food. A guide to international negotiations and rules on intellectual property, biodiversity and food security. Earthscan, London.

Beckerman, S. 1987. Swidden in Amazonia and the Amazon Rim. Pages 55-94 in B. L. Turner II, and S. B. Brush, eds. Comparative farming systems. The Guilford Press, New York.

Bellon, M. R. 1996. The dynamics of crop infraspecific diversity: a conceptual framework at the farmer level. Economic Botany 50(1):26-39.

_______. 2004. Conceptualizing interventions to support on-farm genetic resource conservation. World Development 32(1):159–172.

_______, and S. B. Brush. 1994. Keepers of maize in Chiapas, Mexico. Economic Botany 48:196-209.

_______, J.L. Pham, and M.T. Jackson. 1997. Genetic conservation: a role for rice farmers. Pages 263-289 in N.B. Maxted, B.V. Ford-Lloyd and G.J. Hwakes, eds. Plant genetic conservation: the *in situ* approach. Chapman and Hall, London.

Berkes, F. 1999. Sacred ecology: traditional ecological knowledge and resource management. Taylor and Francis, Philadelphia, Pennsylvania.

_______, and C. Folke. 2002. Back to the future: ecosystem dynamics and local knowledge. Pages 121-146 in C.S. Holling, L.H. Gunderson, and D. Ludwig, eds. Panarchy: understanding transformations in human and natural systems. Island Press, Washington, D.C.

Bernard, H. R. 2002. Research methods in Anthropology: qualitative and quantitative methods. Altamira Press, New York, NY.

Blanche, K. R., M. Hughes, J. A. Ludwig, and S. A. Cunningham. 2006. Do flower-tripping bees enhance yields in peanut varieties grown in north Queensland? Australian Journal of Experimental Agriculture 46:1529-1534.

Borgatti, S.P, M. Everett, and L. C. Freeman. 1999. UCINET for Windows. Software for social network analysis. Analytic Technologies, Natick, Massachusetts. [computer software]

Borges, W. L., G. R. Xavier, and N. G. Rumjanek. 2007. Variabilidade genética entre acessos de amendoim. Pesquisa Agropecuária Brasileira 42 (8):1151-1157.

Boster, J.S. 1983. A comparison of the diversity of Jivaroan gardens with that of tropical forest. Human Ecology 2(1):47-67.

_______. 1984. Classification, cultivation and selection of Aguarana cultivars of *Manihot esculenta* (Euphorbiaceae). Pages 34-47 in G.T. Prance and J.A. Kallunki, eds. Ethnobotany in the Neotropics. Advances in Economic Botany, 1. New York Botanical Garden, New York.

_______.1985. Selection for perceptual distinctiveness: evidence from Aguaruna cultivars of *Manihot esculenta*. Economic Botany 39:310-25.

_______.1986. Exchange of varieties and information between Aguaruna manioc cultivators. American Anthropologist 88: 428-36.

Bragdon, S., K. Garforth, and J. E. Haapala Jr. 2008. Safeguarding biodiversity: the Convention on Biological Diversity (CBD). Pages 82-114 in G. Tansey and R. Tasmin, eds. The future control of food. A guide to international negotiations and rules on intellectual property, biodiversity and food security. Earthscan, London.

Brookfield, H. 2001. Exploring agrobiodiversity. Columbia University Press, New York.

_______, H. Parsons, and M. Brookfield. 2003. Agrodiversity: learning from farmers across the world. United Nations University Press, Tokyo.

Brown, C.B., and W. Lidstone. 1878. Fifteen thousand miles on the Amazon and its tributaries. Edward Stanford, London, UK.

Brown, A.H.D., and T. Hodgkin. 2007. Measuring, managing, and maintaining crop genetic diversity on farm. Pages 13-33 in D. Jarvis, C. Padoch, and D. Cooper, eds. Managing biodiversity in agricultural ecosystems, Colombia University Press, New York.

Brush, S.B. 1989. Rethinking Crop Genetic Resource Conservation. Conservation Biology 3(1):19-29.

_______. 1991. A farmer-based approach to conserving crop germplasm. Economic Botany 45(2):153-165.

_______. 1992. Farmers' rights and genetic conservation in traditional farming systems. World Development 20:1617-1630.

_______. 1995. *In situ* conservation of landraces in centers of crop diversity. Crop Science 35:346-354.

_______. 1999. The issues of *in situ* conservation of crop genetic resources. Pages 3-28 in S.B. Brush, ed. Genes in the field: on-farm conservation of crop diversity. CRC Press, New York.

_______. 2004. Farmer's bounty: locating crop diversity in the contemporary world. Yale University Press, New Haven, Connecticut.

_______. 2005. Farmers' rights and protection of traditional agricultural knowledge. Collective Action and Property Rights Working Paper, 36. International Food Policy Research Institute. Washington, D.C.

_______, and E. Meng. 1998. Farmers' valuation and conservation of crop genetic resources. Genetic resources and crop evolution 45(2):139-150.

_______, J. E. Taylor, and M. R. Bellon. 1992. Technological adoption and biological diversity in Andean potato agriculture. Journal of Development Economics 39(2):365-388.

Bunting, A.H., R.W. Gibbons, and J.C. Wynne. 1985. Groundnut (Arachis Hypogaea L.). Pages 747-800 in R.J. Summerfield and E.H. Roberts, eds. Grain Legume Crops. Collins, London.

Byström, M. 2004. Formal and informal systems in support of farmer management of agro-biodiversity: some policy challenges to consolidate lessons learned. CAPRI Working Paper, 31. International Food Policy Research Institute. Washington, D.C.

Camacho, J. 2006. Good to eat, good to think: food, culture and biodiversity in Cotacachi. In pages 156-172 in Rhoades, R.E., ed. Development with identity: community, culture and sustainability in the Andes. CAB International, Wallingford, Oxon, U.K.

Capobianco, J.P.R. 1999. Biodiversidade Amazônia' 99. Seminário Consulta: Avaliação e Identificação de Ações Prioritárias para a Conservação, Utilização Sustentável e Repartição dos Benefícios da Biodiversidade da Amazônia Brasileira. ISA, IPAM, Imazon, CI, GTA, ISPN, São Paulo, SP, Brazil.

Carneiro da Cunha, M., and M.W. Almeida. 2000. Indigenous people, traditional people, and conservation in the Amazon. Daedalus/Journal of the American Academy of Arts and Sciences 129(2):315-338.

Carneiro, R. 1983. The cultivation of manioc among the Kuikuru of the Upper Xingu. Pages 65-111 in R. B. Hames and W.T. Vickers. Adaptive responses of native Amazonians. Academic Press, New York.

Carlson, T. and L. Maffi, eds. 2004 Ethnobotany and Conservation of Biocultural Diversity. Advances in Economic Botany, 15. The New York Botanical Garden Press. New York.

Castelnau, F. 1949. Expedição as regiões centrais da América do Sul . Biblioteca Pedagógica Brasileira. Série Brasiliana, 5:266-266A. Companhia Editora Nacional . São Paulo, São Paulo, Brazil.

Castro, M.J. and A.T. França. 1868. Diário da viagem que fizeram os capitães pelo rio Arinos no anno de 1812. Revista do Instituto Histórico e Geográfico 31(1):107-160.

Cavalli-Sforza, L.L. and M.W. Feldman. 1981. Cultural transmission and evolution: a quantitative approach. Monographs in Population Biology, 16. Princeton University Press, Princeton, Massachusets.

Chambers, R. 1983. Rural Development. Putting the Last First. Longman, London.

Chase Smith, R. 1996. Los indígenas amazónicos en el camino hacia el desarollo autónomo. Pages 279-301 in COICA. Amazonía: economía indígena y mercado. Los desafíos del desarrollo autónomo. Oxfam América, Quito, Ecuador.

Chávez-Servia, J.L., and R. Sevilla-Panizo. 2006. Fundamentos genéticos y socioeconómicos para analizar la agrobiodiversidad en la región de Ucayali. Anales del Seminário, 16 de enero de 2003 held in Pucallpa, Peru. International Plant Genetic Resources Institute,Cali, Colombia.

Chernela, J.M. 1986. Os cultivares de mandioca na area do Uapes (Tukano). Pages 150-167 in B. G. Ribeiro. Suma Etnológica Brasileira. Vozes, Petrópolis, RJ, Brazil.

Clarke, W. C. 1976. Maintenance of agriculture and human habitats within the tropical forest ecosystem. Human Ecology 4(3): 247-259.

Clement, C.R. 1999. 1492 and the loss of Amazonian crop genetic resources. II. Crop biogeography at contact. Economic Botany 53:203-216.

_______, J.M. McCann, and N.J.H. Smith. 2003. Agrobiodiversity in Amazônia and its relationships with Dark Earths. Pages 159-178 in J. Lehmann, D.C. Kern, B. Glaser, and W. I. Woods. Amazonian Dark Earths: origin, properties, management. Kluwer Press, Boston, Massachusets.

Cleveland, D.A., and D. Soleri. 2007a. Extending Darwin's analogy: bridging differences in concepts of selection between farmers, biologists, and plant breeders. Economic Botany 61(2)121–136.

_______, and D. Soleri. 2007b. Farmer knowledge and scientific knowledge in sustainable agricultural development: ontology, epistemology and praxis. Pages 209-230 in P. Sillitoe, ed. Local science vs global science: approaches to indigenous knowledge in international development. Berghahn Books, New York.

_______, and S.C. Murray, 1997. The world's crop genetic resources and the rights of indigenous farmers. Current anthropology 38:477-515.

_______, D. Soleri, and S.E. Smith. 1994. Do folk crop varieties have a role in sustainable agriculture? BioScience 44(11):740-751.

