AGRICULTURAL VARIATION AND CHANGE AMONG BATORO AND BAKIGA FARMERS AROUND KIBALE NATIONAL PARK IN SOUTHWEST UGANDA

By

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About 100,000 people live within ten kilometers of the boundary of Kibale National Park (KNP), a mid-altitude (5,000-6,000 ft) forest park in western Uganda. This research takes place in the area of high population density surrounding KNP. It contributes to an interdisciplinary project studying the impacts of parks in eastern and southern Africa on land use and land cover surrounding the parks. In working with Batoro and Bakiga farmers who live around KNP and practice rain-fed hoe agriculture, the research looks at agricultural change around KNP. Important findings show that the park's presence has relatively little impact on people's farming strategies. Instead, ethnicity is an important factor in determining farming strategies. Both Batoro and Bakiga moved to the area within the last century, and many within the last fifty years. Bakiga farmers, in particular, follow a pattern of "colonizing intensifiers" (similar to Tiv, Kofyar, and Iraqw farmers) who migrate from their homeland to a new frontier. In the new territory, "colonizing intensifiers" use knowledge and farming strategies from the homeland, as well as developing new techniques, to intensify farming practices. Farming in the new territory may have opened more opportunities, such as access to land tenure, to women (and especially female household heads). Unlike the literature on parks and people that

argues that protected areas create and perpetuate poverty, this research suggests that poverty around KNP is more likely a result of increasing population density and lack of access to non-farm and off-farm opportunities (especially employment) and resources (specifically access to agricultural inputs such as fertilizer) than a result of proximity to a national park.

CHAPTER 1
INTRODUCTION, LITERATURE REVIEW, AND RESEARCH QUESTIONS

Introduction

This research grows out of an interdisciplinary project carved out by entitled “Parks as agents of social and environmental change in eastern and southern Africa” (Goldman et al. 2008). One location of study in the overall interdisciplinary project is the area around Kibale National Park (KNP), located in southwestern Uganda. This is an area with high population density and growth, both conditions that put stress on resources such as firewood and water. Research around KNP over the last five years has recorded land use and land cover in a sample of the area within five kilometers of the park boundary. While working in the area, researchers observed differences in the farming practices of the two main ethnic groups, Bakiga and Batoro, who live around KNP.

The research looks in more depth at the agricultural practices of these two groups of people. It asks farmers about the crops that they choose to grow for consumption and sale, the animals that they raise, the agricultural challenges they face farming in this area, and the techniques they use to minimize farming problems. Finally, farmers’ strategies and techniques and how they are different from those employed by other people who live in the area. It also studies how they have changed through time.

The study focuses on the agricultural practices of smallholder farmers in rural Uganda who practice rain-fed hand hoe agriculture. Agricultural practices include techniques for soil preparation, choices of crops grown for consumption and sale, land management for soil fertility, and techniques to minimize pest and disease damage. Often, farming practices are classified as either extensive or intensive. Extensive

agriculture involves little investment in a plot of land, a short period during which the land is planted to crops, and then an extended fallow period to allow the land to rejuvenate over time. Intensive agriculture uses a similar plot of land for a longer period and leaves it in fallow for a shorter period of time. As a result, it requires greater investment of labor and nutrient inputs to maintain crop outputs. Thus, the process of agricultural intensification involves increasing the utilization and/or productivity of cultivated land (Kates et al. 1993; Netting 1993). This study focuses on intensive agricultural practices and draws on Boserup's (1965) ideas about intensification to understand them.

Agricultural Change and Intensification

Theories on Intensification

Ester Boserup's work on agricultural change has had a lasting impact on social science research in smallholder agriculture. Although written in 1965, she argues that population growth leads to changes in agriculture toward more intensive farming strategies. This was against Malthus' view that population growth, if left unchecked, would supersede agricultural production. Hence, as a population increases, people will gradually adopt farming practices that allow them to produce more crops in the same area of land (Boserup 1965). Growing crops more frequently on the same amount of land requires more work and greater inputs from the farmers. People are unlikely to adopt more intensive farming practices unless it is necessary to meet consumption or market demands (Boserup 1965). Boserup's basic thesis is that population growth creates the need for more intensive production and the adoption of these high labor-demanding activities as well as increased resources.

Since Boserup first published this thesis, social scientists have been testing the conditions under which it works or does not apply. Stone and Downum (1999) summarize the main criticisms of Boserup's thesis. First, factors other than land shortage, such as market incentives, social production, risk reduction, and social institutions, can also stimulate agricultural production (Stone and Downum 1999). For example, in a study of three areas in Kenya, Goldman (1993) found that in rural areas, high population density alone does not generate demand for use of cash-demanding technologies like fertilizers and high yielding crop varieties. However, areas that have high population density, as well as good infrastructure and market access, are more likely to invest in these technologies to increase their production (Goldman 1993). This example shows that other factors, in addition to land shortage and population growth, contribute to the ways that farmers intensify their production.

The second general critique of Boserup's work (Stone and Downum 1999) is that land shortage does not always lead to land intensification. People also respond to land shortages through migration, conflict, trade, and investing in nonagricultural enterprises (Stone and Downum 1999). For example, Netting et al. (1993) explain that the Kofyar of Nigeria first responded to increasing population density by moving to adjacent areas of fertile land. Rather than adopting more intensive practices, families decided to migrate to an area with more land and used more extensive practices until population density in that area also increased.

In spite of these critiques, Boserup's thesis is still useful for understanding agricultural change. In fact, most of the critiques do not suggest that her model is useless, but rather expand upon or qualify the model. Rather than placing farmers at the

mercy of processes like population growth, even if they play a role in contributing to it, Boserup places farmers at the center of reacting to and making decisions based on their situation. In Boserup's theory, farmers are able to manage and mobilize their work in order to adapt to the needs of their present situations. Netting (1993) argues that agricultural change in response to population pressure can occur rapidly: within thirty years the Kofyar transitioned from an intensive system to an expansive period of shifting cultivation in a new area and then finally back to an intensive period as population density in the area increased. Thus, even if simplistic, Boserup's model is a useful way to start thinking about agricultural change among smallholder farmers.

Finally, it is worthwhile to explore ways that scholars working with Boserup's ideas have identified types of intensification. Netting generally describes that intensive smallholders use "more labor and skills, more diversified tasks, better coordination and management for work activities" (1993:70). These tasks include turning the soil, irrigation, foddering rather than pasturing livestock, and collecting manure to redistribute on the fields as fertilizer (Netting 1993). Another way of intensifying land use is to reduce or eliminate fallow periods. While this reduces soil fertility and annual crop yields, it allows farmers to increase the overall crop output over time (Goldman and Heldenbrand 2002). These labor-intensive activities increase soil fertility and therefore help to maintain crop outputs.

Farmers must increase their labor input for intensification. This can be done in several ways, such as using animal or mechanical traction or increasing human labor inputs. Batoro and Bakiga farmers use rain fed hand-held hoe agriculture, thus this research focuses on intensification methods that do not use tractors or animals. Netting

(1993) argues that the Kofyar increased agricultural production without the use of animal traction or mechanical energy, and therefore used labor to support the growth (Netting 1993). More specifically, Stone et al. (1990) argue that the Kofyar work more hours in their fields than neighboring communities and that this added labor allows them to produce more than the others. One way that the Kofyar maintain high labor inputs is by using both men and women's labor on the same fields (Stone et al. 1990, 1995). They also have arranged their labor around the seasons by filling in slack periods with tasks that are not necessary to complete during the growing season. In these cases, household labor allowed people to adopt more intensive practices. Drawing from these examples, similar types of labor mobilization or agricultural techniques in other groups of people should also be indicators of agricultural intensification.

Colonizing Intensifiers

Among work by anthropologists who study agricultural practices there are similarities between groups of people. One recurrent theme is a description of groups of people who have similar expansionist agricultural practices. While the literature does not use the term, these groups could be labeled as "colonizing intensifiers," because they migrate from their homeland, settle in new territories that they adopt as their own through the development of intensive agricultural practices in the new territories that they settle. Three examples, Iraqw of Tanzania and Tiv and Kofyar of Nigeria, will be used to describe the practices of farmers that can be considered "colonizing intensifiers."

The Iraqw are an agropastoral Cushitic-speaking group of people with about 500,000 members (Lawi 1999). Their homeland, Iraqw Da'aw, is located in the highlands of Mubulu District in northwest Tanzania. Their area has been characterized

by high population density since at least the 1800s. Iraqw were mostly confined to this area by the neighboring Maasai and Tatog pastoralist groups (Lawi 1999; Snyder 1996). However, in the late 1800s, German colonial policy, as well as a rinderpest epidemic (that had a large impact on the pastoralist groups) opened up the possibility of out-migration (Snyder 1996). In the 1920s, Iraqw migrated to the southwest of their homeland, and in the 1940s they moved north. In these frontier areas, Iraqw used less intensive farming practices than they had in the homeland (Snyder 1996).

At the same time, they also started to develop different views on land usage. Iraqw practices traditionally distinguished between appropriate uses for different types of land (ridge tops, ridge slopes, valley bottoms, and forested areas). In this understanding of land use, valley bottoms were not used for farm lands, but in the 1940s farmers started expanding to farm valley bottoms (Lawi 1999). After the original expansion to new areas (where Iraqw became the majority), Iraqw adopted new crops and more intensive agricultural practices (Lawi 1999; Snyder 1996). Iraqw thus fit this category of colonizing intensifiers because they expanded out of their homeland, taking new land and putting it into (more and more) intensive agricultural production.

Another group of people who follow this pattern are Kofyar farmers of Nigeria. The Kofyar language is Afro-Asiatic and their homeland is located in the Jos Plateau in central Nigeria (Lewis 2009). The Kofyar homeland area was characterized by high population density, intensive cultivation, small households, and dispersed settlement in privately-controlled farmsteads (Stone 1997). Over the course of about 30 years, thousands of Kofyar farmers voluntarily migrated from the homeland to an area of bush lands on the southern edge of the Jos Plateau (Netting et al. 1996).

Netting (1968) describes that this migration started when the need for perennial sources of water and shelter from enemies were removed by the Pax Britannica. Migration to this frontier area was relatively easy because land was both cheap and abundant and there was little external meddling in the settlement process (Stone 1988). At this time, farmers made season treks to the bush lands area where they would grow extra food crops for home consumption and for sale (Netting et al. 1996). Most Kofyar moved to an area south of the town Namu that Stone (1997) refers to as the Core Area. Originally, Kofyar continued intensively farming in their homeland area while they simultaneously used extensive practices as they expanded in the frontier of the Core Area (Stone et al. 1995; Stone 1997, Stone and Stone 2000). In the frontier area, Kofyar expanded cultivation for the market and women's contribution to farming started to gain greater importance (Stone and Stone 2000).

By the 1960s, Kofyar started expanding outside of the Core Area and farmed in a larger part of the bush lands. Over time, the season bush farms gradually developed into families' stable primary residences. Kofyar abandoned their homesteads in the homeland to move their entire family and farming production to the frontier area. The soils in the bush land allowed for higher sustained yields and Kofyar had more opportunities to earn money from cash cropping in the bush land area. More people moved to and established their permanent residence in this frontier area. By the 1980s a combination of increased population density in the bush land as well as market demand led to a (re)intensification of farming practices (Netting et al. 1996; Stone et al. 1995; Stone 1997).

In thirty years Kofyar farmers went from highly intensive agriculture in their homeland, expanded to a frontier area where they practiced extensive agriculture and then (re)intensified their agricultural practices in the newly settled area as population density and market demand for food crops increased. Their actions follow the pattern of "colonizing intensifiers" by expanding into available land and using knowledge from homeland farming to develop it for intensive agricultural production.

The last example of "colonizing intensifiers" is the Tiv farmers of Nigeria. Tiv speak a Niger-Congo language and live in central Nigeria, predominantly south of the Benue River. Unlike the other groups in this category, Tiv are known for the extensive farming techniques. Expansion and migration are central concepts in Tiv people's lives. Bohannan and Bohannan argue that "a centrifugal migration is the most important single factor about the Tiv" (1953:54). Tiv people provide three answers as to why they move: it is in their nature, they are searching for new or more land, or they are trying to escape the range of political influence of a man or group of men (Bohannan and Bohannan 1953; 1966). Each minimal territory (or the smallest unit of land) is seen as constantly expanding (Bohannan 1954). Tiv expand by moving toward and taking land that borders their holdings from the person that they are most distantly related to genealogically so that they will have the most support for their actions (Bohannan 1954). As one group expands into another group's area, they push that group to expand into their neighbor's territory. This constant movement, sometimes described as predatory expansion, is central to Tiv practices.

Stone (1997) describes that Tiv's constant expansion is a mechanism for mitigating population density; it maintains low population densities and minimizes the

need to intensify agricultural practices. This idea of predatory expansion is only applicable to the interior of Tiv homeland where Tiv were pushing against each other and does not apply to the frontier area of Tiv settlement (Stone 1997). When visiting Asamu, on the frontier of Tiv territory and near the Kofyar Core Area, Stone (1997) found relative stability in the Tiv settlement.

Stone (1997) uses this unexpected observation of more sedentary Tiv in frontier areas to investigate why Tiv are less mobile in the frontier area than in their homeland. He also investigates how Tiv have continued to control this land and maintain low population density when it is in the center of an area that has received a sustained flow of immigrants from plateau groups such as Kofyar, Mwahavul, and Eggon over the last three decades (at the time of the publication). Stone (1997) argues that Tiv became more sedentary in order to protect their land holdings.