Cohen, M.N. 1977. Population pressure and the origins of agriculture: an archaeological example from the coast of Peru. Pages 135-177 in D. Piperno, ed. Origins of agriculture. Mouton Press, The Hague, The Nederlands.

Colchester, M. 2000. Self-determination or environmental determinism for indigenous people in tropical forest conservation. Conservation Biology14(5):1365-1367.

Collado Panduro, L., M. Arroyo Jumpa, A. Riesco, and J.L. Chávez Servia. 2004a. Experiencias sobre la diversidad de los cultivos y aspectos económicos de la conservación *in situ* en la Amazonia Central peruana. Pages 188-198 in J.L. Chávez-Servia, J. Tuxill, and D.I. Jarvis, eds. Manejo de la diversidad de cultivos en los agroecosistemas tradicionales. International Plant Genetic Resources Institute, Cali, Colombia.

_______, J.L. Chávez Servia, and A. Riesco. 2005a. Variedades locales y el abastecimiento de semillas en Ucayali. Consórcio para el Desarrollo Sostenible de Ucayali (CODESU). Lima, Perú.

_______, R. Pinedo Ramirez, A. Riesco, and M. Arroyo Jumpa. 2005b. Potencial Genético del Germoplasma local de maíz, frijol y maní en Agroecosistemas de Ucayali. Consórcio para el Desarrollo Sostenible de Ucayali (CODESU), Pucallpa, Perú.

_______, R. Pinedo Ramirez, A. Riesco, and M. Arroyo Jumpa. 2005c. Producción participativa de semillas seleccionadas de maiz, frijol y mani en comunidades de Ucayali. Consórcio para el Desarrollo Sostenible de Ucayali (CODESU). Pucallpa, Perú.

_______, L., M. Arroyo Jumpa, A. Riesco, and J.L. Chávez Servia. 2006a. Conservación *in situ* de la agrobiodiversidad en la Amazonía Central peruana: resultados preliminaries. Pages 23-31 in J.L. Chávez-Servia, and R. Sevilla-Panizo, eds. Fundamentos genéticos y socioeconómicos para analizar la agrobiodiversidad en la región de Ucayali. Anales del Seminario, 16 de enero de 2003 held in Pucallpa, Peru. International Plant Genetic Resources Institute. Cali, Colombia.

_______, M. Arroyo Jumpa, and R. Pinedo Ramirez. 2006b. Preferencias y potencial de mercado de variedades locales de cultivos amazónicos. Consórcio para el Desarrollo Sostenible de Ucayali (CODESU), Lima, Peru.

Collins, W.W., and G.C. Hawlin. 1999. Conserving and using crop biodiversity in agroecosystems. Pages 167-181 in W.W. Collins and C.O. Qualset, eds. Biodiversity in agroecosystems. CRC Press, New York.

Conklin, B. A. and L. R. Graham. 1995. The shifting middle ground: Amazonian Indians and eco-politics. American Anthropologist 97(4):695-710.

Conklin, H. C. 1957. Hanunóo agriculture: a report on an integral system of shifting cultivation in the Philippines. FAO Forestry Development Paper, 12. FAO, Rome.

CODESU. 2008. Proyecto de investigación: Manejo y monitoreo de variedades locales de cultivos amazónicos. Pucallpa, Perú. (verified on 4/ 28/2008, Project home page: http://www.codesu.org.pe./catalogo/index.swf).

Conway, G.R. 1994. Sustainability in agriculture: trade-offs between productivity, equity, and stability. Journal for Farming Systems Research-Extension 4 (2): 1-14.

Correa, C. M. 1999. In situ conservation and intellectual property rights. Pages 239-260 in S.B. Brush, ed. Genes in the field: On-farm conservation of crop diversity. CRC Press, New York.

Cromwell, E. 1990. Seed diffusion mechanisms in small farmer communities: lessons from Asia, Africa and Latin America. Agricultural Administration Network (Research and Extension) Network Paper, 21. Overseas Development Institute, London.

_______, and S. van Oosterhout. 1999. On-farm conservation of crop diversity: policy and institutional lessons from Zimbabwe. Pages 124-143 in S.B. Brush, ed. Genes in the field: on-farm conservation of crop diversity. CRC Press, New York.

Culp, T. W., W. K. Bailey, and R. O. Hammons. 1968. Natural hybridization of peanuts, *Arachis hypogaea* L., in Virginia. Crop Science 8:109-111.

de Boef, W., Almenkinders, C., Engels, J., and Roling, N. 2000. Adaptive plant genetic resources management. In pages 339-347 in C. Almenkinders, and W. De Boef, eds. Encouranging diversity. The conservation and development of plant genetic resources. Intermediate Technology Publications, London.

_______, K. Amanor, and A. Bebbington. 1993. Cultivating Knowledge. Farmers diversity, farmers experimentation and crop research. Intermediate Technology Publications, London.

Denevan, W. M. 1992. The Pristine Myth: the landscape of the America in 1492. Annals of the Association of American Geographers 82(3):369-385.

_______. 1998. Comments on prehistoric agriculture in Amazonia. Culture and agriculture 20(2/3):253-267.

________. 2001. Cultivated landscapes of native Amazonia and the Andes. Oxford University Press, Cambridge, Massachusetts.

_______. 2004. Semi-intensive pre-European cultivation and the origins of anthropogenic Dark Earths in Amazonia. Pages 135-143 in B. Glaser, and W.I. Woods, eds. Amazonian Dark Earths: Explorations in Space and Time. Springer Verlag, New York.

_______. 2003. The native population of Amazonia in 1492 reconsidered. Revista de Indias 62(227):175-188.

Descola, P. 1994. In the society of nature: a native ecology in Amazonia. Cambridge University Press, Cambridge, Massachusets.

Desmoulière, S. 2001. Approche ethnobotanique de la diversité variétale du manioc en Amazonie centrale: gestion et perspectives de conservation. PhD dissertation. Museum National d'Histoire Naturelle, Paris, France.

DeWalt, B.R. 1994. Using Indigenous Knowledge to improve agriculture and natural resource management. Human Organization 53:123-131.

Dillehay, T.D., J. Rossen, T.C. Andrés, and D.E. Williams. 2007. Preceramic adoption of peanut, squash, and cotton in Northern Peru. Science 316(5833):1890-1893.

DSEIX. 2007. Population census, Xingu Indigenous Park. Universidade Federal de São Paulo, Distrito Sanitário Especial Indígena do Xingu, São Paulo, Brazil. Non published data.

Dove, M. R. 1999. The agronomy of memory and the memory of agronomy. Ritual conservation of archaic cultigens in contemporary farming systems. Pages 45-70 in V.D. Nazarea, ed. Ethnoecology: situated knowledge, located lives. University of Arizona Press, Tucson, Arizona.

Dufour, D.L. 1993. Uso de la selva tropical por los indigenas Tukano del Vaupes. Pages 47-62 in F. Correa, ed. La selva humanizada. Ecología alternativa en el trópico húmedo colombiano. Instituto Colombiano de Antropología, Bogota, Colombia.

Eden, M.J, W. Bray, L. Herrera, and C. McEvan. 1984. Terra preta soils and their archaeological context in the Caqueta Basin of Southeast Colombia. American Antiquity 49(1):125-140.

Elias, M., L. Rival, and D. Mckey. 2000. Perception and management of cassava (*Manihot esculenta* Crantz) diversity among Makushi Amerindians of Guyana (South America). Journal of Ethnobiology 20(2):239-265.

_______, D. McKey, O. Panaud, M.C. Anstett, T. Robert. 2001a. Traditional management of cassava morphological and genetic diversity by the Makushi Amerindians (Guyana, South America): Perspectives for on-farm conservation of crop genetic resources. Euphytica 120(1):143-157.

_______, L. Penet, P. Vindry, D. McKey, O. Panaud, and T. Robert. 2001b. Unmanaged sexual reproduction and the dynamics of genetic diversity of a vegetatively propagated crop, cassava (*Manihot esculenta* Crantz), in a traditional farming system. Molecular Ecology 10(8):1895-1907.

Ellen, R.F., and H. Harris. 1999. Embeddeness of indigenous environmental knowledge. Pages 180-184 in D.A. Posey, ed. Cultural and spiritual values of biodiversity. A complementary contribution to the Global Biodiversity Assessment. Intermediate Technology Publications, London.

_______, and _______. 2000. Introduction. Pages 1-33 in R. Ellen, P. Parkes, and A. Bicker, eds. Indigenous Environmental Knowledge and its transformations. Harwood, Amsterdam.

Ellstrand, N. C., and D. R. Elam. 1993. Population genetic consequences of small population size: im- plications for plant conservation. Annual Review of Ecology and Systematics 24:217-242.

Emperaire L., 2004. Elements for a discussion on the conservation of agrobiodiversity: the exemple of manioc (*Manihot esculenta* Crantz) in the Brazilian Amazon. Pages 224-233 in A. Veríssimo Moreira A, D. Sawyer, I Santos, and L.P. Pinto, eds. Biodiversity in the Brazilian Amazon: Assessment and priority actions for conservation, sustainable use and benefit sharing. ISA/ Estação Liberdade, São Paulo, Brazil.

_______. 2005. A biodiversidade agrícola na Amazônia brasileira: recurso e patrimônio. Revista do Patrimônio Histórico e Artístico Nacional 32:31-43.

_______, and N. Peroni, 2007. Traditional management of agrobiodiversity in Brazil: A case study of manioc. Human Ecology 35(6):761-768.

_______, F. Pinton, and G. Second. 1998. Gestion de la diversité variétale du manioc en Amazonie du nord-ouest, Brésil. Natures Sciences et Societes 6(2):27-42.

_______, _______, and _______. 2001. Dinámica y manejo de la diversidad de las variedades de yuca del noroccidente Amazónico. Etnoecológica 5(7):38-59.

_______, G.S. Mühlen, M. Fleury, T. Robert, D. Mckey, B. Pujol, and M. Elias. 2003. Approche comparative de la diversité génétique et de la diversité morphologique des maniocs en Amazonie (Brésil et Guyanes). Les Actes du Bureau des Ressources Génétiques 4:247-267.

Engels, J.M.M. and Wood, D. 1999. Conservation of agrobiodiversity. Pages 85-103 in D. Wood, and J. M. Lenné, eds. Agrobiodiversity: characterization, utilization and management. CAB International, Wallingford, Oxon, U.K.

Erickson, C. 2003. Historical Ecology and future explorations. Pages 455-500 in J. Lehmann, D.C. Kern, B. Glaser, and W. I. Woods, eds. Amazonian Dark Earths: origin, properties, management. Kluwer, Boston, Massachusetts.

FAO.1996. The State of the World's Plant Genetic Resources for Food and Agriculture. Food and Agriculture Organization of the United Nations, Rome.

_______. 2002a. Agrobiodiversity conservation and the role of rural women: an expert consultation report. RAP publication, 7. FAO-RAP, CIP-UPWARD, SEAMEO-SEARCA, Bangkok, Thailand.

_______. 2002b. Rural and tribal women in agrobiodiversity conservation. An Indian case study. RAP publication, 8. FAO Regional Office for Asia and the Pacific and M.S. Swaminathan Research Foundation, Bangkok, Thailand.

Fávero A.P., C.E. Simpson, J.F.M. Valls, and N.A. Vello 2006. Study of the evolution of cultivated peanut through crossability studies among *Arachis ipaënsis*, *A. duranensis*, and *A. hypogaea*. Crop Sci. 46:1546-1552.

Ferreira Penna, D.S. 1869. A Região Occidental da Provincia do Pará. Typographia do Diario de Belém, Belém, Brazil.

Ferreira, A.R. 1972. Viagem filosófica pelas Capitanias do Grão Pará, Rio Negro, Mato Grosso, e Cuiabá, 1783-1792. Conselho Federal de Cultura. Rio de Janeiro, RJ, Brazil.

Ferreira, M. K. L. 1994. Histórias do Xingu. Coletânea de depoimentos dos índios Suya, Kayabi, Juruna, Trumai, Txucarramãe e Txicão. NHII/Universidade de São Paulo, FAPESP, São Paulo, SP, Brazil.

FIBGE, 2008. Levantamentos para Cereais, leguminosas e oleaginosas. (verified on 5/11/08; http://www.ibge.gov.br/home/estatistica/indicadores/agropecuaria/lspa/lspa_200802comentarios.pdf)

Fischler, C. 1995. El (h)omnivoro. El gusto, la cocina y el cuerpo. Editorial Anagrama, Barcelona, Spain.

Franchetto, B. 1987. Laudo antropológico: A ocupação indígena da região dos formadores e do alto curso do Rio Xingu (Parque Indígena do Xingu). UFRJ/Museu Nacional, Rio de Janeiro, RJ, Brazil.

_______, and M. J. Heckenberger, 2000. Os povos do Alto Xingu: história e cultura. Editora da UFRJ, Rio de Janeiro, RJ, Brazil.

Frankel, 0. H., A. H. D. Brown, and J. J. Burdon. 1995. The conservation of plant biodiversity. Cambridge University Press, Cambridge, Massachusetts.

Freitas, F.O., and J.F.M. Valls. 2001. Nota sobre a ocorrência de um tipo distinto de amendoim no Parque Indígena do Xingu e arredores e suas implicações etnobotânicas. Pages 303-304 in SIRGEALC. Simpósio de Recursos Genéticos para a América Latina e o Caribe, 3. Londrina. Anais. IAPAR, Londrina, PR, Brazil.

_______, M.C. Moretzsohn, and J.F.M. Valls. 2007. Genetic variability of Brazilian Indians landraces of *Arachis hypogaea* L. Genetics and Molecular Research 6(3):675-684.

Friis-Hansen, E., and B. Sthapit. 2000. Participatory approaches to the conservation and use of plant genetic resources. International Plant Genetic Resources Institute, Rome.

Frikel, P. 1959. Agricultura dos índios Munduruku. Boletim do Museu Emílio Goeldi, Nova Série, Antropologia, 4. Belém, Pará, Brazil.

Gaifami, A. and A. Cordeiro. 1994. Cultivando a Diversidade. Recursos genéticos e segurança alimentar local. AS-PTA, Rio de Janeiro, Brazil.

Galvão, E. E. 1963. Elementos da horticultura de subsistência indígena. Revista do Museu Paulista, Nova Série 14:120-144.

_______, and M. Simões. 1966. Mudança e sobrevivência no Alto Xingu, Brasil Central. Revista de Antropologia 14:37-52.

García-Barrios, L. 2003. Plant-plant interactions in tropical agriculture. Pages 11-58 in J. H. Vandermeer. Tropical agroecosystems. CRC Press, New York.

Gauthier, S. and R.P. Woodgate. 2001. Coevolutionary agroecology: a policy oriented analysis of socioeconomic dynamics, with special reference to forest margins in North Lampung, Indonesia. Pages 153-176 in S. R. Gliessman. Agroecosystem sustainability: developing practical strategies. CRC Press, New York.

Glaser, B., G. Guggenberger, W. Zech, and M. L. Ruivo. 2003. Soil organic matter stability in Amazonian Dark Earths. Pages 141-158 in J. Lehmann, D.C. Kern, B. Glaser, and W. I. Woods, eds. Amazonian Dark Earths: origin, properties, management. Kluwer, Boston, Massachusetts.

Godoy, R., V. Reyes-García, J. Broesch, I.C. Fitzpatrick, P. Giovanninni, M.R. Martínez Rodríguez, N. Jha, and T. Huanca. 2006. Does modernization erode the secular trend of indigenous knowledge? New evidence from native Amazonians born 1920-1985, Bolivia. Tsimane' Amazonian Panel Study Working Paper, 29. Heller School for Social Policy and Management, Brandeis University, Waltham, Massachusetts.

Gonçalves, M.A., org. 1996. Diários de campo de Eduardo Galvão: Tenetehara, Kaioá e índios do Xingu. Editora UFRJ and Museu do Indio/FUNAI, Rio de Janeiro, RJ, Brazil.

Gonzales, T. A. 2000. The cultures of the seed in the Peruvian Andes. Pages 193-216 in S. B. Brush, ed. Genes in the Field: On-farm Conservation of Crop Diversity. CRC Press, New York.

GRAIN. 2001. Proyecto cultivando diversidad. (verified on 4/16/2006, Project home page: http://www.grain.org/gd).

_______. 2002. Proyecto Cultivando Diversidad. Taller Internacional sobre el manejo local de la agrobiodiversidad. May 9-19 2002. Proceedings. GRAIN, Rio Branco, Acre, Brazil.

Grünberg, G. 2004. Os Kaiabi do Brasil Central. História e etnografia. Instituto Socioambiental, São Paulo, SP, Brazil.

Gunderson, L. H. and C. S. Holling. 2002. Panarchy. Understanding transformations in human and natural systems. Island Press, Washington, D.C.

Halewood, M., and K. Nnadozie. 2008. Given priorities to the commons: the International Treaty on Plant Genetic Resources for Food and Agriculture. Pages 115-140 in G. Tansey and R. Tasmin, eds. The future control of food. A guide to international negotiations and rules on intellectual property, biodiversity and food security. Earthscan, London.

Hall, A. 2000. Environment and development in Brazilian Amazonia: from protectionism to productive conservation. Pages 99-115 in A. Hall, ed. Amazonia at the crossroads: the challenge of sustainable development. Institute of Latin American Studies, London.

Hammons, R.O. 1963. Artificial cross-pollination of the peanut with bee-collected pollen. Crop Science, 3:562-563.

_______, and D. B. Leuck. 1966. Natural cross-pollination of the peanut, *Arachis hypogaea* L., in the presence of bees and thrips. Agronomy Journal 58:396.

_______. 1994. The origin and history of groundnut. Pages 24-42 in J. Smart, ed. The groundnut crop. A scientific basis for improvement. Chapman and Hall, London.

Hanski, I.A. 1998. Metapopulation dynamics. Nature 396:41-49.

Harlan, J. 1975. Our Vanishing genetic resources. Science 188:618-21.

Hart, R. 1984. Ecological framework for multiple cropping research. Pages 40-56 in C.A. Francis, ed. 1984. Multiple cropping systems. MacMillan, New York.

Hawkes, G.J. and Maxtel, N.B. 2000. *Ex situ* conservation. Chapman and Hall, London.

Hawtin, G.C. and T. Hodgkin. 1997. Towards the future. Pages 368-383 in N.B. Maxted, B.V. Ford-Lloyd, and G.J. Hwakes, eds. Plant genetic conservation: the *in situ* approach. Chapman and Hall, London.

Hecht, S.B. and D.A. Posey. 1989. Preliminary results on soil management techniques of the Kayapo Indians. Pages 174-188 in D.A. Posey, and W. Balée, eds. Resource Management in Amazonia: indigenous and folk strategies. Advances in Economic Botany, 7. New York Botanical Garden, New York.

Heckenberger, M.J. 1996. War and peace in the shadow of empire: sociopolitical change in the Upper Xingu of Southeastern Amazonia, A.D. 1400-2000. PhD dissertation, University of Pittsburgh, Pittsburgh.

_______. 2000. Estrutura, história e transformação: a cultura xinguana na longue durée, 1000-2000 D.C. Pages 21-62 in B. Franchetto, and M. J. Heckenberger, eds. Os povos do Alto Xingu: história e cultura. Editora da UFRJ, Rio de Janeiro, RJ, Brazil.