Stone (1997) identifies the methods that Tiv use to control migration, both by other Tiv as well as members of different ethnic groups, to the frontier area. Settlement patterns and ideas about political interactions allow Tiv to limit migration to the trontier area near Asamu. Land near Asamu lacks the contiguous blocks of agnates that are common in Tiv homeland. In the homeland, these agnates collaborate on settlement expansion. In all areas where Tiv live, settlement without a powerful patron that will protect the immigrant from tsav (a form of witchcraft) is dangerous and rarely attempted. Thus, Tiv who do not have relatives living in the frontier territory are unlikely to move to the area because they will not have important social and political protection. By reinforcing concerns over tsav and the necessity to move to an area where an individual has a patron, Tiv living in the frontier land limit immigration by other Tiv settlers.

Stone (1997) also describes that Tiv have adopted different practices for dealing with other ethnic groups than the strategies that they use with other Tiv to control immigration to the frontier area. While Tiv within the homeland are pushing against one another in their constant expansions and migrations, Tiv in the frontier area protect their land from other ethnic groups by becoming more sedentary. Tiv argue that they lived in the area before the other groups and before the presence of a chief who has the power to allocate land. They therefore do not respect the chief's decisions to sell land to members of other ethnic groups, arguing that the chief is not selling unused land, but rather Tiv land that is currently in fallow. In order to protect these land holdings, the Tiv have developed slightly more intensive practices where they are more present on their land. Additionally, they harass migrants by stealing their crops and setting traps for their animals. Not only do they perform these acts, but news of this harassment has dispersed far enough to discourage Kofyar from settling in this area.

Tiv thus colonized a new area of land using their traditional expansion practices and continued to use their extensive agricultural practices. However, in order to protect the new territory from other ethnic groups, they developed a strategy that Stone (1997) calls "predatory sedentism." Interestingly, these "predatory tactics were designed to protect the sustaining area of a stable hamlet rather than for the expansion for which the homeland Tiv are famous" (Stone 1997:241). Tiv started farming more intensively in order to lay claim to the land that they wished to protect. They also projected an image of intimidation in order to discourage other people from settling the land; and in so doing maintained low population densities compared to neighboring areas.

This category of “colonizing intensifiers” is a category that describes the practices of certain groups of people, like Iraqw, Kofyar, and Tiv farmers. However, it is also a process that members of these groups experience. Each of these example groups, in their expansion to new areas, has encountered other ethnic groups of people. This constant overlapping with other groups has helped in shaping the agricultural strategies that they adopt as they colonize a new territory.

Households and Gender

The literature on households and gender draws attention to types of inequalities that may exist within or between households. It looks at households, both as holistic units and as units comprised of individuals, and helps in understanding smallholder farmers’ agricultural practices. It is challenging to provide a universal definition of a household. According to Evans, the international definition is that a household comprises “individuals who are all sharing a common kitchen or the same cooking pot and living under the same roof” (1992:18). However, this definition can be problematic because it makes several assumptions that do not hold true in all cases. These assumptions include ideas that households are based on the family relationships of marriage and parenthood, that co-residence defines a household, that residence and consumption units comprise the same people, and that decisions for the combining and distributing of resources occurs within the household (Evans 1992). Thus, households are “settings in which membership roles vary, even for persons of similar age-sex status and kinship affiliations” (Ardayfio-Schandorf 1997:25). In spite of these potential problems, considering people as members of a household is a common way to organize categories of people. Netting argues that “in the farming community, no other social unit is as salient and significant as the household” (1993:62).

One way of including some of the complexity of people's lives within the concept of households is to consider the unit as well as types of individuals within units. Adults, adolescents, and children of both sexes make up households. These individuals often have different roles and responsibilities within the functioning of the household as well as different desires and priorities (Feldstein and Poats 1989). Feldstein and Poats argue that "gender has proved to be the most useful category to disaggregate the farm household and analyze intrahousehold behavior" (1989:10). Understanding who in the household does which tasks helps in understanding the factors that contribute to farmer decision-making. Looking at men and women within households provides a better understanding than looking at the household as one unified unit.

One way to distinguish between men and women in the household is to consider the tasks (economic, reproductive, and community) and who controls individual labor. Various authors (Doss 2001; Greico 1997; Guyer 1988; Stone et al. 1995; Udry 1996) investigate who controls different household members' labor or how work is negotiated, as well as how this influences types of production. Additionally, it is important to recognize that women often do multiple tasks at the same time, such as caring for children and working in fields. Multitasking often blurs the distinctions between productive and reproductive labor and can make women's contribution to farm work less apparent or more difficult to quantify (Dixon 1985; Sachs 1996). Asking women more specifically about the agricultural tasks that they do helps to account for their contribution to farm work. Finally, the gender division of labor is not fixed and often varies depending on household needs, available labor, and current social and economic conditions (Feldstein and Poats 1989; Evans 1994).

When the division of labor is seen as dynamic rather than static, it becomes possible to study how people make decisions about allocating household members' labor. There are two main models for describing household decision-making. The first, called a cooperative bargaining or collective model, assumes that household members pool all of the resources and then individuals negotiate how to allocate them (Doss 2001). The second model, referred to as a non-cooperative bargaining model, assumes that household members do not pool resources and rather that each individual makes separate decisions about the use of the resources that they control (Doss 2001). However, these models are too simplistic and do not accurately explain people's decision making. Udry (1996) found that models of pooling resources do not adequately describe the allocation of resources within households. Stone et al. (1995) stress that these models are not mutually exclusive; rather households can make decisions based both on competitive differences as well as cooperative interests. As described by March et al., "gender relations are simultaneously relations of cooperation, connection, and mutual support, and of conflict, separation, and competition, of difference and inequality" (1999:18). These studies show that intrahousehold decision-making is complex and requires in-depth study of the relationships between household members in order to understand it.

The gender of the household head is another aspect that distinguishes between different types of households. As Doss and Morris (2001) explain, the gender of the household head may influence the constraints or access to resources that a household faces. A woman in a jointly headed household (JHH), with both an adult male and female, may face fewer constraints than a woman in a female-headed household

(FHH). Understanding this aspect of household composition can be important for understanding the resources available to a household.

This study cannot address in detail the intrahousehold relationships that influence the distribution of resources and the negotiation of labor. However, it will take these potential types of inequalities into account by asking people about household composition and the division of labor in their household. While these questions will not provide a full understanding of intrahousehold dynamics, they will paint a general picture of the role of gender in farming practices around KNP.

Parks and People

This research takes place around a national park and needs to be situated within the literature on parks and people. Scholars in the social sciences have produced a literature on the impact of parks and protected areas on the people who live around them. In a review of this literature, Hartter and Goldman (in press, n.d.), find that most of the work in this area falls into two main categories. The first focuses on the exclusions and restrictions that result from park policy, especially when park creation results in population displacements. Authors argue that parks generate or perpetuate poverty and that this leads to hostility between park management and the people that live around the park (Brockington and Igoe 2006; Cernea and Schmidt-Soltau 2006; Roe 2008; Schmidt-Soltau 2009; West et al. 2006). For example, Brockington and Igoe (2006) argue that the displacement and marginalization of people living around protected areas is one of the main defining features of protected areas. Similarly, Cernea and Schmidt-Soltau argue that “restriction of access inevitably causes impoverishment as long as alternative income generating options are not provided” (2006:1811). These

perspectives convey that parks have mostly negative impacts on the people living around them.

Hartter and Goldman (in press, n.d.) identity a second category of social science research in which there is a mixture of positive and negative attitudes about parks among local people (Anthony 2007; Gadd 2005; Gillingham and Lee 1999; Lepp and Holland 2006; Newmark et al. 1999; Robertson and Lawes 2005). Unlike the studies in the first category that are based on reconstructions of park histories, these studies focus on surveys conducted with people who currently live around the park (Hartter and Goldman in press, n.d.). They question the role of parks in creating and perpetuating poverty. For example, de Sherbinin (2008) argues that if parks exacerbate poverty, then it follows that poverty rates around national parks should be higher than national poverty rates. Using infant mortality as a proxy for overall poverty rates, de Sherbinin (2008) found that there is no significant difference between poverty rates around protected areas and national rates. Studies falling in this category generally find that people consider crop losses to animal raiding (and not displacement) to be the most important negative impact of parks and the economic opportunities that parks create to be the main positive affect or parks.

Hartter and Goldman (in press, n.d.) argue that much of the literature, particularly the first category that only addresses negative impacts, describe situations that are significantly different from KNP. First, the majority of the studies are conducted in savanna environments that have different ecological characteristics than forest areas. Additionally, people living in these different ecological regions use different subsistence strategies. These differences make it difficult to compare savanna parks with forest

parks. Second, most studies focus on areas that have low to moderate human population density. This differs from the landscape surrounding KNP that has a high population density; based on Goldman et al. (2008:133) estimates, the average population density around KNP is 243 people per square kilometer. Finally, the majority of these studies describe injustices to human populations that were present in the geographic area before park creation. The settlement history around KNP is different; the large majority of people living around the park migrated to this area after the park was created (Hartter and Goldman in press, n.d.; Goldman et al. 2009b). For these reasons, Hartter and Goldman (in press, n.d.) argue that KNP does not fit into this body of literature on the negative aspects of parks.

KNP more appropriately relates to the second category of literature that identifies a complex combination of positive and negative aspects of parks. Hartter and Goldman (in press, n.d.) conducted a survey with people living within five kilometers of the park boundary. They found that most people do not consider restriction from park land and resources to be a negative impact. Instead, people indicated that crop losses to park animals are their most important park-related concern. Unlike other studies in this second category of literature in which people list economic benefits as the main positive impact of parks, the people living around KNP indicated environmental services as the main park benefit.

Research Questions

This literature on agricultural intensification and household dynamics is important for understanding agricultural variation and change among people who farm within five kilometers of the boundary of KNP. This research investigates what factors influence people's agricultural practices and how those practices have changed over the last ten

years. It looks at this topic through the lens of four main research questions about two ethnic groups, Bakiga and Batoro:

(1) Are there cultural variations in land management and agricultural practices or in responses to the risks and opportunities represented by the park? Do Bakiga have more intensive farming practices than Batoro? Do Batoro and Bakiga think that their farming practices are different, and if so, in what ways do they say that their practices differ?

(2) How does the presence of KNP affect agricultural practices, income, and access to resources? In particular, how has the park affected agriculture through its impacts on institutions, infrastructure, and opportunities in the area as well as with respect to risks and restrictions that the park may generate? This question connects this case study with the larger project on the impact of parks and protected areas in Africa. Additionally, it allows the exploration of Boserup's (1965) concept of intensification in this special context.

(3) Are there gender-based variations in agricultural practices and in the impacts of and responses to the risks and opportunities of the park? Literature on households and gender stresses the importance of looking at individual activities rather than a constructed ideal of a unit in order to understand farming practices. This question thus orients the study toward looking at how women and men individuals, not as aggregated household members.

(4) What have been the main changes in agriculture in the last ten years, particularly with respect to the adoption of new crops, and new agricultural and land management practices? How have these varied by area and the impacts these changes

have had? To what extent has the presence of the park, or proximity to the park impacted these changes? This question ties together two themes of this research. It looks at the presence and impact of the national park but in the context of change over time. Studying agricultural intensification requires a concept of change over time since intensification is not a one-time event, but rather a process. Thus, looking at how farming practices have changed helps in understanding the larger research question of land use change around parks as well as the more specific process of agricultural intensification.

Thesis Structure

This chapter presented a review of literature important for situating this study. The research is introduced by placing it in the context of the interdisciplinary project on land use and land cover change around parks in Africa of which it is a part. By looking at agricultural change around KNP, this research contributes to the project's questions on the impact of parks on the land use surrounding them. It starts by defining different types of agricultural practices and then discusses Boserup's (1965; 1981) theory of agricultural intensification that states that population growth leads to agricultural intensification through increased labor inputs. Then, it explores literature on households and gender and household composition and intrahousehold dynamics as important factors that impact agricultural decision making and division of labor. Finally, it situates this research within the context of previous research and findings on the relationships between people and parks. It concludes by presenting the four main research questions that guide this study.

The second chapter provides the context for this study. It presents a geographic description of Uganda as well as a brief political history of the country. Then, it

describes in more depth southwest Uganda, where KNP is located. It provides the history of the creation of the park, a description of the area around the park, and the history of human settlement in this area. Finally, it discusses the histories of Bakiga and Batoro peoples.

Chapter 3 presents the methods used in this study. It describes in more depth the larger research project in which this study is situated and the methodologies adopted from that project. It then presents the techniques used for sampling, data collection, and data management and analysis.

The fourth chapter presents the findings of the questionnaire conducted with 104 farmers. It is organized using the same themes of the questions that farmers responded to. It presents findings on people's settlement histories in the area, the crops that they grow for consumption and sale, the animals they keep, their main problems, the techniques that they use to mitigate these problems, their views of cultural differences in agricultural practices, and comments on changes in climate. Questionnaire respondents describe what they do today and how this differs from what they did ten years ago. This chapter also looks at what factors, such as ethnicity, distance from the park, age, and gender, impact people's agricultural practices.

Finally, the fifth chapter discusses these findings in relation to the relevant literature. It returns to each of the main research questions and explores how the research findings can answers these questions. It therefore discusses cultural differences in agricultural practices, the impact of KNP on people's farming, gendered differences in both respondents and household heads, and how practices have changed over time.

CHAPTER 2
CONTEXT

Introduction

This chapter will situate this study within Uganda. It starts by describing the geography, climate, and demographics of the country. It then briefly recounts 20th century Ugandan history. Next, the chapter introduces the area of southwest Uganda where the research occurred. It describes the creation of Kibale National Park (KNP) as well as the local climate. Finally, it provides background on the two ethnic groups, Batoro and Bakiga, who live around KNP.

The Republic Uganda

General Description

Uganda is situated in Eastern Africa, about 800 kilometers inland from the Indian Ocean (Langlands 2008) and is bordered by Sudan, the Democratic Republic of Congo, Rwanda, Tanzania, and Kenya. The country comprises a total of 241,038 square kilometers of which 197,100 are land (CIA 2010). With the exception of the semiarid northeast, Uganda has a tropical climate with two dry seasons a year that last from December to February and from June to July or August (CIA 2010; US State Department 2009). Often referred to as the Pearl of Africa, most parts of Uganda are fertile for agricultural production.

The people of Uganda speak 43 different living languages (Lewis 2009). English is the only official language of Uganda, although people often use Luganda, the language spoken by one of the larger ethnic groups who live in the region of the capital city Kampala, for communication (CIA 2010). Swahili, the main East African trade language, is generally spoken only by the Ugandan military (US State Department

2009). In the study area, people predominantly speak the Rutoro and Rukiga languages.

Uganda is a country with a fast-growing and young population. In 1950, Uganda's population was 5,522,000 and has increased to 32,370,000 by 2009 (US Census Bureau 2010). The population is growing quickly at an estimated rate of 3.6% in 2008 (US Census Bureau 2010). The United National Development Programme (UNDP) creates a Human Development Report, which provides data on health and well being that provide a picture of Uganda and allow for a comparison between Uganda and other developing countries. The Human Development Index (HDI) is a composite measure that reflects health (measured by life expectancy at birth), knowledge (measured by the adult literacy rate and ratio of school enrollment), and a standard of living (measured by GDP per capita) (UNDP 2009). The UNDP (2009) categorizes Uganda as a medium development country, with an HDI ranking of 157. Figure 2-1 shows how Uganda has lower health and well-being than other East African and Asian countries. Uganda has one of the highest fertility rates in the world; the UNDP (2009) estimates that between 2005 and 2010, Ugandan women bore an average of 6.4 children (Figure 2-2). Figure 2-3 compares other health and well-being indicators for Uganda with other developing countries. Uganda has a high dependency ratio of 99.9% as well as a low life expectancy at birth of 52 years (UNDP 2009). Additionally, the World Bank's (2009) international poverty line is people living on less than 2 USD per day; three-quarters of the Ugandan population lives below this poverty line, and half of the population live on less than 1.25USD per day (UNDP 2009). Finally, the HIV/AIDS virus has had a strong impact on Ugandans. The current prevalence rate is 8% among adults, but in the early

1990s it was as high as 14% (US Census Bureau 2000). Data from Fort Portal showed about a 20% prevalence rate among pregnant women who attended antenatal clinics in 1991 that declined to 16.6% in 1997 (US Census Bureau 2000). All of these indicators show prevalent and persistent poverty in Uganda.

Ugandan History

Understanding Uganda's past political turmoil is important for understanding the economy today. Historically, Uganda was comprised of many different ethnic groups, some of whom are organized into kingdoms. Each of the kingdoms had a long past of political institutions. The British colonizers left these kingdoms mostly intact during their rule (Leggett 2001). Since people maintained close ties to their ethnic kingdom, independence from British colonial rule was not easy because politics were fragmented along religious and political lines and this made it difficult to create any sentiments of national Ugandan unity (Leggett 2001). Even after the election of Uganda's first Prime Minister, Milton Obote, tensions between support for a centralized state and support for a federation of the kingdoms continued (US State Department 2009). In 1971, Idi Amin led a military coup overthrowing Obote and assuming absolute power over the country. This led to eight years of military rule in which at least 100,000 Ugandans were murdered (Leggett 2001) and almost all of the "Asians" (generally from South Asia and (often skilled business owners) were expelled from the country (US State Department 2009). The political instability and violence during this military rule led to economic decline and social disintegration (Leggett 2001; US State Department 2009) that have had long-lasting impacts.

Another coup ousted Amin's government in 1979 and a series of interim governments followed. They were eventually succeeded by the reelection of Obote as

president. However, Obote's second rule continued the high levels of violence and therefore did not lead to economic recovery (Leggett 2001). In 1985, an army brigade ended Obote's second rule and following negotiations with different armed factions, Youweri Museveni became Uganda's president (US State Department 2009). Museveni is still serving as Uganda's president. The human rights abuses of the earlier governments mostly stopped when Museveni came to power and he has worked toward economic recovery after the devastating impacts of the 1970s and 1980s (Leggett 2001). The traditional kingdoms never regained political power at the national level, but they remain symbolically important for many of the ethnic groups.

Agriculture continues to be an important component of Uganda's economy. Over 80% of the labor force works in the agricultural sector, which comprises 21.5% of the country's GDP (CIA 2010). Uganda's main agricultural exports are coffee, tea, cotton, and tobacco (CIA 2010). However, many people focus on growing food for household consumption and not cash crops for sale. Idi Amin's regime hurt all sectors of the economy and significantly decreased all exports, including those in the agricultural sector. For example, prior to 1972, Uganda was the second African tea producer (after Kenya), but production declined until in 1980 Uganda barely exported any tea (Mullan et al. 2008; Van Buren 2008). Over the 1990s, the tea sector recovered and has once again become an important export crop for the country. Additionally, while most sub-Saharan African countries use little fertilizer compared to the rest of the world, rates of fertilizer use are particularly low in Uganda; total fertilizer consumption is 7,248,333 kilograms and per capita fertilizer use is 0.29 kilograms per person (Table 2-1).

Southwest Uganda

This research focuses on people living around KNP, which is located in western Uganda (Figure 2-4). Administratively, Uganda is divided into five levels of administrative government: LCV (District), LC IV (County/Municipality), LCIII (Sub County), LCII (Parish) and LCI (Village) (UBOS 2006). National statistics also group districts into regions in order to draw out geographical similarities; however regions are not used in the government for administration. The area included in this study around KNP falls mostly in the Kabarole District but also includes part of the Kamwenge District (2-5). The study area encompasses 38 villages. The Uganda Bureau of Statistics (UBOS) provides descriptive data at the district-level.

Geographic Description

The Kabarole and Kamwenge Districts are located in the forested highlands of western Uganda. This area is a part of the western portion of the East African Rift Valley that spans parts of Ethiopia, Kenya, Uganda, and Tanzania (Lepp 2004). The region is known for fertile soils and abundant rainfall; climatic qualities that create amenable conditions for both wildlife and human populations. The altitude in this area ranges from 1100 to 1590 meters (Struhsaker 1997:16; Chetri et al. 2004:1) and mean annual temperatures range from a minimum of 8°C to 23°C (46°F to 73°F) to a maximum of 18°C to 35°C (64°F to 95°F) (Muhwezi et al. 2004:18). Annual rainfall ranges between 1200 and 1500 millimeters (Muhwezi et al. 2004:24) and comes in two rainy seasons that last from approximately March through May and August through November (Struhsaker 1997). Within this general pattern, the rains are both temporally and quantitatively variable. For example, Struhsaker (1997:17) calculates that over a fourteen-year sample, the coefficient for variation in monthly rainfall was as low as

30.5% in October but as high as 88.3% in February. Thus while climate has amenable growing conditions, the variability makes it challenging for farmers to know when to plant so that seedlings get the appropriate amount of water (Naughton-Treves et al. 1998).

The Creation of Kibale National Park

A brief history of the creation and management of KNP provides an understanding the presence of the park today. In 1932, the Ugandan government established Kibale Forest as a Forest Reserve and designated management responsibilities to the Forest Department (Struhsaker 1997; Muhwezi et al. 2004). At this time, the area around the forest was sparsely populated by Batoro farmers (Struhsaker 1997; Goldman et al. 2008). In 1948, Kibale became a Central Forest Reserve, with the main goal for the forest to manage wood harvesting for sale as timber (Naughton-Treves 1996). The Forest Department hoped to manage the timber sustainably in order to support long-term economic activity. In 1964, the government expanded the designated area south of the park, called the Forest Corridor, to a game reserve (Struhsaker 1997. The Forest Corridor touches the Forest Reserve area, so this act expanded the total protected area. Park management continued to focus on the sustainable management of timber harvesting.

The war years between 1971 and 1986 were detrimental to the management of Kibale Forest. As the country experienced a severe economic recession and the disintegration of state function, “the Forest Department lost control of much of the reserves due to a precipitous decline in funding, low employee morale, and public disregard for governmental authority” (Naughton-Treves 1996:22). In many cases, no real management of the forest existed and both the army and local people took and

used resources from the forest area without consequence. Not only did people use the resources, but displaced and landless people began to settle within both Kibale Forest and the Forest Corridor over the course of the war. By the end of the war, between 3,000 and 5,000 people illegally lived in the Kibale Forest Reserve and had cleared about 70 square kilometers, an area comprising 16% of the central forest reserve (Naughton-Treves 1999:322). At the same time, Bakiga from southwestern Uganda had migrated to the area, and 30,000 to 50,000 had settled in the Kibale Game Corridor (Naughton-Treves 1999:322).

With the arrival of peace and economic growth during the 1990s, the Ugandan government started paying more attention to Kibale Forest. In 1992, the government forced people living in the Forest Corridor to resettle, and the people moved predominantly to the areas on the east of Kibale Forest (Struhsaker 1997; Hartter and Goldman in press; n.d.). There is variation in the estimates of how many people were displaced at this time since figures range from 13,000 people to 30,000 households, or 170,000 people (Hartter and Goldman in press; n.d.). After removing people from the forest area, in 1993, the Ugandan government combined the Kibale Forest Reserve and game corridor, forming one national park covering a total of 766 square kilometers (Struhsaker 1997). At this time, the Ugandan National Parks (UNP) adopted jurisdiction of the park (Struhsaker 1997; Muhwezi et al. 2004). In 1996, the UNP and Game Department merged to create the Uganda Wildlife Authority (UWA), which functions under the minister responsible for wildlife (UWA 2009). UWA still manages the park at present, with the mission to “conserve and sustainably manage the wildlife and Protected Areas of Uganda in partnership with neighboring communities and

stakeholders for the benefit of the people of Uganda and the global community" (UWA 2009). UWA thus manages the park in an effort to balance conservation, tourism, and local communities.

KNP is especially known for its diverse primate population. Thirteen primate species, including habituated chimps and endangered red colobus monkeys, live in the park (UWA 2009). When compared with all Ugandan forests, KNP ranks fifth for species richness and sixth for overall biodiversity (Hartter 2007:24). While fewer tourists frequent KNP than savanna parks, there are still an estimated 6,000 visitors per year (Goldman et al. 2008; Hartter and Goldman in press; n.d.). For the 2007/8 fiscal year, this resulted in an estimated 1 to 2 billion Ugandan Shillings (approximately 800,000 USD) from tourist revenues, including park entry and chimp tracking (Hartter and Goldman in press; n.d.).

Description of the Area around Kibale National Park

This research takes place in the human landscape around KNP. While Struhsaker (1997) describes the area around KNP as relatively empty at the time that the forest reserve was created, this is no longer the case. The larger geographic area of the Albertine Rift, which runs through the KNP region, is known as one of the most densely populated areas of Africa (Lepp 2004). The landscape around KNP is characterized as having rapid population growth, high population densities, and a strong reliance on agriculture (Archabald and Naughton-Treves 2001; Hartter 2007; Goldman et al. 2008). Hartter (2007:25) calculates that 43% of the land within five kilometers of the park boundary is used agriculturally for cultivation or pasture. As of the latest census in 2002, the Kabarole and Kamwenge Districts respectively had populations of 356,914 and 263,730 people and population densities of 200 and 115 people per square

kilometer (UBOS 2006). Based on the 2002 census data, Goldman et al. (2008:133) estimate that almost 240,000 people live in the seven sub counties that border the park and that population density in the study areas is about 260 people per square kilometer on the western side of the park (including the areas in tea estates) and about 225 people per square kilometer on the east. These high population densities indicate that there is intensive pressure on all resources (land, wood, water).

Several factors have contributed to the population growth around the park over the last half century. First, natural increase is an important component since the average Ugandan women has seven children (UBOS 2006). Second, migration of Batoro and Bakiga farmers to the area during the 1970s and 1980s contributed to population increase (Goldman et al. 2008). Third, the revitalization of the tea plantations after their neglect during Amin's reign and Obote's second period in power has drawn migrant laborers to the area (Goldman et al. 2008).

People living around KNP do not have access to the resources within the park. UWA established several programs with specific communities that allow them to use certain forest resources, for example cutting of a limited number of exotic tree species or placing bee hives inside the park boundary. Without one of these contracts, local people are not supposed to enter the forest or use its resources. Additionally, park policy limits how people may deal with animals that leave the park, even when they take crops from farmers' fields. UWA policy prohibits locals from killing or injuring any park animals except for animals that in 2000 were designated as vermin (baboons, vervet monkeys, and bush pigs) leave the park (Chetri et al. 2004). Vermin outside of the

national park may be injured or killed. The park thus delineates the landscape and limits access for local people to resources such as land and firewood.