_______, A. Kuikuro, U. Kuikuro, C.T J. Russell, M. Schmidt, C. Fausto, and B. Franchetto. 2003. Amazonia 1492: Pristine Forest or Cultural Parkland? Science 301:1710-1714.

_______, J.C. Russell, J.R Toney, and M.J. Schmidt. 2007. The legacy of cultural landscapes in the Brazilian Amazon: implications for biodiversity. Philosophical Transactions of the Royal Society of London 362(1478):197-208.

Heckler, S. 2002. Traditional knowledge loss and gender among the Piaroa. Pages 532–548. J. R. Stepp, F. Wyndham, and R. Zarger, eds. Ethnobiology and Biocultural Diversity. Proceedings of the VIIth International Congress of Ethnobiology. International Society of Ethnobiology, Athens, Georgia.

______, and S. Zent. 2008. Piaroa manioc varietals: hyperdiversity or social currency? Human Ecology 36:679-697.

Hemming, J. 2003. Die if you must: Brazilian Indians in the twentieth century. Macmillan, London.

Hewlett, B.S., and L.L. Cavalli-Sforza. 1986. Cultural transmission among Aka Pygmies. American Anthropologist 88(4):922-934.

Hiemstra, W., and B. Haverkort. 1999. Food for thought: ancient visions and new experiments of rural people. ETC/COMPAS, Leusden, The Netherlands.

Hiraoka M., S. Yamamoto, E. Matsumoto, S.Nakamura, I.C. Falesi, and A.R.C. Baena. 2003. Contemporary use and management of Amazonian Dark Earths. Pages 387-406 in J. Lehmann, D. C. Kern, B. Glaser, and W. I. Woods, eds. Amazonian Dark Earths: Origins, Properties, Management. Kluwer, Boston, Massachusetts.

Holling, C.S., L.H. Gunderson, and G. D. Peterson. 2002. Sustainability and panarchies. Pages 63-102 in C.S. Holling, L.H. Gunderson, and D. Ludwig, eds. Panarchy: understanding transformations in human and natural systems. Island Press, Washington, D.C.

Howard, P. L. 2003. Women and the plant world: an exploration. Pages 2-31 in P. L. Howard, ed. Women and Plants. Gender relations in Biodiversity Management and Conservation. GTZ/IDRC/CRDI, New York.

Hunn, E. S. 2002. Evidence for the precocious acquisition of plant knowledge by Zapotec children. Pages 604-613 in J.R., Stepp, S. Wyrdham, and R. Zarger, eds. Ethnobiology and Biocultural Diversity. University of Georgia Press, Athens, Georgia.

_______. 1999. The value of subsistence for the future of the world. Pages 24-36 in V.D. Nazarea, ed. Ethonecology situated knowledge, located lives. University of Arizona Press, Tucson, Arizona.

IBPGRI / ICRISAT. 1992. Descriptors for groundnut. FAO, Rome.

ICRISAT. 2008. Groundnut. (verified on 5/13/08; http://www.icrisat.org/GroundNut/GroundNut.htm#0).

Instituto Histórico e Geográfico do Brasil (IHGB). 1856. Memória da nova navegação do rio Arinos até a Villa de Santarem, Estado de Grão-Pará. Revista do Instituto Histórico e Geográfico do Brasil, 19:99-118.

Instituto Socioambiental (ISA). 2005. Situação jurídica das Terras Indígenas no Brasil hoje. (verified on 11/1/05; http://www.socioambiental.org/pib/portugues/quonqua/ondeestao/sit_jurid.asp).

_______. 2008a. Direitos indígenas. Introdução. (verified on 11/17/08; 2008.http://pib.socioambiental.org/pt/c/direitos/estatuto-do-Indio/introducao).

_______. 2008b. Cabeceiras do rio Xingu 2005-2007. São Paulo, SP, Brazil. (Thematic map scale 1: 1,000,000).

Iskandar, J. and R.F. Ellen. 1999. *In situ* conservation of rice landraces among the Baduy of West Java. Journal of Ethnobiology 19(1):97-125.

Ishizawa, J. 1999. Biodiversity, cultural diversity and spirituality in the Peruvian Andes. Seminar Mountain Area Development: The Americas. August 29 -September 2, 1999. Abisko, Sweden.

Jarvis, D., and T. Hodgkin. 1999. Farmer decision making and genetic diversity: linking multidisciplinary research to implementation on farm. Pages 261-278 in Brush, S.B., ed. Genes in the field: on-farm conservation of crop diversity. CRC Press, New York.

_______, L. Meyer, H. Klemick, L. Guarino, M. Smale, A.H.D. Brown, M. Sadiki, B. Sthapit, and T. Hodgkin, 2000. A training guide for *in situ* conservation on-farm: Version 1. International Plant Genetic Resources Institute, Rome.

_______, C. Padoch, and D. Cooper. 2007. Managing biodiversity in agricultural ecosystems. Columbia University Press, New York.

_______, and and T. Hodgkin. 2008. The maintenance of crop diversity on farm: supporting the Convention of Biological Diversity's programme of work on agricultural biodiversity. Biodiversity 9(1/2):23-28.

_______, A. H. D, Brown, P. H., Cuong, L., Collado-Panduro, L. , Latournerie-Moreno, S., Gyawali, T. Tesema, T. Tanto, M. Sawadogo, I. Mar, M. Sadikik, N. T. Hue, L. Arias-Reyes, D. Balma, J. Bajracharya, F. Castillo, D. Rijal, L. Belqadi, R. Rana, S. Saidi, J. Ouedraogo, R. Zangre, K. Rhrib, J. L. Chavez, D. Schoen, B. Sthapit, P. Santis, C. Fadda, and T. Hodgkin. 2008. A global perspective of the richness and evenness of traditional crop-variety diversity maintained by farming communities. Proceedings of National Academy of Sciences of the United States of America 105(14):5326-5331.

_______, R. Sevilla Panizo, J.L. Chávez Servia, and T. Hodgkin. 2004. Seed systems and crop genetic diversity on farm. Proceedings of a workshop, September 16-20. Pucallpa, Peru. International Plant Genetic Resources Institute, Rome: Italy.

Kaiabi, T., and G.M. Silva, 2001. Experiencia de manejo de recursos genéticos amazónicos por indigenas del Xingu. Growing Diversity Project. Taller Regional Latinoamericano. Sasaima, Colombia. (verified on 4/16/06, Home page: http://www.grain.org/gd/es/case-studies/cases/fulltext/la-full-brazil2-es.cfm).

_______, A. Kaiabi, T. Yudja, M. Yudja, T. Yudja, G.M. Silva, and K.Y. Ono. 2004. Resgate cultural e manejo da agrobiodiversidade em roças indigenas. Agriculturas 1(1):6-8.

Kanden, H.B.S., and P. Richards. 1996. Rural people as conservationists: querying neo-Malthusian assumptions about biodiversity in Sierra Leone. Africa 1(1):18-32.

Kern, D. C., and N. Kampf. 1989. Antigos assentamentos indígenas na formação de solos com terra preta arqueológica na região de Oriximiná, Pará. Revista Brasileira de Ciência do Solo 13: 219-225.

_______. 1996. Geoquímica e pedogeoquímica em sítios arqueológicos com terra preta na Floresta Nacional de Caxinauá (Portel, PA). PhD dissertation. Centro de Geociências. Universidade Federal do Pará, Belém, Pará, Brazil.

_______, G. D'Aquino, T.E. Rodrigues, F.J.L. Frazão, W. Sombroek, T.P. Myers, and E.G. Neves. 2003. Distribution of Amazonian Dark Earths in the Brazilian Amazon. Pages 51-76 in J. Lehmann, D.C. Kern, B. Glaser, and W. I. Woods, eds. Amazonian Dark Earths: origin, properties, management. Kluwer. Boston, Massachusetts.

_______, M.L. Costa, and F.J.L. Frazão, 2004. Evolution of the scientific knowledge regarding Archaeological Black Earths of Amazonia. Pages 19-28 in B. Glaser, and W. I. Woods, eds. Amazonian Dark Earths: explorations in space and time. Springer Verlag, New York.

Kochert G., H.T. Stalker, M. Gimenes, L. Galgaro, C.R. Lopes, and K. Moore. 1996. RFLP and cytogenetic evidence on the origin and evolution of allotetraploid domesticated peanut, *Arachis hypogaea* (Leguminosae). American Journal of Botany 83:1282-1291.

Krapovickas, A. 1969. The origin, variability and spread of the groundnut (*Arachis hypogea*). Pages 427-441 in P.J. Ucko and I.S. Falk, eds. The domestication and explotation of plants and animals. Gerald Duckworth, London.

_______.1973. Evolution of the genus *Arachis*. Pages 135-151 in R. Moav, ed. Agricultural genetics: selected topics. National Council for Research and Development, Jerusalem, Israel.

_______, and W.C. Gregory. 1994. Taxonomía del género *Arachis* (Leguminosae). Bonplandia 8:1-186.

_______. 1995. El orígen y dispersión de las variedades del maní. Anales de la Academia Nacional de Agronomia y Veterinaria 49:18-26. Montevideo, Uruguay.

_______.1998. *Arachis hypogaea* var. *hirsuta* y las relaciones transoceánicas precolombinas. Anales de la Academia Nacional de Ciencias Exactas, Físicas y Naturales 50:211-216.

_______.2004. Consideraciones sobre el origen del mani. Pages 35-37 in Encontro Latino-Americano De Especialistas em *Arachis*, Annals. 4. Embrapa Recursos Genéticos e Biotecnologia. Documentos, 127. Brasília, D.F., Brazil.