People Living around Kibale National Park

The focus here is two ethnic groups, Batoro and Bakiga, who live around KNP. Batoro live predominantly on the west and Bakiga live predominantly on the east of the park, although there are some members of each ethnic group who live on the other side. They speak different languages, come from different areas of Uganda, and have different migration histories to the area. Around KNP they live in close proximity to each other. The UNDP (2009) only provides aggregated health and well-being data for the entire country, so it is assumed that fertility and health among Batoro and Bakiga living around KNP are similar to the aggregate presented earlier in this chapter. Understanding some of the history of each of these peoples will aid in understanding their current approaches to agriculture.

Batoro

Batoro come from the western part of Uganda that includes six districts: Kabarole, Kibale, Bndibagyo, Kamwenge, Kyenjojo, and Kasese (Lewis 2009). They speak Rutoro, a Bantu language. Batoro people used to be a part of the Bunyoro Kingdom that Beattie (1960) describes. Bunyoro ruled by a hereditary king, called a Mukama, who held both ritual and political power. The king organized a feudal type of organization where he gave power to chiefs, people with whom the king maintained close personal ties. The king held all of the power and granted the rights over a territory and its people to a chief. “Chiefship, then, was not just a formal administrative office; rather, it was a private and personal (though conditioned) possession, which like any other private property was though of as hereditable” (Beattie 1960:36). Thus while chiefships were

not guaranteed to be inherited by the sons, this commonly occurred. Batoro were members of this kingdom until the nineteenth century.

Ingham (1975) describes the creation of the Toro Kingdom. In the early nineteenth century, the king of Bunyoro began to lose some of his power and the image of unity across the kingdom started to dissolve. At the same time, this son, Kaboyo who was a prince and chief of a territory near Mwenge started to grow restless, wishing for more power. “It is not clear where the idea of a rebellion originated thought it is possible that the Batoro and Bakonjo sense Kaboyo’s restlessness and so took the initiative in proposing it to him” (Ingham 1975:23). Ingham (1975) explains that Kaboyo did not want to take over his father; rather he wanted to carve out a small kingdom from within his father’s empire for himself. Kaboyo led the rebellion with the support of Batoro and Bakonjo people living in the area. “The people of Toro were initially bound together less by a sense of national unity than be a localized desire to escape the pressures arising from membership of a large empire and their subordination to what they regarded as a remote and arbitrary government” (Ingham 1975:1).

Kaboyo’s rebellion, which occurred around 1830, was successful (Ingham 1975). He established himself as the Mukama of the Toro Kingdom and set up a system of rule following traditional Bunyoro customs. Kaboyo was the source of all authority and appointed his sons as territorial chiefs. The disparate nature of Batoro people is reflected in more recent descriptions of their current group cohesiveness. Toro people are generally considered to be only loosely tied together linguistically and are not a strong cohesive social or political group (Naughton-Treves 1996; Marcus 2000). Naughton-Treves (1996) suggests that they have unified during specific moments in

resistance to advances from neighboring and often larger groups, while Marcus (2000) argues that their ties were created for administrative purposes. Regardless of the ways in which they come together, people do identify themselves as Batoro, but historically, the meaning of “being Batoro” has been loosely defined.

While the Toro kingdom has been present in western Uganda for centuries, Batoro residents in the KNP region are more recent. Most Batoro came to the western side of the park in the first half of the twentieth century (Naughton-Treves 1999). Goldman et al. (2008) found that today’s oldest Batoro residents moved to the park area in the 1930s. They were thus present in the area before the arrival of Bakiga.

Bakiga

Bakiga come from the southwest areas of Uganda that border Rwanda. Today this area falls in five districts: Kanungu, Kabale, Kisoro, Ntungamo, and Rukungiri (Lewis 2009), previously lumped into one district called Kigezi. Ugandan historian Ngologoza (1998) posits that Bakiga had settled in this area before 1500 AD. This area of Uganda is higher in elevation than the area around KNP, with an altitude of 1500 to 2759 meters (Carswell 2007:10). Annual rainfall averages 1000 millimeters that occur in two peaks: March to April and October to November (Carswell 2007:10), producing two growing seasons.

Like Rutoro, Bakiga’s language, called Rukiga, is also a Bantu language. In fact, Rukiga shares about 68% lexical similarity with Rutoro (Lewis 2009). Marcus (2000) found that people living around KNP think that the Rutoro and Rukiga languages have become more similar in this area where Batoro and Bakiga live in close proximity.

The southwestern part of Uganda has been known for its high population densities since colonial times. In 1944, a survey of the Kigezi District found higher population

densities in both the rural and urban areas when compared to other parts of Uganda (Carswell 2003). Purseglove, an agricultural officer for the colonial government, determined that the area was overpopulated and that any further increase in population would result in soil deterioration and erosion (Carswell 2003). Carswell (2003) describes that Purseglove adopted two policies for dealing with this problem; he encouraged people to move from this area to less densely populated areas farther north and also introduced a new method of strip cropping that left every third strip fallow. Carswell (2003:142) argues that these impressions of the region as overpopulated have had a lasting effect: "the reputation of being seriously overpopulated and threatened with serious environmental degradation that Kigezi gained in this period is one that it has never been able to shake off." Today the region has a high population density of 281 people per square kilometer in the Kabale District and 324 people per square kilometer in the Kisoro District (UBOS 2006). Kabale also has the highest rate of outmigration (11.4%) in all of Uganda (UBOS 2006).

In addition to high population densities, the Kigezi region is characterized by intensive agriculture, with densely planted crops and short or no fallow periods. With an inheritance system that divides land into smaller holdings, land is the major limiting factor and labor the primary input into agriculture (Carswell 2003; 2007). Bakiga have been described as particularly industrious laborers. Turyahikayo-Rugyema (1974:7) found that "everyone seems to agree that [Bakiga] are hardworking, for they have been favoured by the invigorating climate that enables them to work in their fields from dawn to dusk." Thus both local and academic opinions see Bakiga as coming from a densely populated and intensively farmed part of Uganda.

These long-lasting perceptions of overpopulation in the Kigezi District contributed to the migration of Bakiga farmers to the area around KNP. The colonial government organized official resettlement plans in the mid-1940s to encourage and force Bakiga to move farther north to less populated areas (Naughton-Treves 1996; Carswell 2003; 2007). Even after the official resettlement programs ceased, Bakiga farmers continued to migrate to the area from the 1950s to the 1970s (Goldman et al. 2008). This migration was supported by the need for laborers on the many tea estates on the western side of the park (Edmunds 1997). From the 1940s to the 1960s, the King of Toro maintained administrative duties in the area around KNP and thus Batoro Chiefs, appointed by and working for the king, would indicate where newly arrived Bakiga immigrants could settle (Edmunds 1997; Naughton-Treves 1997). They often allocated land to Bakiga on the outskirts of their property, with the intention of buffering their crops from damage by wild animals (Naughton-Treves 1997) or allocated land within the Kibale Game Corridor Reserve (Naughton-Treves 1996; Edmunds 1997). As Bakiga continued to migrate in the 1970s, Amin's officials encouraged them to settle inside the Kibale Game Corridor. As already described in the history of KNP, the people living in the Game Corridor were forced to leave in 1992 and most resettled on the east side of the park. Migration from the Kigezi area continues, albeit at a reduced rate, today.

Conclusion

This research works with Batoro and Bakiga farmers who live in western Uganda around KNP. Batoro were once a part of the Bunyoro Kingdom, but became their own kingdom in the nineteenth century. They moved to the area around KNP in the twentieth century. Bakiga come from the region of southwestern Uganda that is known for high population densities and intensive agricultural production. Most Bakiga living around

KNP migrated to the area after the 1970s. While the protected area was managed in different ways and expanded several times throughout history, the central Kibale Forest Reserve was created in 1932; thus the majority of the human population moved to the area around KNP after it existed as a protected area.

Political instability and violence in Uganda during the 1970s and 1980s damaged the economy, which is still in recovery. Persistent poverty exists in Uganda and many health and well-being indicators show that Ugandans are less well-off than their East African neighbors. While Uganda has generally good soils, farmers do not have access to fertilizers and therefore have low fertilizer consumption. This may contribute to persistence of poverty in the country.

Table 2-1. Fertilizer Use (kg) in 2001 (Based on 3-year running average). Source: based on FAO (2009) data.

	Total fertilizer consumption	Per capita fertilizer use
Uganda	7,248,333	0.29
Kenya	146,151,000	4.67
Tanzania	12,475,333	0.36
Malawi	90,093,667	7.43
Malaysia	1,182,997,333	53.19
Philippines	746,328,333	8.98

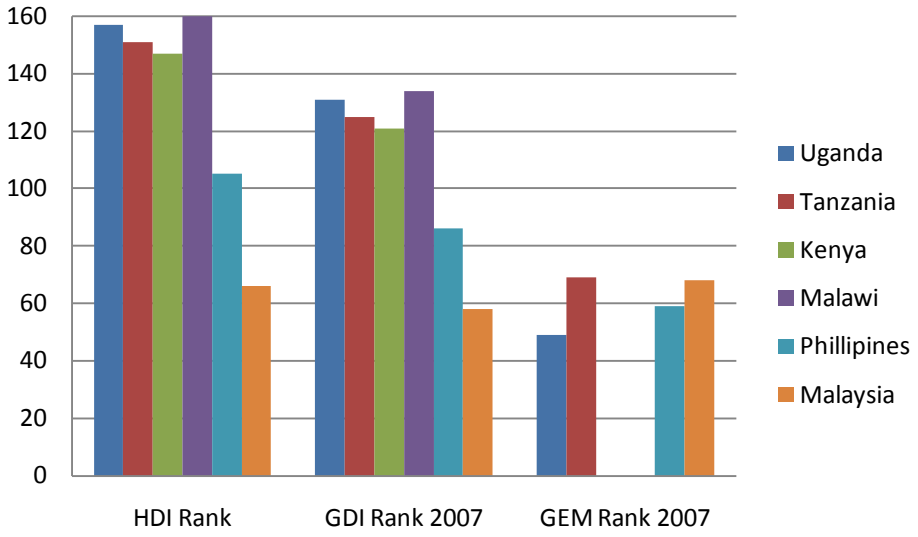

Figure 2-1. Health and well-being indicators in East African and select Asian countries. Source: based on data from UNDP (2009). 1) The HDI (Human Development Index) is a composite of health (life expectancy at birth), knowledge (adult literacy rate and gross enrollment ratio in primary, secondary, and tertiary school), and standard of living (GDP per capita). Countries are ranked from most developed (lowest rank) to least developed (highest rank). 2) The GDI (Gender-related Development Index) is the HDI adjusted for gender inequality. It focuses on the opportunities available to women political and economic forums. It focuses on women's ability to take advantage of the opportunities of life. Countries. Countries are ranked from most developed (lowest rank) to least developed (highest rank). 3) The GEM (Gender-Empowerment Measure) evaluates agency and women's participation in are ranked from most developed (lowest rank) to least developed (highest rank).

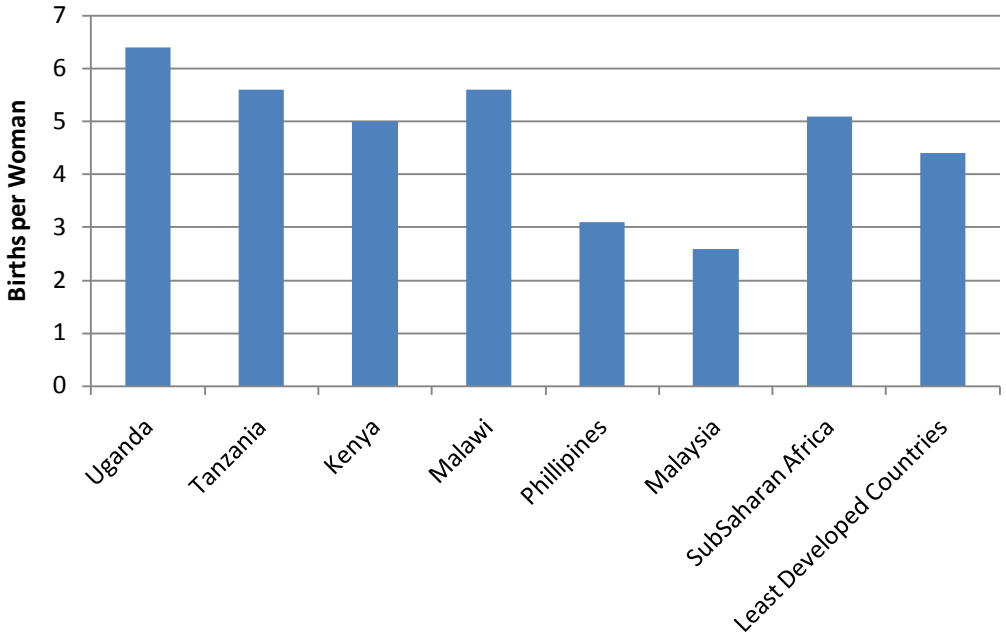

Figure 2-2. Total fertility rate 2005-2010. Source: based on data from UNDP (2009).