Kresovich, S., and J. R. McFerson. 1992. Assessment and management of plant genetic diversity: considerations of intra- and interspecific variation. Field Crops Research 29(3):185-204.

Leon, J. 1987. Botanica de los cultivos tropicales. IICA, San José, Costa Rica.

Leuck, D.B., and R.O. Hammons. 1969. Occurrence of atypical flowers and some associated bees (Apoidea) in peanut, *Arachis* hypogaea L. Agronomy Journal 61(6):958-960.

Lewis, V., and P.M. Mulvany. 1997. A typology of community seed banks. Natural Resources Institute, University of Greenwich, Kent, UK.

Liang, L. 2002. Promoting agrodiversity: experience of UNU Project on People, Land Management and Environmental Change (PLEC). Paper for Stakeholder Workshop and Steering Committee Meeting of the Globally Important Ingenious Agricultural Heritage Systems project (GIAHS), August 5- 7 2002. FAO, Rome.

Liebman, M. 1995. Polyculture cropping systems. Pages 205-218 in M.A. Altieri, ed. Agroecology. The science of sustainable agriculture. Westview Press, Boulder, Colorado.

Lima, A. R., F. M. Baptista, and N. Bensusan, 2003. Direitos intelectuais coletivos e conhecimentos tradicionais. Pages 203-216 in A.R. Lima and N. Bensusan, eds. Quem cala consente? Subsídios para a proteção ao conhecimento tradicional. Instituto Socioambiental, São Paulo, SP, Brazil.

Lima, T. S. 1995. A parte do cauim. Etnografia Juruna. PhD dissertation, UFRJ/Museu Nacional, Rio de Janeiro, RJ, Brazil.

Lizarralde, M. 2001. Biodiversity and loss of indigenous languages and knowledge in South America. Pages 265-81in L. Maffi, ed. On biocultural diversity: linking language, knowledge, and the environment. Smithsonian Institution Press, Washington, D.C.

Louette, D. 1999. Traditional management of seed and genetic diversity: what is a landrace? Pages 109-142 in S. B. Brush, ed. Genes in the field: on-farm conservation of crop diversity. CRC Press, New York.

________, A. Charrier, and J. Berthaud. 1997. *In situ* conservation of maize in Mexico: Genetic diversity and maize seed management in a traditional community. Economic Botany 51(1):20-38.

Louette, D., and M. Smale, 2000. Farmers' seed selection practices and traditional maize varieties in Cuzalapa, Mexico. Euphytica 113:25-41.

MacGuire, S., G. Manicad, and L. Spearling. 2003. Technical and institutional issues in participatory plant breeding done from a perspective of farmer plant breeding. A global analysis of issues and of current experience. PPB Monograph Series, 2. CGIAR/CIAT, Cali, Colombia.

Maffi, L., 2001. On biocultural diversity: linking language, knowledge, and the environment. Smithsonian Press, Washington, D.C.

Major, J., A. DiTommaso, L.A. German, and J.M. McCann. 2003. Weed population dynamics and management on Amazonian Dark Earth. Pages 433-454 in J. Lehmann, D.C. Kern, B. Glaser, and W. I. Woods, eds. Amazonian Dark Earths: origin, properties, management. Kluwer, Boston, Massachusetts.

Mara, K. 2008a. No agreement for WIPO Committee on Traditional Knowledge and Folklore. (verified on 11/24/08, http://www.ip-watch.org/weblog/index.php?p=1276).

Mara, K. 2008b. Indigenous people seek recognition at WIPO meeting on their rights. (verified on 11/24/08, http://www.ip-watch.org/weblog/index.php?p=1286).

Martin, G. 2004. Ethnobotany. A methods manual. Earthscan. London.

Maxted, N., L. Guarino, L. Myer, and E.A. Chiwona. 2002. Towards a methodology for on-farm conservation of plant genetic resources. Genetic Resources and Crop Evolution 49:31-46.

Maxted, N.B., B.V. Ford-Lloyd, and G.J. Hawkes. 1997. Complementary conservation strategies. Pages 15-39 in N.B. Maxted, B.V. Ford-Lloyd, and G.J. Hawkes. Plant genetic conservation: the *in situ* approach. Chapman and Hall, London.

McKey, D., L. Emperaire, M. Elias, F. Pinton, T. Robert, S. Desmouliere, and L. Rival. 2001. Local management and regional dynamics of varietal diversity of cassava in Amazonia. Genetics Selection Evolution 33:S465-S490.

Menezes, M.L.P. 2000. Parque Indígena do Xingu: a criação de um território estatal. Editora da UNICAMP/Imprensa Oficial do Estado de São Paulo. Campinas, São Paulo, Brazil.

Meng, E., J. E. Taylor, and S. B. Brush. 1998. Implications for the conservation of wheat landraces in Turkey from a household varietal choice. Pages 127–142 in M. Smale, ed. Farmers, Gene Banks and crop breeding. Kluwer, Boston, Massachusetts.

Ministério do Meio Ambiente(MMA)/PPG7/WB. 2002. Lessons from the Rain Forest: Experiences from the Pilot Program to Conserve the Amazon and the Atlantic Forests of Brazil. Brasília, Brazil.

Miranda, O.O. 1890. Resumo da conferencia feita pelo Sr. Capitão sobre o rio Paranatinga ou S. Manoel. Revista da Sociedade de Geographia do Rio de Janeiro 6:135-151.

Mkumbira, J. 2002. cassava development for small-scale farmers. Approaches to breeding in Malawi. PhD dissertation, Swedish University of Agricultural Sciences, Upsala, Sweden.

Moran, E.F. 1995. Rich and poor ecosystems of Amazonia: an approach to management. Pages 45–67 in T. Nihizawa and J.I. Uitto, eds. The fragile tropics of Latin America: sustenable management of changing environments. United Nations University Press, Tokyo, Japan.

Moretzsohn, M.C. and J.F.M. Valls, 2001. Análise da variabilidade genética da coleção brasileira de germoplasma de amendoim (*Arachis* hypogea L.), por meio de marcadores microssatélites. EMBRAPA/CENRAGEN. Boletim de Pesquisa e Desenvolvimento, 13. Brasília, DF, Brazil.

Nabhan, G.P. 1985. Native crop diversity in aridoamerica: conservation of regional gene pools. Economic Botany 39:387-399.

Nazarea, V.D. 1991 Ethnoagronomy and ethnogastronomy: On indigenous typology and use of biological resources. Agriculture and Human Values 8(1-2):121-131.

_______. 1998. Cultural memory and biodiversity. University of Arizona Press, Tucson, Arizona.

_______. 2005. Heirloom seeds and their keepers. University of Arizona Press, Tucson, Arizona.

Netting, R.M. 1993. Smallholders, householders: farm families and the ecology of intensive, sustainable agriculture. Stanford University Press, Palo Alto, California.

Neves, E.G., J.B. Peterson, R.N. Bartone, and C.A. da Silva. 2003. Historical and socio-cultural origins of Amazonian Dark Earths. Pages 29-50 in J. Lehmann, D. C. Kern, B. Glaser, and W. I. Woods, eds. Amazonian Dark Earths: origins, properties, management. Kluwer, Boston, Massachusetts.

_______, J.B. Peterson, R.N. Bartone, and M.J. Heckenberger. 2004. The timing of terra preta formation in the Central Amazon: archaeological data from three sites. Pages 125-134 in B. Glaser, and W.I. Woods, eds. Amazonian Dark Earths: Explorations in space and time. Springer Verlag, New York.

Nimuendajú, C. 1948. The Cayabi, Tapanyuna, and Apiaca. Pages 307-320 in J. Steward, org. Handbook of South American Indians, 3. The Tropical Forest Tribes. Smithsonian Institution, Washington, D.C.

_______, and Riester, J. 1978. Los mitos de creación y de destrucción del mundo como fundamentos de la religión de los Apapokuva-Guaraní. Centro Amazónico de Antropología y Aplicación Práctica, Lima, Perú.

Norden, A.J. 1973. Breeding of the cultivated peanut (*Arachis hypogea* L.). Pages 175-208 in American Peanut Research and Education Association. Peanut: cultures and uses. American Peanut Research and Education Association, Stillwater, Oklahoma.

______. 1980. Peanut. Pages 443-456 in W. R. Fehr, and H. H. Hadley, eds. Hybridization of crops. American Society of Agronomy, Madison, Wisconsin.

______, Smith, O.D. and Gorbet, D.W. 1982. Breeding of the cultivated peanut. Pages 95-122 in H.E. Pattee, and C.T. Young, eds. Peanut science and technology. American Peanut Research and Education Society, Yoakum, Texas.

Noorgard, R. B. 1994. Development betrayed: the end of progress and a co-evolutionary revisioning of the future. Routledge, London.

______, and T.O. Sikor. 1995. The methodology and practice of agroecology. Pages 21-40 in M.A. Altieri, 1995. Agroecology. The science of sustainable agriculture. Westview Press Boulder, Colorado.

Nye, M.M. 1991. The mis-measure of manioc (*Manihot esculenta*, Euphorbiaceae). Economic Botany 45(1):47-57.

Nye, P. H., and D.J. Greenland. 1961. The soil under shifting cultivation. Commonwealth Agricultural Bureaux. Commonwealth Bureau of Soils Technical Communication, 51. Commonwealth Bureau of Soils, Harpender, U.K.

Oakdale, S. R. 1996. The power of experience: agency and identity in Kayabi healing and political process in the Xingu Indigenous P. PhD dissertation, University of Chicago, Chicago, Ilinois.

______. 2004. The culture-conscious Brazilian Indians: representing and reworking Indianness in Kayabi political discourse. American Ethnologist 31(1): 60-75.

______. 2005. I foresee my life. The ritual performance of autobiography in an Amazonian community. University of Nebraska Press, Lincoln, Nebraska.