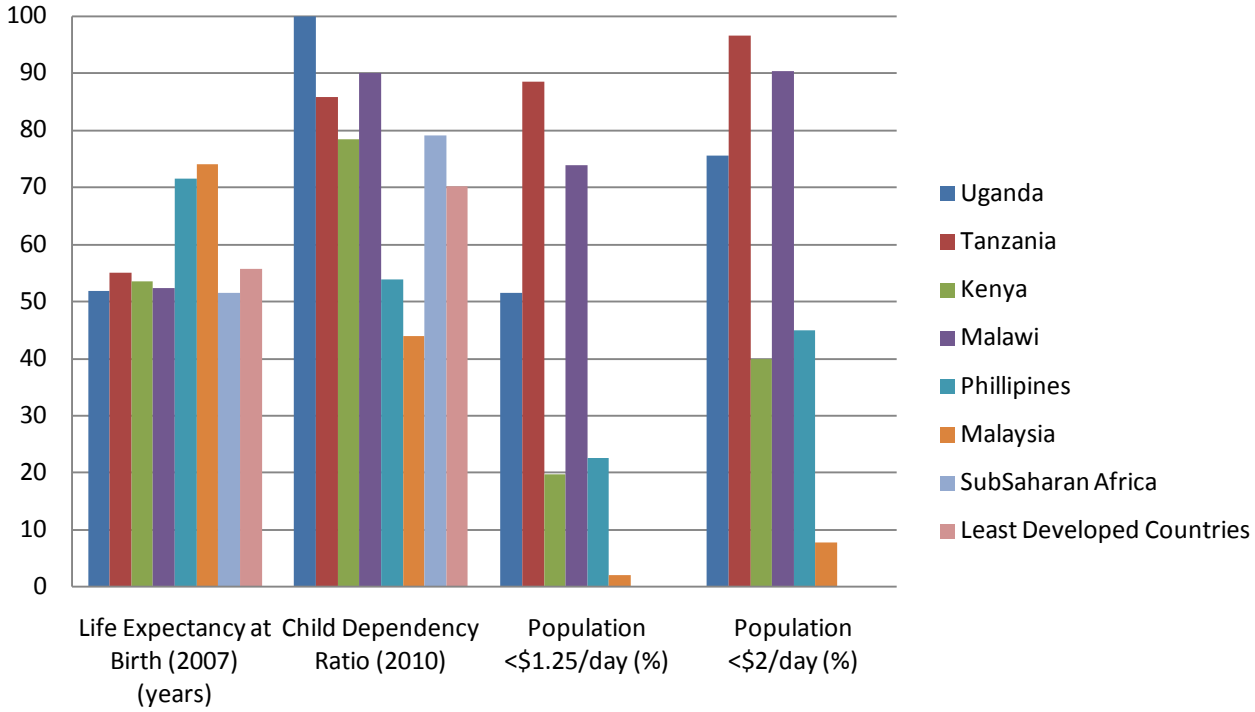

Figure 2-3. Health and well-being indicators in developing countries. Source: based on data from UNDP (2009).

Figure 2-4. Kibale National Park in southwestern Uganda. Source: Shank 1999.

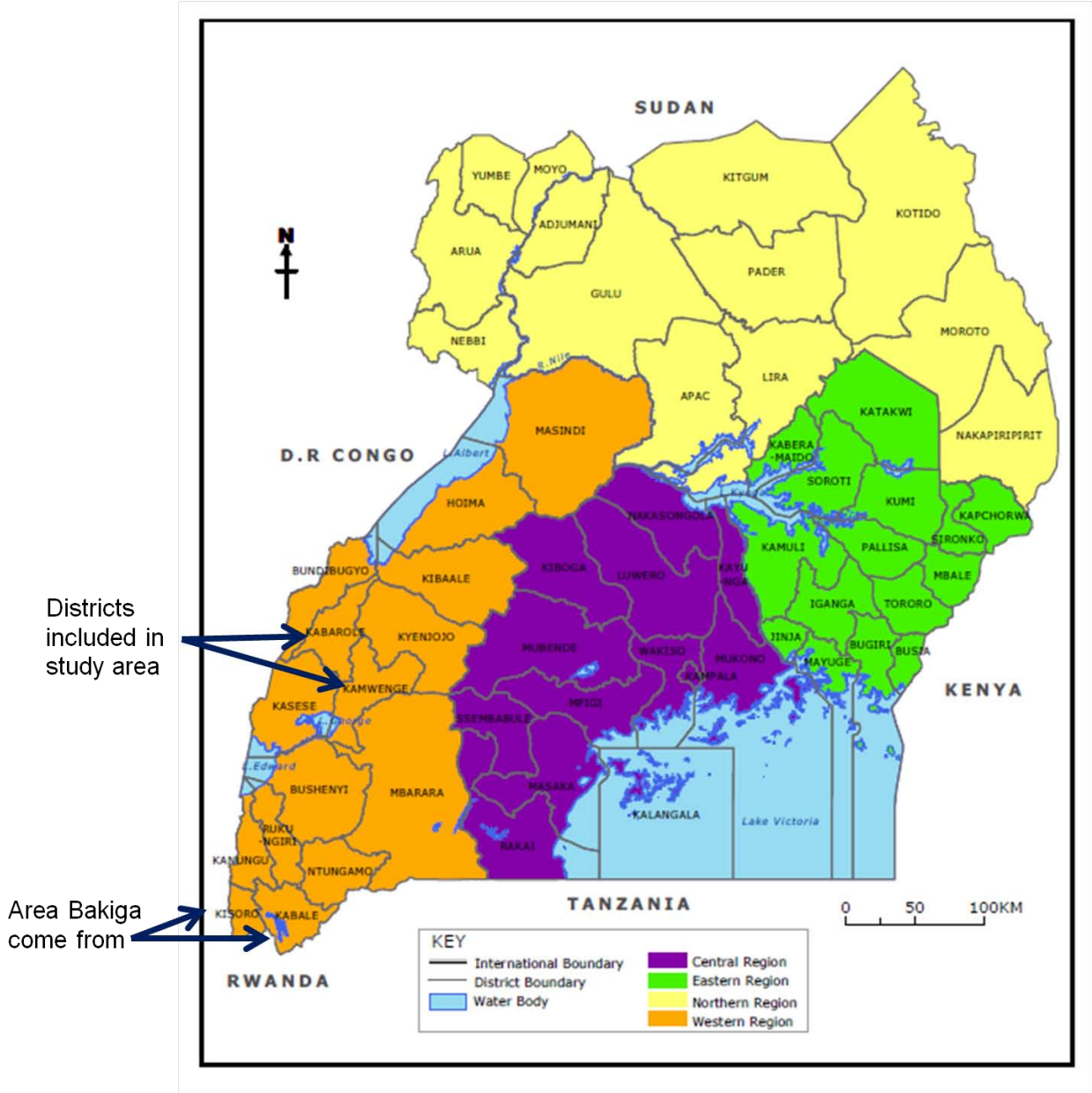

Figure 2-5. Administrative districts in Uganda. Source: adapted from UBOS 2006:13.

CHAPTER 3
METHODS

Introduction

This case study is a part of an interdisciplinary research project looking at land cover and land use change around parks in east and southern Africa (Goldman et al. 2008). This chapter describes the main research questions and combination of interdisciplinary members of the research project. It then explains how this case study adopts sampling methods from the interdisciplinary project as well the research methods and procedures that the case study uses. It includes a description of questionnaire design, data collection and management and data analysis.

The Larger Research Questions and Methods

This research is part of an interdisciplinary study, entitled "Parks as agents of social and environmental change in eastern and southern Africa," that looks at the impact of parks in east and southern Africa on the land use and livelihoods as well as on the biodiversity of the landscapes around parks (Goldman et al. 2008). It considers these questions through the collaboration of work of social scientists (anthropologists and cultural and physical geographers) and natural scientists (biologists) who study both people and the natural environment. The interdisciplinary project asks two main research questions: "(1) How does the presence of the park affect agricultural land use and other livelihood strategies by the people living near the park? and (2) How does the character of agriculture around the park affect biodiversity outside the park?" (Goldman et al. 2008: 130). The research here contributes to these questions by looking at agricultural practices and agricultural change among the people living around Kibale National Park (KNP).

The principal investigators of the interdisciplinary research project led by Dr. Terrence McCabe, Dr. Paul Leslie, Dr. Abraham Goldman, Dr. Michael Binford, and Dr. Brian Child use a random spatial sampling that identifies specific study locations in which to conduct research. They have determined that a study area that falls within five kilometers of the park boundary is appropriate for the landscape around KNP because of the high population density. There are two mid-scale research areas; one on the east (56 square kilometers) and one on the west (110 square kilometers) side of the park (Goldman et al. 2008). Within each of these research areas, there are randomly selected geographic coordinates. Each coordinate became the center of a 9-hectare circle (with a radius of 170 meters) called a “superpixel” (Goldman et al. 2008). Interdisciplinary work in the superpixels includes the collection of biological and social data over the last five years. There are a total of 95 superpixels, 60 on the west and 35 on the east of the park (Figure 3-1). The distribution of superpixels between the east and west sides of the park result from the sizes of each area and the random selection (Goldman et al. 2008). This type of sampling method is intended to provide a representative sample of the landscape. Unlike other social science samples that are based on lists of village inhabitants or people living on an accessible transect, this questionnaire extends to areas that are harder to access and therefore less likely to be seen (Goldman et al. 2008).

Methods

Sampling and Questionnaire

Clearance for this research was obtained from the University of Florida’s Institutional Review Board, the Uganda National Council for Science and Technology (UNCST), Uganda Wildlife Authority (UWA), and local community leaders. This

research uses the pre-established superpixels as the geographic sampling area for interviews with farmers. The number of landholders per superpixel varies, with one superpixel including a lake, another being in the middle of a town, and several occurring in large tea estates with no individual owner. Of the 95 total superpixels, 70 had landholders. As a part of the earlier work of the interdisciplinary study, graduate student Joel Hartter (unpublished material) conducted a census of the number of landholders in each superpixel. He recorded the GPS coordinates of each household in the questionnaire. These census data, accurate as of 2004, were used to determine a proportionate sample for this study. The number of people interviewed in each superpixel reflects the percent of landholders in that superpixel in relation to the sum of the landholders in all of the superpixels. This sample is not completely representative since it is impossible to speak with fractions of people. In all, 104 landholders (102 used in the statistical analysis) in 67 superpixels participated in the study.

The census information also contributed to decisions about which individuals to ask to participate in the study. Over the last five years, social science researchers participating in the interdisciplinary project have recorded the households who participated in questionnaires using the GPS coordinates (Hartter, unpublished material). In an attempt to avoid respondent research fatigue, (a concern in this area where several large projects are conducting long-term research), this research targeted households who had not yet been interviewed. This was only possible in superpixels with higher populations. However, in the end, many decisions regarding who participated in the questionnaire were opportunistic. It was important to have individuals who were at home or easy to find at an unannounced visit to the superpixel and who

were willing to take the questionnaire. Opportunistic sampling was a necessity, because in trying to speak with people over a large geographic area in only a few weeks time, the luxury of returning to a superpixel multiple times to find a specific individual was not possible.

The majority of people who live around KNP do not speak English, one of the national languages of Uganda. Therefore, the questionnaire was conducted in one of the two main local languages, Rutoro or Rukiga, with the aid of a translator. A few better-educated questionnaire participants speak English. In this case, the questionnaire was conducted in English with the research assistant present and ready to aid in the case of vocabulary or comprehension difficulties. Information from interviews was written on the questionnaire forms.

Questions address basic demographics of the individual and household; history of settlement; land holdings; crops grown and animals raised for home consumption and market sale; land use and crop productivity; agricultural problems; division of labor; cultural perceptions of agricultural practices; and climate and seasonal changes (Appendix A). The questionnaire has predominantly open-ended questions that allow interviewees to direct conversation and provide details about their responses. Also, the questionnaire design leaves time and space for follow-up questions that were not pre-formulated to pursue interesting or different comments. This flexibility means that not all respondents answered the exact same questions. However, everyone responded to the same core questions in order to provide comparative data.

In addition to collecting questionnaire data, informal learning opportunities and participant observation also contribute to this study. Research assistants provided extra

information by pointing out aspects on the landscape or different agricultural practices and by commenting on how they understood some confusing questionnaire responses. When possible, farmers showed examples in their fields of techniques that they discussed in the interview. All of these observations and explanations contributed to a general understanding of farming in the area and helped to direct supplemental follow-up questions within the questionnaire.

Data Management and Analysis

While in Uganda, everything that had been written on the questionnaire form was entered into an Excel spreadsheet weekly and saved both to the computer and an external hard drive. The spreadsheet designated one box per question in which to type responses. In order to perform a quantitative analysis, it was necessary to code these responses; a task completed after returning to the US. Since responses were already entered into one place, it was possible to look at all of the responses to one question at one time. By looking at each question individually, it was possible to see trends and similarities between people's responses. After several iterations of categorizing responses, it was possible to organize all of the responses to one question into several categories. These categories were coded into numerical representations and exported into the software program PASW Statistics 17. People's original responses and comments were kept with their questionnaire responses. These dialogues provided explanations that could clarify statistical analysis, since people often provided an answer that went into more depth than can be contained in a statistical variable.

Relationships between responses and independent variables (ethnicity, age, settlement history, gender of household head, gender of respondent, dependency ratio, wealth, and location) were examined using Pearson chi-square and independent t-test.

Dependency ratios can be an important determinant of poverty (Anriquez and Stloukal 2008). They illustrate the distribution between household members consume household resources but do not contribute to household labor and those who both contribute labor to the household as well as consume household resources. The dependency ratio of households was calculated based on the UNDP's (2009) definition in their Human Development Report. The UNDP (2009) defines the dependency ratio as "the ratio of the population defined as dependent—those under 15 and over 65—to the working-age population, aged 15 to 64." Since the questionnaire asked respondents to categorize family members in categories of under and over 16, dependents for this study are defined as those under 16 (rather than 15). Additionally, it is problematic in African agricultural societies to categorize people over 65 as dependent and not part of the working population. Nine percent of the study population households only have members under 16 and over 65; if people over 65 are considered to be dependents, it would be impossible to calculate a dependency ratio for these households. Furthermore, when asked about how much labor or time they contribute to farming, many elderly people indicated that they would work on the farm until they died or were too physically ill to do the work. Based on these comments and the types of composition of households that participated in the survey, people over 65 are considered a part of the working population. Thus, for the dependency ratios in this study, household dependents are under 16 and household workers are over 16. For comparative purposes, dependency ratios are broken into two categories (using Fratkin's [1989] categories): low (<50) and high (>50).