Oakley, E., and J. H. Momsen. 2005. Gender and agrobiodiversity: a case study from Bangladesh. Geographical Journal 171:195-208.

Oberg, K. 1955. Indian Tribes of Northern Mato Grosso, Brazil. Instituto of Social Anthropology Publications, 15. Smithsonian Institution, Washington, D.C.

Ogkibo, B. N. 1984. Improved permanent production systems as an alternative to shifting intermittent cultivation. FAO Soils Bulletin, 53, Rome.

Organization for Economic Co-operation and Development (OECD). 2001.Environmental Indicators for agriculture. Vol. 3 Methods and Results. Organization for Economic Co-operation and Development, Paris, France.

Oldfield, M. L., and J. B. Alcorn. 1987. Conservation of traditional agroecosystems. Bioscience 37:199-208.

Orlove, B.S., and S.B. Brush, 1996. Anthropology and the conservation of biodiversity. Annual Review of Anthropology 25: 329-352.

Pabst, E. 1991.Critérios de distinção entre terra preta e latossolo na região de Belterra e os seus significados para a discussão pedogenética. Boletim do Museu Paraense Emílio Goeldi, S. Antropológica 7(1):5-19.

Pagliaro, H. 2002. A revolução demográfica dos povos indígenas do Brasil: a experiência dos Kaiabi do Parque Indígena do Xingu, MT, 1970-1999. PhD dissertation, Faculdade de Saúde Pública, Universidade de São Paulo, SP, Brazil.

Paz R., C. L. 2003 Forest-use history and the soils and vegetation of a lowland forest in Bolivia. MsC thesis, University of Florida, Gainesville, Florida.

Perales, H.R., B.F. Benz, and S.B. Brush. 2005. Maize diversity and ethnolinguistic diversity in Chiapas, Mexico. Proceedings of the National Academy of Sciences of the United States of America 102(3):949-954.

Pereira, A.H. 1995. 0 Pensamento mítico Kayabi. Instituto Anchietano de Pesquisas, UNISINOS. Pesquisas, Série Antropologia, 51. São Leopoldo, Rio Grande do Sul, Brazil.

Peroni, N., and P.S. Martins. 2000. Influência da dinâmica agrícola itinerante na geração de diversidade de etnovariedades cultivadas vegetativamente. Interciencia 25(1):22-29.

______, and N. Hanazaki. 2002. Current and lost diversity of cultivated varieties, especially cassava, under swidden cultivation systems in the Brazilian Atlantic Forest. Agriculture, Ecosystems and Environment 92(2/3):171-183.

Perreault, T. 2005. Why chacras (swidden gardens) persist: agrobiodiversity, food security, and cultural identity in the Ecuadorian Amazon. Human Organization 64(4):327-339.

Peters, W. J., and L.F. Neuenschwander. 1988. Slash and burn: farming in the Third World forest. University of Idaho Press, Moscow, Idaho.

Petersen, J., E.G. Neves, and M.J. Heckenberger. 2001. Gift from the past: Terra Preta and prehistoric Amerindian occupation in Amazonia. Pages 86-107 in C. McEwan, C. Barreto, and E. G. Neves, eds. Unknown Amazon. The British Museum Press, London.

Pfeiffer, J.M., and R.J. Butz. 2005. Assessing cultural and ecological variation in ethnobiological research: the importance of gender. Journal of Ethnobiology 25(2):240-278.

Pinton, F. 2003. Traditional knowledge and areas of biodiversity in Brazilian Amazonia. International Social Science Journal 55(4):607-618.

______, and L. Emperaire. 2001. Le manioc en Amazonie brésilienne: diversité variétale et marché. Genetic Selection and Evolution 33:491-512

Pistorius, R. 1997. Scientists, plants and politics: a history of the plant genetic resources movement. International Plant Genetic Resources Institute, Rome.

Plucknett, D.L., and N.J.H. Smith. 1984. Historical perspectives on multicropping. Pages 20-39 in C.A. Francis, ed. Multiple cropping systems. MacMillan, New York.

Poiteau, P. A. 1802. Observations botaniques faites a Saint-Domingue. Bulliten de la Société Philom. Paris 66:137-138.

______. 1806. Observations sur l'*Arachis hypogea* L. Memoire des Institute des Sciences Diversique Savans, Science et Mathematique. Serie 1. 1:455-462, pl.7.

Posey, D. A. 1984. Ethnoecology as applied anthropology in Amazonian development. Human Organization 43(2):134-151.

______. 1985. Indigenous management of tropical forest ecosystems: the case of the Kayapo Indians of the Brazilian Amazon. Agroforestry Systems 3(2):139-159.

______.1996. The Kayapo Indian protests against Amazonian dams: successes, alliances, and unending battles. Pages 221-233 in C. McDowell, ed.Understanding impoverishment: the consequences of development-induced displacement. Refugee and forced migration studies 2. Oxford University Press, Oxford, U.K.

______.1999. Cultural and spiritual values of biodiversity. Intermediate Technology Publications, London.

______, and G. Dutfield. 1996. Beyond intellectual property: toward traditional resource rights for indigenous peoples and local communities. International Development Research Centre, Ottawa.

Pujol, B., G. Gigot, G. Laurent, M. Pinheiro-Kluppel, M. Elias, P. Hossaert-McKey, and D. Mckey, 2002. Germination ecology of cassava (*Manihot esculenta* Crantz, Euphorbiaceae) in traditional agroecosystems: seed and seedling biology of a vegetatively propagated domesticated plant. Economic Botany 56(4):366-79.

Pyrineus de Souza, A.1916. Exploração do rio Paranatinga 1915-1916. Commissão de Linhas Telegráficas Estratégicas, Rio de Janeiro, RJ, Brazil.

Qualset, C.O., A.B. Damania, A.C. Zanatta, and S.B. Brush. 1997. Locally based crop conservation. Pages in 160-175 in N. B. Maxted, B.V. Ford-Lloyd, and G.J. Hwakes, eds. Plant genetic conservation: the *in situ* approach. Chapman and Hall, London, UK.

RadamBrasil. 1981. Levantamento de Recursos Naturais.Folha SC. 22 Tocantins. Ministério das Minas e Energia/Projeto Radambrasil. Rio de Janeiro, RJ, Brazil.

RadamBrasil. 1980. Levantamento de Recursos Naturais. Folha SC 21, Juruena. Ministério das Minas e Energia/Projeto Radambrasil. Rio de Janeiro, RJ, Brazil.

Raina, S.N., and Y. Mukai, 1999. Genomic *in situ* hybridization in *Arachis* (Fabaceae) identifies the diploid wild progenitors of cultivated (*A. hypogaea*) and related wild (*A. monticola*) peanut species. Plant Systematics and Evolution 214:251-262.

Ramakrishnan, P.S. 2002. Globally Important Ingenious Agricultural Heritage Systems (GIAHS): An eco-cultural landscape perspective. Globally Important Ingenious Agricultural Heritage Systems Project (GIAHS), FAO, Rome.

Ramanatha Rao, V., and U.R. Murty. 1994. Botany: morphology and anatomy. Pages 43-95 in J. Smart, ed. The groundnut crop. A scientific basis for improvement. Chapman and Hall, London.

Ramos, A. R. 1998. Indigenism: ethnic politics in Brazil. University of Wisconsin Press, Madison, Wisconsin.

Rappaport, R.A. 1971. The flow of energy in an agricultural society. Scientific American 225(3):116-132.

Reford, K. H. 1991. The ecologically noble savage. Cultural Survival Quarterly 15(1):46.

Rhoades, R.E., and V.D. Nazarea. 1999. Local management of biodiversity in traditional agroecosystems. Pages 215–236 in W.W. Collins and C.O. Qualset, eds. Biodiversity in agroecosystems. CRC Press, New York.

______, and and V.D. Nazarea. 2007. Forgotten futures: scientific models vs local visions of land use change. Pages 231-256 in Sillitoe, P., ed. Local science vs global science: approaches to indigenous knowledge in international development. Berghahn, New York.

Ribeiro, B. 1979. Diários do Xingu. Paz e Terra, Rio de Janeiro, RJ, Brazil.

Rice, E., M. Smale, and J. L. Blanco. 1998. Farmers' use of improved seed selection practices in Mexican maize: evidence and issues from the Sierra de Santa Marta. World Development 26(9):1625-1640.

Rice, R.A. 2003. Tropical agricultural landscapes. Pages 195-218 in J. H. Vandermeer, ed.Tropical agroecosystems. CRC Press, New York.

Richards, P., 1985. Indigenous agricultural revolution: ecology and food production in West Africa. Hutchinson, London.

______. 1986. Coping with hunger: hazard and experiment in an African rice-farming system. Allen and Unwin, London.

Rival, L. 2001. Seed and clone: the symbolic and social significance of bitter manioc cultivation. In L. Rival, and N. Whitehead, eds. Beyond the visible and the material: the Amerindianization of society in the work of Peter Rivière. Oxford University Press, Oxford, U.K.

Rodrigues, A J. 1993. The ecology of the Kayabi Indians of Xingu, Brazil: soil and agroforestry management. Doctoral dissertation, Darwin College, Cambridge University, Cambridge, U.K.

Rolling, N.G., and M.A.E. Wagemakers. 2000. A new practice: facilitating sustainable agriculture. In pages 3-22 in N.G. Rolling and M.A.E Wagemakers, ed. Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty. Cambridge University Press, Cambridge, UK.

Romney, A.K, S.C. Weller, and W.H. Batchelder. 1986. Culture as consensus: a theory of culture and informant accuracy. American Anthropologist 88(3):313-338.