A cluster analysis was used to analyze wealth among questionnaire respondents. Hartter (2010) analyzed wealth on data collected in the same superpixels using a cluster analysis; this study uses Hartter's (2010) methods. Indicators included in the cluster analysis are house category (based on a five-category classification of house construction materials), amount of land owned, and number of goats and cows per household. These indicators were used to cluster respondents into three categories: "more poor," "less poor," and "well off" (Aldenderfer and Blashfield 1984; Hartter 2010). Only three households fell into the "well off" category, thus statistical analysis only compares members of the "more poor" and "less poor" categories.

Description of Sample

Of the 102 farmers included in statistical analysis, 54% live on the west, and 46% live on the east side of the park. Although there are some Bakiga living west of the park, most live in the east. Only eight of the 49 Bakiga respondents live on the west side of the park. The Batoro live predominantly in the western questionnaire region, with only five of the 50 Batoro respondents living in the east.

Observation of farm land indicates that farms in the southern section on the west side of the park generally resemble Bakiga farms (located predominantly on the east side of the park) more than they resemble Batoro farms (located on the northern part of the west side of the park) (Figure 3-2). Therefore, the data on the west side of the park were divided into north and south, based on respondents' comments of where this division should occur, to see if they confirm these observations (Figure 3-3). When divided this way, Bakiga respondents comprise 11% of respondents in the north section and 25% of respondents in the south section (Table 3-1). Additionally, more residents on the east side of the park (24%) than residents on the west side of the park (4%) are

“less poor”. Thus, residents on the west side of the park are almost entirely (95%) “more poor”; compared to three quarters (76%) of residents on the east side of the park being “more poor” ($x^2(1)=7.686$; $p<.01$).

Women comprise 66% of the sample, men are 32% of respondents, and for 2% of the time, both a man and woman were present and responded to the questionnaire together. Participants were interviewed based on whoever in the household was available and willing to take the questionnaire. Some husbands asked their wives to participate in the questionnaire because they felt that she was better able to answer the questions.

Study participants range in age from 16 to 99 with most of the respondents between 20 and 50 years old. The mean age is 44, the median is 39, and the mode is 30. There are 49 Bakiga and 50 Batoro plus three people from other ethnic groups interviewed.

As described in the study design, all of the people in the study farm within five kilometers of the park boundary. A respondent’s distance from the park boundary was estimated based on the GPS locations of the superpixel in which the respondent farms. When grouped in one-kilometer increments, more people live closer to the park than those who live farther away; 43% of the people interviewed live less than 1 kilometer from the park boundary, 17% live 1 to 2 kilometers away, 11% live 2 to 3 kilometers away, 14% live 3 to 4 kilometers away, and 16% live 4 to 5 kilometers away from the park. The random locations of the superpixels included some village areas located within 1 kilometer of the park that may contribute to the disproportionate number of people living within 1 kilometer of the park boundary. More Batoro (56%) than Bakiga

(33%) in the sample live within 1 kilometer of the park boundary ($x^2(2) = 7.144$; $p<.05$). It is unclear if this is representative of the population distribution or an artifact of the sampling.

The primary occupation of 91% of study participants is farming. Of those who are not farmers, five are retired and four primarily work off-farm. More men (9%) work off-farm than women (2%). Additionally, 4% of men have a spouse who works off-farm while 66% of women's spouses work off-farm. Farmers whose primary occupation is off-farm, still contribute to household farming activities. The most common off-farm occupations are tea pluckers on one of the tea estates or running a small shop in a trading center. Additionally, an on-farm primary occupation does not preclude an individual from participating in wage labor. Farmers hire people to help them with agricultural tasks, often during a busy time of the year or with arduous tasks like land preparation and harvesting. While the richest farmers hire permanent labor, and in some cases even provide housing for their employees, the majority of people hire an extra person for a few-day period.

Even though Batoro and Bakiga live in close geographic proximity, there are few inter-ethnic marriages and they maintain separate identities. Only one Batoro interviewed is married to a Bakiga and only three of the interviewed Bakiga are married to Batoro.

Most people (69%) are currently married, but 12% are single, 3% are divorced, and 17% are widowed. The questionnaire does not distinguish between households with multiples wives and households with one wife. Households in which female respondents indicate that they are not currently married are identified as female headed

households (FHH) (Greico 1997; March et al. 1999; Sachs 1996). Since this classification is not based on the presence of an adult male in the household, it may not correctly identify all of the FHH in the study. For example, a woman may state that she is married but not mention that her husband generally lives or works elsewhere and is present for infrequent visits. Likewise, a woman may not be married, but may live with a grown son or a brother who fulfills an adult-male role for agricultural tasks.

Using this definition of FHH, 23% of the study households are headed by females. This prevalence of FHH is similar to the rest of Uganda, where 20% to 30% of all households are female-headed (Dolan 2002). About one-third of FHH have a head of household who is over 61 years old (Table 3-2). Female heads are most commonly (65%) widowed, although almost a third (30%) are not married and a few (4%) are divorced. JHH are not more wealthy than FHH: 9% of FHH and 15% of JHH are “less poor” ($x^2(1)=.674$; $p>.05$).

Respondents indicated household members as people who normally sleep in the household. Anywhere between 1 and 15 people are members of a household (mean =5.47, median =5, and mode =4). Respondents grouped household members into four age categories: under 15, 16 to 40, 41-59, and over 60 (Table 3-3). Table 3-4 shows seven categories of types of household composition. These categories incorporate both the total number of people in the household, as well as the age distribution of household members. The most prevalent household composition is a small young family; 40% of households are “small young,” 19% are “small mid-age,” and the remaining household types occur less than 11% of the time each.

The dependency ratio of households ranges from 0 to 400 with a mean of 126, median of 100, and mode of 100. When grouped into two categories (low and high), 28% of households have a low dependency ratio (less than 50) and 72% have a high dependency ratio (51 and above). Since FHH lack a working-age male, it makes sense that they would have higher dependency ratios. However, there is no difference between the dependency ratios of FHH and JHH ($t(29)=1.209$; $p>.05$).

One way of looking at wealth is to assess the type of house that a family has. This study uses Goldman et al.'s (2008) classification system that categorizes houses into five different types that range from inexpensive to expensive building materials (Table 3-5). Almost half (48%) of the people have a type 3 house,11% have a type 1, 31% a type 2, 5% have a type 4 and 5% have a type 5 house. This indicates that most people in the area are not wealthy or have not invested their money in a house.

Conclusion

The focus of this research on agricultural practices and change around KNP fits into the interdisciplinary research project, of which it is a part, on land cover and land use change around national parks in eastern and southern Africa. This research uses the superpixel sampling method developed by the principal investigators of the larger project to determine in what geographic areas to conduct the questionnaire. The questionnaire conducted asks a set of open-ended questions about agricultural practices that farmers use today and the changes in their practices over the last ten years. These textual responses were coded, based on common trends and themes, into a few categorical responses. Statistical analysis was conducted on these categorical data to look at the relationship between responses and independent variables such as ethnicity, wealth, settlement history, gender of household head, and location.

There are 104 participants in the questionnaire of which 102 are used for statistical analysis. All respondents farm within five kilometers of the boundary of KNP in survey areas on the east and west sides of the park. Almost all study participants belong to Bakiga or Batoro ethnic groups. Both men and women responded to survey questions and represent households of varying wealth levels, with diverse compositions of ages of household members, and with both male and female household heads. The variety in types of study participants allows questionnaire responses to show how different people employ farming strategies.

Table 3-1. Distribution of people interviewed around KNP.

	West Side of KNP			East Side of KNP	Total People
	North	South	Total		
Bakiga	4	4	8	41	49
Batoro	35	12	45	5	50
Total	39	16	53	46	99

Table 3-2. Age distribution of female heads of household (in percent).

Age of respondent	FHH (n=23)
< 30	13.0
31 to 40	8.7
41 to 50	26.1
51 to 60	17.4
> 61	34.8

Table 3-3. Average proportion of family members in each age category (in percent).

	Age Composition of Household			
	Under 16	16-40	41-60	over 60
Percent of Household Members	47.3	32.0	10.00	10.60

Table 3-4. Categories of household composition in jointly headed households.

Household type	Number family members					Percent of households
	< 16	16 to 40	41 to 60	> 60	Total	
old age, small size	0	0	1 to 2	1 to 2	1 to 2	5
old age and child age, small size	1 to 4	0	0	1 to 2	2 to 6	9
middle age and child age	1 to 4	0	1 to 2	0	2 to 6	11
middle age, small size	1 to 4	1 to 3	1 to 2	0 to 2	3 to 11	19
middle age, big size	5 to 8	4 to 7	3 to 4	0 to 2	12 to 21	8
young age, small size	1 to 4	1 to 3	0	0	2 to 7	40
young age, big size	5 to 8	1 to 3	0	0	6 to 11	8

Table 3-5. Categories of house type.

Category	Description	Percent of households
1	Thatch roof; no plaster walls	11
2	Metal roof; ≤ 1 plaster wall	31
3	Metal roof; ≥ 2 plaster walls	48
4	Metal roof; plaster walls all sides; windows and doors	5
5	Metal roof; plaster walls all sides; glass windows	5

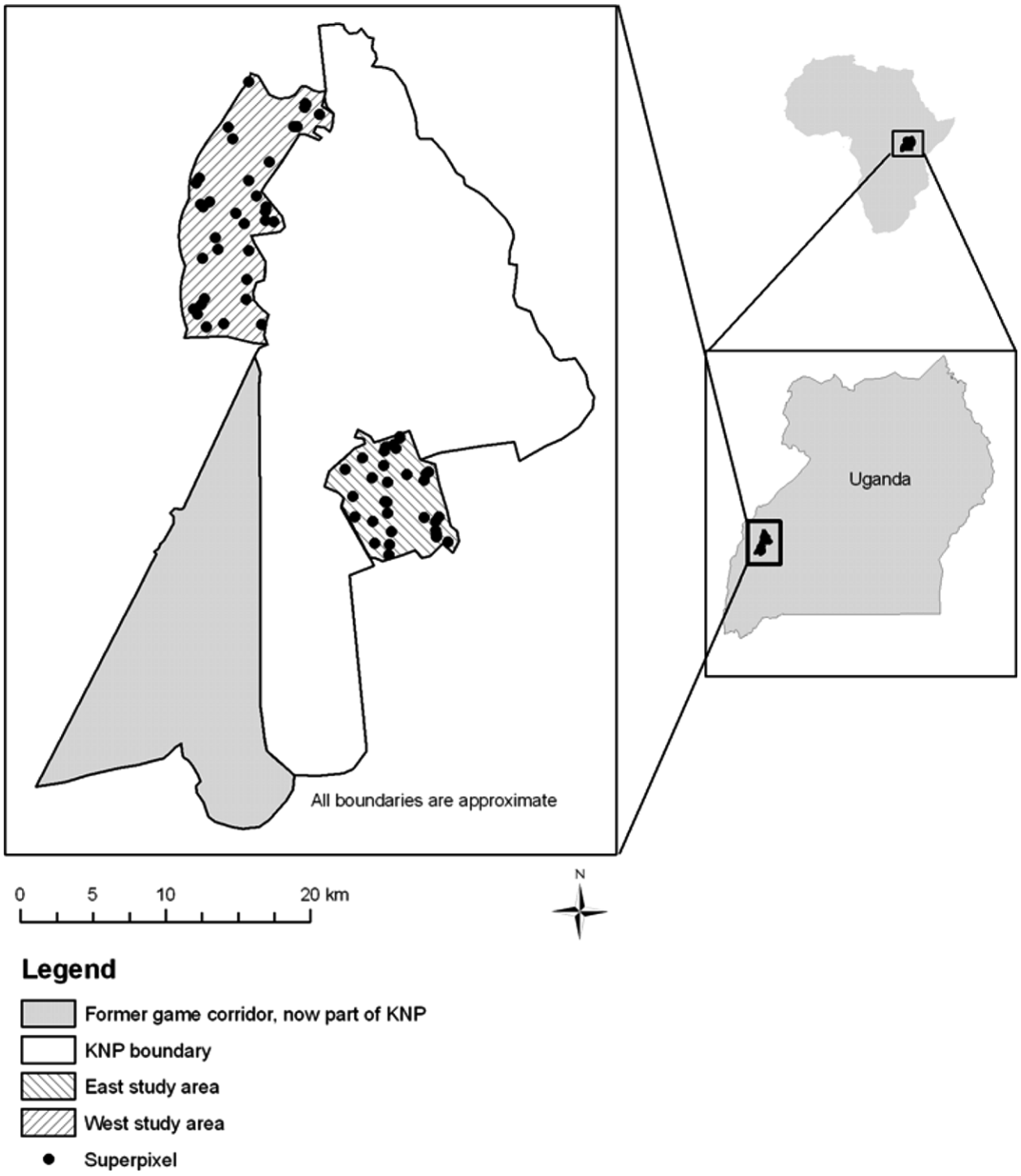

Figure 3-1. Superpixel research areas in the landscape surrounding KNP in western Uganda. Source: Hartter 2010:4.