Ross, P. 2002. Lacandon Maya intergenerational change and the erosion of folk biological knowledge. Pages 585-592 in J. R. Stepp, F. S. Wyrdham and R. K. Zanger, eds. Ethnobiology and Biocultural Diversity. Proceedings of the International Congress of Ethnobiology, 7. Athens, Georgia, October 2000. University of Georgia Press, Athens, Georgia.

Russel Bernard, H. 2002. Research methods in anthropology. Altamira Press, New York.

Sachs, C. 1996. Gendered fields: rural women, agriculture, and environment. Westview Press, Boulder, Colorado.

Sadiki, M., D. Jarvis, D. Rijal, J. Bajracharya, N. Hue, T. Camacho-Villa, L. Burgos-May, M. Sawadogo, D. Balma, D. Lope, L. Arias, I. Mar, D. Karamura, D. Williams, J. Chavez-Servia, B. Sthapit, and V. Rao. 2007. Variety names: An entry point to crop genetic diversity and distribution in agroecosystems? Pages 34–76 in D. Jarvis, C. Padoch, and D. Cooper, eds. Managing biodiversity in agricultural ecosystems. Colombia University Press, New York.

Sahlins, M. 1997. O ‘pessimismo sentimental’ e a experiência etnográfica: por que a cultura não é um ‘objeto’ em via de extinção (Parte I). Mana 3(1):41-73.

Salick, J., N. Cellinese, and S. Knapp. 1997. Indigenous diversity of cassava: generation, maintenance, use and loss among the Amuesha, Peruvian Upper Amazon. Economic Botany 51(1):6-19.

Sambatti, J. B. M., P. S. Martins, and A. Ando. 2001. Folk taxonomy and evolutionary dynamics of cassava: a case study in Ubatuba, Brazil. Economic Botany 55(1):93-105.

Sanchez, P. A. 1976. Soil management in shifting cultivation areas. Pages 346-412 in P. A. Sanchez, ed. Properties and management of soils in the tropics. Wiley-Interscience, New York.

Santos, G. M. 2001. Seara de homens e deuses: uma etnografia dos modos de subsistência dos Enewenê-Nawe. MsC thesis, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil.

______. 2006. Da cultura à natureza: um estudo do cosmos e da ecologia dos Enawene-Nawe. PhD dissertation on Social Anthropology, Universidade de São Paulo, São Paulo, Brasil.

Savage, G.P. and J.I. Keenan, 1994. The composition and nutritive value of groundnut kernels. Pages 173-213 in J. Smartt, ed. The groundnut crop. A scientific basis for improvement. Chapman and Hall, London, UK.

Schmidt, M. 1942. Los Kayabi en Mato Grosso. Revista de la Sociedad Científica del Paraguay, Sociedad Científica del Paraguay, 5(6):1-34. Assunción, Paraguay.

Schmidt, M.J. and M.J. Heckenberger, 2008. Formação de Terra Preta na região do Alto Xingu: resultados preliminares. In press in I. Falesi, ed. Manejo de Terras Pretas na amazônia brasileira. EMBRAPA. Belém, Pará, Brazil.

Schmidt, M.V.S. 2001. Etnosilvicultura Kaiabi no Parque Indígena do Xingu: subsídios ao manejo de recursos florestais. MsC thesis, Universidade Estadual de São Carlos, São Carlos, São Paulo, Brazil.

Schwartzman, S., and B. Zimmerman, 2005. Conservation alliances with indigenous peoples of the Amazon. Conservation Biology 19(3):721-727.

______, D.C. Nepstad, and A. Moreira, 2000. Arguing tropical forest conservation: people versus Parks. Conservation Biology 14(5):1370-1374.

Scoones, I., and J. Thompson. 1994. Knowledge, power and agriculture: towards a theoretical understanding. Pages 16-32 in I. Scoones and J. Thompson, eds. Beyond Farmers First. Intermediate Technology Publications, London.

Senra, K.V. 1999. Kaiabi. In Enciclopédia dos Povos Indígenas no Brasil. Instituto Socioambiental, São Paulo, São Paulo. (verified on 14/10/2007, http://www.socioambiental.org/pib/epi/kaiabi/kaiabi.shtm).

______. 2004. As terras Kaiabi hoje e suas reinvidicações. Pages 51-57 in G. Grünberg. Os Kaiabi do Brasil Central. História e etnografia. Instituto Socioambiental, São Paulo, SP, Brazil.

______, and E.L. Jesus.1997. Relatório sobre o levantamento dos sistemas de produção da Aldeia Capivara, Etnia Kayabi, Parque Indígena do Xingu. Instituto Socioambiental, São Paulo, SP, Brazil.

______, S.F. Athayde, G.M. and Silva. 2004. Os Kaiabi hoje: aspectos culturais e ambientais. Pages 251-289 in G. Grünberg. Os Kaiabi do Brasil Central. História e etnografia. Instituto Socioambiental, São Paulo, SP, Brazil.

Sillitoe, P. A. 2002. Globalizing indigenous knowledge. Pages 108-138 in Sillitoe, P., A. Bicker, and J. Pottier, eds. Participating in development. Approaches to indigenous knowledge. ASA Monographs, 39. Routledge, London.

______, A. Bicker and J. Pottier, 2002. Participating in Development: Approaches to Indigenous Knowledge. ASA Monographs, 39. Routledge, London.

Silva, G. M. 1996. Aspectos da agricultura indígena no médio Xingu. Relatório Técnico. Instituto Socioambiental/The Norwegian Rainforest Foundation, São Paulo, SP, Brazil.

______. 1999 Agricultura Kaiabi e Yudja na paisagem norte do Parque Indígena do Xingu. Relatório Técnico. Instituto Socioambiental/The Norwegian Rainforest Foundation, São Paulo, SP, Brazil.

_______. 2002. Uso e conservação da agrobiodiversidade pelos índios Kaiabi do Xingu. Pages 71-83 in N. Bensusan, ed. Não seria melhor mandar ladrilhar? Biodiversidade: Como, por que, para quem. UnB/ISA, Brasília,DF, Brazil.

_______. 2004. O sistema agrícola Kaiabi. Pages 265-272 in G. Grünberg. Os Kaiabi do Brasil Central. História e etnografia. Instituto Socioambiental, São Paulo, SP, Brazil.

______, and S.F. Athayde. 1999. Bases socioambientais para o desenvolvimento de alternativas econômicas sustentáveis na região norte do Parque Indígena do Xingu. Relatório Técnico. Instituto Socioambiental/The Norwegian Rainforest Foundation, São Paulo, SP, Brazil.

______, and S.F. Athayde. 2002. A Ciência da Roça no Xingu: livro Kaiabi. Instituto Socioambiental, ATIX /Growing Diversity Project/FNMA/RFN, São Paulo, SP, Brazil.

______, S.F. Athayde, K.V. Senra, and M.V.S Schmidt. 2000. Viagem histórica do povo Kaiabi ao seu território ancestral. Relatório Técnico. Instituto Socioambiental, The Norwegian Rainforest Foundation, São Paulo, SP, Brazil.

Simpson, C.E., A. Krapovickas, and J.F.M. Valls, 2001. History of *Arachis*, including evidence of *A. hypogaea* L. progenitors. Peanut Science 28:78-80.

Smale, M., and M.R. Bellon. 1999. A conceptual framework for valuing on-farm genetic resources. Pages 387-408 in D. Wood and J. M. Lenné. Agrobiodiversity: characterization, utilization and management. CAB International, Wallingford, Oxon, U.K.

Smith, A. 1990. Explorers of the Amazon. Viking Press, New York.

Smith, A. F. 2002. Peanuts, the illustrious history of the goober pea. University of Illinois Press, Champaign, Illinois.

Smith, H. H. 1879. Brazil, the Amazons and the Coast. Charles Scribner's Sons, New York.

Smith, N.J.H. 1980. Anthroposols and human carrying capacity in Amazonia. Annals of the Association of American Geographers 70(4):553-566.

Soleri, D. and Cleveland, D.A. 1993. Hopi crop diversity and change. Journal of Ethnobiology 13(2):203-231.

______,and Smith, S.E. 1999. Conserving folk crop varieties: different agricultures, different goals. Pages 133-154 in V.D. Nazarea, ed. Ethnoecology: situated knowledge, located lives. University of Arizona Press, Tucson, Arizona.

Sombroek, W.G. 1966. Amazon soils. A reconnaissance of the soils of the Brazilian Amazon region. Wageningen Agricultural University, Wageningen, NL.

Souza, G.S. 1938. Tratado descriptivo do Brasil em 1857. Série Brasiliana, 117. Companhia Editora Nacional, São Paulo, SP, Brazil.

Sponsel, L. E. 1995. Relationships among the world system, indigenous peoples, and ecological anthropology in the endangered amazon. Pages 263-293 in L.E. Sponsel, ed. Indigenous People and the Future of Amazonia. University of Arizona Press, Tucson, Arizona.

Steinberg, M.K. 1999. Maize diversity and cultural change in a Maya agroecological landscape. Journal of Ethnobiology 19(1):127-139.

Stocké, V., and Hunkler, C. 2007. Measures of desirability beliefs and their validity as indicators for socially desirable responding. Field Methods 19(3):313-336.

Sullivan, L. E. 1988. Icanchu's drum. An orientation to meaning in South American religions. Macmillan, New York.

Swift, M.J. and J.M. Anderson. 1994. Biodiversity and ecosystem function in agricultural systems. Pages 15-41 in E.D. Schulze and H.A. Mooney, eds. Biodiversity and Ecosystem Function. Springer Verlag, New York.

Tansey, G. and Tasmin, R. 2008. The future control of food. A guide to international negotiations and rules on intellectual property, biodiversity and food security. Earthscan, London.

Thrupp, L. A. 1998. Cultivating diversity: agrobiodiversity and food security. World Resources Institute, Washington, D.C.