A B

Figure 3-2. Images of land use on west side of KNP. A) Northern part of west side. B) Southern part of west side.

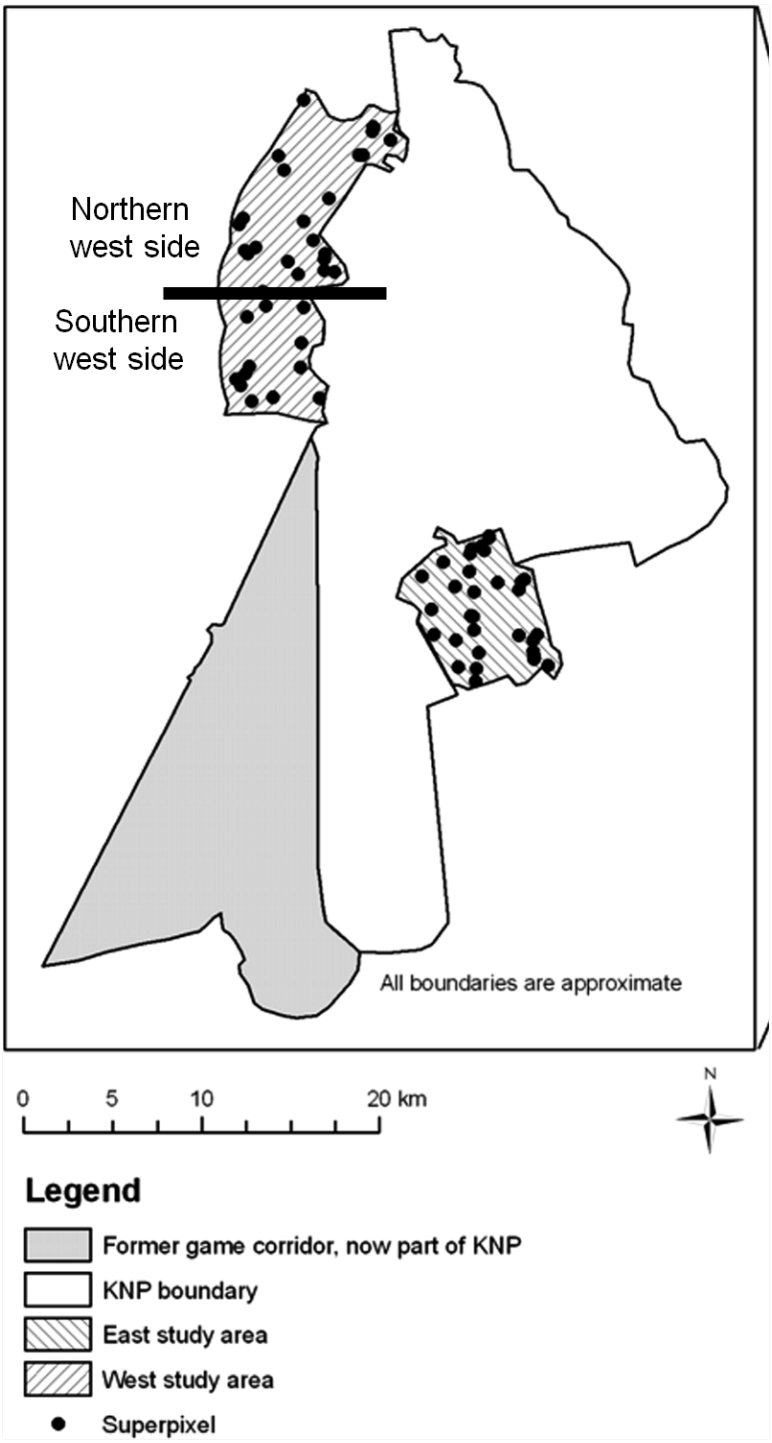

Figure 3-3. Superpixel research areas in the landscape surrounding KNP, west side of park divided into northern and southern portions. Source: adapted from Hartter 2010:4.

CHAPTER 4
DATA AND FINDINGS

Introduction

This chapter analyses the results of 102 respondents' answers to the questionnaire and focuses on eleven main topics: (1) settlement history, (2) land holdings and use, (3) food crops, (4) cash crops, (5) animals, (6) money, (7) crop productivity, (8) agricultural problems, (9) gender division of labor, (10) cultural differences in farming techniques, and (11) climate. This chapter uses these main themes to describe people's farming strategies and the independent variables that influence people's responses to the questions. It uses both statistical evidence and anecdotal examples to illustrate people's responses as the ways that they farm.

Settlement Histories

Questionnaire respondents moved to their current property around Kibale National Park (KNP) over the last half century, between 1944 and 2009 with a mean of 1987 and median of 1989. Most people moved to their current property after 1980. This reflects the large number of household heads less than thirty years old included in the questionnaire.

Of the 43% of people who came to their current property from a different district, 33% (all Bakiga) came from Kabale District, and 10% (all Batoro) came from Kyenjojo District. Kyenjojo District is located to the east of the area around KNP and Kabale District borders Rwanda in the southwestern tip of Uganda. Younger respondents come from the same district in which they currently live while older respondents moved to their current property from a different district ($x^2(4)=13.146$; $p<.05$). Also, many more Batoro

(81%) than Bakiga (35%) came to their present property from the same district ($x^2(1)=16.666$; $p<.001$).

The majority of people (53%) bought their land; 9% “occupied” it (meaning that they settled on the land without purchasing it), and 12% inherited it from their parents. Only old farmers, who settled the land several decades ago, early in the settlement history of the area, say that they occupied the land. Among both Bakiga and Batoro, women move from their parents’ household to their husband’s house when they get married; thus 21% said that they moved to their husband’s house and do not know how he acquired the property.

Most people (66%) settled in an area they said was mostly grassland when they arrived there; no one moved to a wetland area, 16% moved to forested area, and 18% moved to land that was already farmland. Members of the different ethnic groups describe different types of land cover when they first arrived to their current property. Bakiga settled in areas with forest (27%) and farmland (18%) as well as grassland (55%) while Batoro settled almost exclusively in grassland (83%). Almost all farmers (87%) who settled before 1970 found grassland when they arrived

The most common problem when people arrived was crop raiding; 59% responded that crop raiding was their biggest problem, compared to 20% who had problems with human sickness, and 15% who had no problems. If park animals are the main culprits of crop raiding, than people who live closer to the park should have more problems with crop raiding. However, a comparison of how far a respondent lives from the park and if they listed crop raiding as their main problem when they first settled shows that crop raiding is not associated with distance to the park ($x^2(4)=8.661$; $p>.05$). Several older

people say that crop raiding has decreased. This is especially evident with bush pigs, a stated problem for people who settled in the past, but not a problem for more recent arrivals. Long-time residents give two reasons for this change in crop raiding. First, people used to hunt and often eat wild animals, especially the bush pigs outside the forest reserve (as KNP was at the time). Second, as more people moved to the area around KNP, they cleared the land and effectively eliminated animal habitat. With a growing human population, animals were pushed into (or survived only in) the habitat that the park provides.

Land Holdings and Use

Ascertaining the exact amount of land that people have is complicated because they rarely know or are unwilling to say the exact quantitative size of their land. It can also be challenging to distinguish between land that is owned, borrowed, and rented, as well as which household member holds responsibility for the land. Additionally, people may not have all of their land in one place. So while a household may own a certain number of acres in the study superpixel, they may also own, borrow, or rent other land on which they also grow crops. Because of time limitations, this questionnaire only asked how much land people own in the immediate area. If respondents did not know the answer, a quantitative estimate was determined based on the description of land holdings given to the research assistant.

Based on these estimates, the range of land owned is between 0 and 60 acres. However, only two households own more than 25 acres; one has 46 acres and the other has 60. In both cases, the male household head has secondary school education, earns money from off-farm work, and owns a nice house made of brick, with glass windows

and electricity. Since each of these households have about twice as much total land as the other farmers they are not included in the statistical analysis.

For the sample, the mode is one acre, the median is 2.5 acres and the mean is 4.1 acres (about .04, 1, and 1.7 hectares, respectively), indicating that apart from a small minority of families, most people have small land holdings. Batoro households have a mean of 5.73, median of 2, and mode of 1 acres of land (2.3, .8, and .4 hectares, respectively). Bakiga households have a mean of 4.42, median of 3.13, and mode of .25 acres of land (1.8, 1.3, and .1 hectares, respective). There is no difference between the amount of land that FHH and JHH own ($t(97)=-1.126$; $p>.05$).

Among people who have been farming the land for more than 10 years, 63% have the same amount of land as they had 10 years ago, 19% have less and 18% have more land. These figures are similar for both Bakiga and Batoro households. Most people who have less land today than they did 10 years ago, sold their land to obtain money for expenses such as paying for children's school fees or medical expenses of sick family members. It seems that many of these medical expenses were HIV/AIDS related based on the description of the illness (long-term and often resulting in death) because of the large impact of the HIV/AIDS virus in Uganda and in this area. The other main reason for have less land than in the past is due to land transfer to the household head's sons.

People were asked how they divide their land currently and how they divided it ten years ago between five main land uses: crops, pasture, fallow, planted trees, and natural trees. Not everyone distinguishes between fallow and pasture; since fallow periods are generally short and grass grows on fallowed fields, people use this land for animal grazing. However, other farmers have land specifically designated for animal

pasture that is separate from crop land put in fallow. Land use intensity is coded so that natural trees and fallow are less intensive than pasture and planted trees which are less intensive than crops. Using this classification, 56% of the people have maintained the same degree of intensity, 27% use land more intensively and 17% use land less intensively than they did 10 years ago. Bakiga and Batoro have not managed their land in the same way. About two-thirds of Bakiga while only 40% of Batoro farmers have maintained the same land use intensity ($x^2(2) = 7.125$; $p<.05$). This implies that Bakiga have maintained the same land use intensity while Batoro have changed (by either increasing or decreasing) their intensity.

Food Crops

Household Use of Food Crops

When asked questions about crops, even a question asking for "the most important crop," farmers would provide a list of the crops that belonged in that category. It has been easiest for analytical purposes to deal with these lists by breaking them down and looking at each crop individually.

People grow a variety of crops, including groundnut, cassava, Irish potatoes, vegetables, millet, sorghum, and cocoyams. However, the crops that more than half of respondents list as a main crop are bananas (93%), sweet potatoes (84%), beans (81%), and maize (76%) (Table 4-1). Bakiga and Batoro include different crops in their list of main crops (Table 4-2). Considerably more Bakiga (92%) than Batoro (52%) grow maize ($x^2(1) = 19.362$; $p<.000$) as a main crop. Also, more Bakiga (92%) than Batoro (74%) grow beans as a main crop ($x^2(1) = 5.536$; $p<.025$). Batoro (98%) somewhat more than Bakiga (86%) grow bananas as a main crop ($x^2(1) = 5.029$; $p<.025$). Irish potatoes are a new crop for both Batoro and Bakiga. More people under 40 (60%) than those

over 40 (15%) in both ethnic groups grow Irish potatoes as a main crop ($x^2(4) = 22.184$; $p<.001$). FHH and JHH predominantly grow the same main crops (Table 4-3). The only difference is in cassava; 35% of FHH and 60% of JHH grow cassava as a main crop ($x^2(1)=4.378$; p,.05). Roughly the same percent of households of different wealth levels grow the same other main crops (Table 4-4). However, more households who are “more poor” (95%) grow bananas than households that are “less poor” (77%) ($x^2(1)=5.347$; $p<.025$).

People predominantly list four food crops, maize (40%), bananas (35%), sweet potatoes (21%), and beans (14%), as the crops planted on the most land. More Bakiga (65%) than Batoro (14%) plant maize on the most land ($x^2(1) = 27.285$; $p<.001$). Batoro (30%) plant sweet potatoes on the most land more commonly than Bakiga (12.2%) ($x^2(1) = 4.668$; $p<.050$). Households who are “less poor” more commonly (92%) plant maize on the most land than households who are “more poor” (36%) ($x^2(1)=7.423$; $p<.01$). No households that are “less poor,” compared to 38% “more poor” households plant bananas on the most land ($x^2(1)=7.423$; $p<.01$).

Respondents most commonly list bananas (65%) and sweet potatoes (58%) in their list of important staple crops for family food. While people consider maize to be a main crop and plant it on a large portion of their land, only 12% of respondents include maize in their list of important crops for family food. Neither Batoro (6%) nor Bakiga (21%) frequently consider maize one of their important family foods ($x^2(1) = 3.679$; $p>.05$). Additionally, there is no difference in responses between Batoro (72%) and Bakiga (53%) for including bananas as an important family food ($x^2(1) = 3.230$; $p>.05$). So bananas are the most commonly cited staple for both groups. However, Bakiga

(62%) include beans as an important family food more often than Batoro (17%) ($x^2(1)$ =17.184; p<.001). More FHH (82%) than JHH (52%) consider sweet potatoes as an important family food (x2(1)=5.271; p<.025). Families who are “more poor” (69%) depend more on bananas as a family food than families who are “less poor” (30%) ($x^2(1)$=5.619; p<.025). Eighteen people (18%) said that all of their crops were important for their family food.

A section of the questionnaire asks about changes in agricultural practices by exploring changes in food consumption over the last ten years. Only 22% of people interviewed eat new foods today that they did not eat 10 years ago. Of those who do eat new foods, there is no clear consensus about these new foods ; 28% now eat rice, 22% fruit, 11% maize, 11% Irish potatoes, and 11% now eat new vegetables.