Tibiriçá, L. C. Dicionário Tupi-Português, com esboço de gramática de Tupi antigo. Editora Traço, São Paulo, SP, Brazil.

Travassos, E. 1984. Xamanismo e música entre os Kayabi. MsC thesis, UFRJ/Museu Nacional, Rio de Janeiro, Rio de Janeiro, Brazil.

______. 1993. A tradição guerreira nas narrativas e nos cantos Caiabis. Pages 445-83 in V.P. Coelho, org. Karl von den Steinen: um século de antropologia no Xingu. EDUSP/FAPESP, São Paulo, SP, Brazil.

Tripp, R. 1996. Biodiversity and modern crop varieties: sharpening the debate. Agriculture and Human Values 13(4):48–63.

Vadez, V., V. Reyes-García, L. Apaza, E. Byron, T. Huanca, W. Leonard, F. Perez, and D. Wilkie. 2004. Does integration to the market threaten agricultural diversity? Panel and cross-sectional evidence from a horticultural-foraging society in the Bolivian Amazon. Human Ecology 32:635-646.

Valls, J.F.M. 1996. O gênero *Arachis* (Leguminosae): Importante fonte de proteinas na pré-historia sul-americana? Pages 265-280 in Reunião científica da Sociedade de Arqueologia Brasileira, 8, 1995, Porto Alegre, Anais. EDIPUCRS. Porto Alegre, Rio Grande do Sul, Brazil.

______.2005. Recursos genéticos de *Arachis*: Avanços no conhecimento botânico e a situação atual de conservação e uso. Agrociencia, 9(1-2):123-132. Montevideo, Uruguay.

______, and C.E. Simpson, 2005. New species of *Arachis* (Leguminosae) from Brazil, Paraguay and Bolivia. Bonplandia 14:35-64.

van Etten, J. 2006 Changes in farmers' knowledge of maize diversity in highland Guatemala, 1927/37-2004. Journal of Ethnobiology and Ethnomedicine 2:29.

Villas-Bôas, C., and O. Villas-Bôas. 1986. Xingu: os Kayabi do Rio São Manoel. Kuarup, Porto Alegre, Rio Grande do Sul, Brazil.

Visser, B., and J. Engels, 2000. Synthesis: the common goal of conservation of genetic resources. In pages 145-153 in C. Almenkinders, and W. De Boef, eds. Encouranging diversity: the conservation and development of plant genetic resources. Intermedite Technology Publications, London.

Viveiros de Castro, E. 1984. Proposta para um II Encontro Tupi. Revista de Antropologia, 27/28:403-407.

_______.1996a. Os pronomes cosmológicos e o perspectivismo ameríndio. Mana 2(2):114-144.

_______.1996b. Images of nature and society in Amazonian ethnology. Annual Review of Anthropology 25:179-200.

_______.2008. Perspectivismo indígena. Pages 83-92 in C.A. Ricardo and M. Antongiovanni. Visões do Rio Negro: Construindo uma rede socioambiental na maior bacia de águas pretas do mundo. Instituto Socioambiental, São Paulo, SP, Brazil.

_______.1992. From the enemy’s point of view. Humanity and divinity in an Amazonian society. University of Chicago Press, Chicago, Illinois.

Voeks, R.A., and A. Leony. 2004. Forgetting the Forest: assessing medicinal plant erosion in Eastern Brazil. Economic Botany 58:S294-S306.

von den Steinen, K. 1942. O Brasil Central. Expedição em 1884 para a exploração do rio Xingu. Companhia Editora Nacional, Sao Paulo, São Paulo, Brazil.

von Werden, P. 1999. Diários de Fritz Tolksdorf. Companhia de Jesus, Cuiabá, Mato Grosso, Brazil. (Unpublished manuscript.)

Wagley, C. 1977. Tears of welcome: the Tapirapé Indians of Central Brazil. Oxford University Press, Oxford, U.K.

Warren, D. M. 1991. Using indigenous knowledge in agricultural development. Intermediate Technology Publications, London.

Weiss, E.A. 2000. Oilseed Crops. Blackwell, London.

Weller, S.C. 1987. Shared knowledge, intracultural variation, and knowledge aggregation. American Behavioral Scientist 31(2):178-93.

_______. 2007. Cultural Consensus Theory: applications and frequently asked questions. Field Methods 19(4):339-368.

Whitehead, N. L. 2003. Three Patamuna Trees: Landscape and History in the Guyana Highlands. Pages 59-80 in N. L. Whitehead, ed. Histories and historicities in Amazonia. University of Nebraska Press, Lincoln, Nebraska.

Williams, D. E. 1991. Peanut and peanut farmers of the Rio Beni: traditional crop genetic resource management in the Bolivian Amazon. PhD dissertation, City University of New York, New York, NY.

______. 1996. Aboriginal farming system provides clues to peanut evolution. Pages 11-17 in B. Pickersgill, and J.M. Lock, ed. Advances in legume systematic, 8. Legumes of economic importance. Royal Botanical Gardens, Kew, UK.

_______. 2006. Los recursos genéticos del maní o cacahuate (*Arachis hypogea* L.) en Perú: bosquejo taxonómico y apuntes sobre la coleta, multiplicación y caracterización del germoplasma. Pages 51-59 in J.L. Chávez-Servia, and R. Sevilla-Panizo, eds. Fundamentos genéticos y socioeconómicos para analizar la agrobiodiversidad en la región de Ucayali. Seminario, 16 de enero de 2003, Pucallpa, Peru. International Plant Genetic Resources Institute, Cali, Colombia.

Wilson, W.M. 2003. Cassava (*Manihot esculenta*, Crantz), cyanogenic potential, and predation in Nortwestern Amazônia: the Tukanoan perspective. Human Ecology 31(3):403-416.

Woodley, E. 2006. Cultural indicators of Indigenous Peoples' food and agro-ecological systems. Draft summary prepared for the Second Global Consultation on the Right to Food and Food Sovereignty for Indigenous Peoples. Puerto Cabezas, Nicaragua 7-9 September 2006, International Indian Treaty Council (IITC) / FAO - Sustainable Agriculture and Rural Development (SARD). FAO, Rome, Italy. (verified on 10/23/2008, home page http://www.fao.org/sard/common/ecg/2653/en/CulturalIndicators_exsum16oct.pdf).

World Commission on Environment and Development. (WCED). 1987. Our common future. Oxford University Press, Oxford, U.K.

USDA/NRCS. 2008. The Plants Database. (verified on 3/5/08, http://plants.usda.gov).

Zarger, R.K. 2002. Acquisition and transmission of subsistence knowledge by Q’eqchi’ Maya in Belize. Pages 593-603 in J. R. Stepp, F. S. Wyrdham, and R. K. Zarger, eds. Ethnobiology and biocultural diversity. Proceedings of the Seventh International Congress of Ethnobiology. University of Georgia Press, Athens, Georgia.

Zent, S. 1999. The quandary of conserving ethnobotanical knowledge: A Piaroa example. Pages 90-124 in T. Gragson and B. Blount, eds. Ethnoecology: knowledge, resources, rights. University of Georgia Press, Athens, Georgia.

_______. 2009. A genealogy of scientific representations of indigenous knowledge. In press in Heckler, S., ed. Landscape, Power and Process: a re-evaluation of traditional environmental knowledge. Bergahn, London.

_______, and L. Maffi. 2007. Final Report on Indicator no. 2: Vitality Index for Traditional Ecological Knowledge (VITEK). Terralingua Working Document for the Project Global Indicators of the Status and Trends of Linguistic Diversity and Traditional Knowledge. (verified on 8/8/08; http://www.terralingua.org/projects/vitek/VITEK_Report.pdf)

Zeven, A. C. 1998. Landraces: a review of definitions and classifications. Euphytica 104(2):127-139.

_______. 1999. The traditional inexplicable replacement of seed and seed ware of landraces and cultivars: a review. Euphytica 110(3):181–191.

Zimmerer, K. S. 1996. Changing fortunes: biodiversity and peasant livelihood in the Peruvian Andes. University of California, Berkeley, California.

_______. 2001. Report on Geography and the new ethnobiology. Geographical Review 91(4):725-734.

_______. 2003. Geographies of seed networks for food plants (potato, ulluco) and approaches to agrobiodiversity conservation in the Andean countries. Society and Natural Resources 16(7):583-601.

_______. 2004. Cultural ecology: placing households in human-environment studies: the cases of tropical forest transitions and agrobiodiversity change. Progress in Human Geography 28(6):795-806.

_______, and D. S. Douches. 1991. Geographical approaches to native crop research and conservation: the partitioning of allelic diversity in Andean potatoes. Economic Botany 45:176-189.

BIOGRAPHICAL SKETCH

Geraldo Mosimann da Silva was born in Curitiba, Paraná State, Brazil. He earned a B.A. in agronomy in 1984 from Universidade Federal do Paraná (UFPR), and started his career working with family farmers in South and Northeast Brazil. Back to school, in 1993 he earned a master's degree on soil science and land evaluation from UFPR. His professional activities were developed with NGOs and as an independent consultant, including technical support for small farmers' organic production and management of protected areas in Paraná, Rondônia and Mato Grosso states. In 1996, he moved to the Xingu Indigenous Park, in Mato Grosso state, south of the Amazon region. He joined an interdisciplinary team at the Instituto Socioambiental and contributed to developing economic alternatives for the Indians of the north part of the indigenous land. His duties included participatory mapping and management of natural resources and agroecosystems, focusing on local strategies for agrodiversity use and conservation. All activities were carried out based on an educational approach including village-level technical support and intensive training events for youth under the guidance of elders.

Upon completion of his doctoral studies at University of Florida he will return to work in the Amazon region.