However, 53% have stopped eating particular foods over the last 10 years. People most commonly list millet (29%) and cassava (20%) but also include groundnuts (12%), peas (10%), maize (10%), bananas (8%), Irish potatoes (6%), beans (6%), rice (6%), cocoyams (4%), sweet potatoes (4%), and wild plants (2%) as foods they no longer consume. Only 10% of the people who stopped eating a food list crop raiding as the reason. Other reasons that people discontinued eating a food include that it did not grow well (46%), that they lack necessary resources (energy, money, land, or time) to grow it (29 %), and that they have trouble eating it (10%) (referring to problems digesting the food).

Does crop choice reflect a dietary preference? While some people provided their favorite food without hesitation, others, especially poorer respondents, had difficulty. This probably reflects that they have little variety in the crops that they grow and thus

having a favorite food may be a luxury that only richer people with more varied diets can afford. Since the goal was to tie the responses specifically to agricultural decision-making, respondents were asked to limit their answer to local crops consumed regularly and not to include meat or rice that are purchased and generally consumed only for special occasions. Most people (51%) like bananas, followed by beans (31%) and sweet potatoes (31%). As with important family foods, few people (10%) said that maize is their favorite food. Few Bakiga (9%) or Batoro (9%) say that maize is their favorite food ($x^2(1) = 0.001$; $p > .05$). Also, Batoro (61%) and Bakiga (44%) respond similarly for bananas as their favorite food ($x^2(1) = 1.850$; $p > .05$). However, twice as many Bakiga (42%) as Batoro (20%) list beans as a favorite food ($x^2(1) = 5.482$; $p < .025$). Gender of the household head and wealth do not impact people's favorite food.

If people who live closer to the park suffer more from park raiding, do they adjust their crops grown accordingly? Naughton-Treves (1998) found that primate raiders prefer bananas and maize over all other crops. However, Batoro and Bakiga grow the same main crops regardless of how close they live to the park. Similarly, the crops that they plant on the most land do not change depending on their distance from the park. There is a difference, however, among Batoro farmers; Batoro living closer to the park list sweet potatoes as an important family food more than people living farther away from the park ($x^2(2)=7.733$; $p < .05$). Even though no farmers specifically said it, it is likely that Batoro living less than one kilometer from the park boundary may grow sweet potatoes as their primary family food because this root crop is less vulnerable to animal raiding.

Food Crops Bought and Sold

Three-quarters of the people interviewed sometimes buy foods; this encompasses those who buy regularly, as well as those who buy only on rare occasions. Additionally, this question does not specify if people buy food because they did not grow enough (a sign of food insecurity) or if they buy food because they have enough money to buy products that they do not grow (a sign of wealth). Table 4-5 shows the crops that respondents buy and sell and Table 4-6 shows these crops divided by ethnicity. People purchase rice (28%), cassava flour (28%), and maize flour (27%). Families who grow maize for sale also say that they purchase maize flour because it is easier to sell the kernels and purchase ground flour than to grind the kernels themselves. Few Batoro (10%) buy beans while Bakiga more commonly (39%) purchase them ($x^2(1) = 8.745$; $p<.01$). Also more Batoro (43%) than Bakiga (6%) purchase maize ($x^2(1) = 12.471$; $p<.001$). More JHH (17%) than FHH (7%) purchase Bananas ($x^2(1)=5.621$; $p<.025$) (Table 4-7). No households who are “less poor” but 25% of “more poor” households buy cassava ($x^2(1)=4.528$; $p<.05$) (Table 4-8). More households with low dependency ratios (21%) than high dependency ratios (4%) buy sweet potatoes ($x^2(1)=5.749$; $p<.025$).

There is no clear trend regarding changes in how much food people buy currently compared to 10 years ago; 39% buy less, 22% buy the same amount, and 29% buy more. When people describe why they have changed their buying habits in the last ten years, they generally indicate that it was related to changes in family size (number of people to feed), family composition (reduction of able-bodied adults because of illness), soil fertility, crops grown, and market prices.

While everyone consumes some of the crops that they grow, only about two-thirds of the respondents sell crops, either regularly or only when they have had a good harvest. Families who are “less poor” more commonly (92%) sell crops than families who are “more poor” (64%) ($x^2(1)=4.074$; $p<.05$). Of those who sell crops, 70% sell maize. More Bakiga (94.3%) than Batoro (42%) sell maize ($x^2(1) =21.402$; $p<.001$). Beans are the second most common crop that people sell (47%). No Bakiga sell sweet potatoes while about half of Batoro respondents who sell crops sell sweet potatoes ($x^2(1) =24.040$; $p<.000$). Also, more Batoro sell bananas than Bakiga ($x^2(1) =4.088$; $p<.05$). All “less poor” families while only 65% of “more poor families” sell maize ($x^2(1)=5.779$; $p<.025$).

Over half of respondents (58%) list maize as the crop from which they earn the most money. Bananas are the second largest money earner (15%). Over 80% of Bakiga while less than 25% of Batoro who sell crops earn the most money from maize ($x^2(1) =20.090$; $p<.001$). “Less poor” families more commonly (91%) than “more poor” families (55%) earn the most money from maize ($x^2(1)=4.930$; $p<.05$).

Most of the respondents (55%) sell less today than they did 10 years ago, while almost one-third sell more (33%), and a few sell same amount (3%). Many of the people who sell less attribute this to declining soil fertility that reduces output. Changes in family size (and the amount of crops needed for food) also impact how much people sell; families that have increased in size sell less. No Bakiga and only two Batoro sell the same amount as they did ten years ago. However, while most Bakiga (83%) sell less, Batoro are almost equally divided between selling more (46%) and selling less (48%) than before ($x^2(2) =11.584$; $p<.01$).

People sell crops on-farm to traders (54%) or neighbors (12%) and off-farm in trading centers of markets (25%). Farmers call traders to come to the farm to buy the crops and transport the crops to be resold. There are trading centers of various sizes where people can sell crops dispersed throughout the area, especially along the major roads.

Non-Food Cash Crops

Farmers do not include non-food cash crops such as tea, coffee, eucalyptus, and tobacco as main crops. Therefore, a section of the questionnaire focuses more specifically on why people choose to grow these particular cash crops.

Tea

Tea plantations have been present on the west side of the park since colonial times. At the time of independence, the Ugandan national government took over the management of the colonial government's tea plantations (Mullan et al. 2008). Since the 1980s and 1990s, already existing as well as newly formed tea plantations became private enterprises (Mullan et al. 2008). The companies that run these plantations hire wage laborers to pluck tea on the plantation.

Tea plantation companies also purchase unprocessed tea leaves from smallholders. Tea must be processed within the day that it is picked, thus close proximity to a drying facility is imperative for the success of smallholder tea (Mullan et al. 2008). Only Batoro who live on the west side of the park grow smallholder tea. The one exception is a Bakiga employee at the Makerere University Biological Field Station (MUBFS) who would like to start smallholder tea on the east side of the park. He has spoken with his neighbors about creating a cooperative for growing tea as a source of

income. He planted his first tea seedlings in the summer of 2009, so it is too early to tell how the project will turn out.

Only six Batoro (11%) grow tea. Most Batoro (56%) say that they do not grow tea because they do not have enough land for it. Those who do grow tea either inherited or bought land with tea on it, thus they did not decide to plant the tea themselves. Most people who have tea complain that it does not grow well without inputs and that the costs of inputs are high.

Coffee

Coffee is grown on both sides of the park. Neither Batoro nor Bakiga drink coffee. While 39 people previously grew coffee, only 15 people grow coffee today. Most people (93%) stopped growing coffee because the trees died or stopped producing. Coffee is susceptible to several diseases and pests that can ruin trees if not treated with pesticides. No one mentioned trying to access pesticides for their coffee trees. People who still grow coffee today do not earn much money for it. Their trees often do not produce much. Furthermore, the factory that processed coffee closed about five years ago, so they must sell to traders who come from farther away.

Eucalyptus

Eucalyptus trees are important for personal construction materials and firewood and for sales of these to neighbors, traders, or tea companies. Many people have the trees for multiple uses; over 60% say that they use the trees in each of these three ways. While bikes transporting bags of charcoal are a common sight on the roads around KNP, none of the respondents mentioned charcoal when answering questions about eucalyptus. Also, farmers did not indicate how much money they can earn from selling eucalyptus.

The imported eucalyptus trees are preferable to indigenous trees because they grow quickly and are profitable in a shorter amount of time. Additionally, the trees can be coppiced very successfully: ie, if part of the stump is left when harvested, the tree will grow back and the farmer does not need to reinvest in saplings. Less than half (45%) of the respondents grow eucalyptus. Visual observations show that there are more eucalyptus trees on the west than on the east side of the park. More Batoro (56%) have eucalyptus than Bakiga (33%) ($x^2(1) = 5.463$; $p < .025$).

People plant eucalyptus on various parts of their property; most frequently (42%) in bottomlands (Batoro only) but also along the property border (18%), scattered (16%), and on the top of a hill (7%). Half of farmers have the same number of trees today as ten years ago, while almost 40% have more than in the past. Batoro and Bakiga plant eucalyptus in different parts of their property; most Batoro (55%) plant eucalyptus in bottomlands but no Bakiga plant them in bottomland.

Tobacco

Tobacco is the newest non-food crop in the area around KNP. The tobacco company provides a guaranteed market with a centrally-located auction for buying the leaves. It then transports the leaves to larger markets for resale. Farmers can purchase fertilizer on credit from the tobacco company, who will later charge them for the inputs against their delivered tobacco crop.

With the exception of one Batoro man living on the west side of the park who has about ten experimental tobacco plants, only Bakiga living on the east side of the park currently grow tobacco. All respondents started growing tobacco within the last four years. Most of the respondents were growing tobacco for the first time during the 2009 summer, when this questionnaire took place. Fifteen Bakiga (32%) are currently

growing tobacco. In an interview with UWA officials, they indicated that they have been encouraging people living next to the boundary to grow tobacco because park animals do not like tobacco, and if the field is large enough, the animals will not traverse it to access food crops. UWA officials also encourage people to grow tobacco to earn money to buy food rather than growing food that will likely be lost to animals. However, it seems to be the tobacco company, and not UWA, is mainly promoting tobacco. Most of the farmers (75%) started growing tobacco to earn money and only one person grows tobacco to avoid crop raiding.

Everyone who has grown tobacco says that they earned more from tobacco than from any other crop. One man was in the process of building a new brick house with the money that he had earned from tobacco. When Bakiga were asked why they do not grow tobacco, almost half (48%) said that they cannot manage it (implying constraints in land, time, or energy) while almost a quarter (22%) (including both Muslims and Christians) said that their religion prevented them from growing tobacco.

Most people do not put much land into tobacco. Respondents had between one-eighth and five acres of tobacco, with the median response of a half acre. People found out about growing tobacco either from their neighbors or from the company that sells the seedlings and buys the leaves. Only three people have used inputs for the tobacco and they did not use them on any of their other crops. One man explained that he does his reluctance to use inputs because he might then be dependent on them.

Three-quarters of the people growing tobacco have had problems with the crop. One of their main complaints is feeling sick (cough, chest pain, headache, loss of appetite) while working with it, especially when smoking and drying the leaves.

Additionally, people do not like the risk involved in growing tobacco. If the crop does not turn out well or the company does not classify leaves as high quality, farmers may not earn much money from it. In this climate, food crops are grown twice a year, but tobacco is grown once a year, and the money earned from it must then last until the next harvest. As a result of these problems, six of the fifteen people who have tried growing tobacco say that they will not grow it again.

Animals

About three-quarters of the respondents (76%) have at least one animal. People keep an average of 1.26 cows, 2.38 goats, 3.24 chickens, and .48 pigs. Batoro keep more goats (mean 3.28) than Bakiga (mean 1.49) (t (73.86) =-3.22; $p<.005$). Bakiga have more pigs (mean .73) than Batoro (mean .24) (t (.71.88) =2.495; $p<.025$). Batoro and Bakiga on average keep the same number of chickens. Batoro identification includes being cattle keepers. However, equal numbers of Batoro (42%) and Bakiga (25%) have pasture land ($x^2(1)=3.414$; $p>.05$). It is not possible to compare the number of acres of pasture land because people described their land division in terms of “a lot” or “a little.” Bakiga have a mean of 0.71 cows and Batoro have a mean more than twice as large –of 1.88 cows -- but this difference is not statistically significant (t (64.593)=-6.56; $p>.05$).

About two-thirds of the respondents (68%) have fewer animals currently than they had ten years ago. People’s reasons include: (1) animals died and they were unable to replace them or animals were sold (2) due to financial problems (human sickness and death), and (3) lack of land to support grazing. Of those who own animals, 55% say that their biggest problem is animal sickness and purchasing medications for the sick

animals. Animals are an important way of storing wealth, but also require time and land that people cannot always invest.

Cows are expensive to purchase and maintain, and only nineteen people (less than a quarter of all respondents) have them. All produce milk for family consumption; twelve farmers also sell some milk to neighbors. Of the 56 people who buy milk, 96% purchase it from neighbors. Goats are not used for milk.

Of the people who have animals, 82% sometimes sell them. Cattle and goats are sold every two to three years but small animals like chickens are sold one to two times per year. Selling animals is not a regular source of income, but is based on animal reproduction and family needs. In most cases, animals are sold to local butchers or traders at farm sale. Crops provide cash, whereas animals rarely do; almost everyone (89.9%) earns more money from crops than animals. Only farmers who are “more poor” or “well off” earn the most money from animals rather than crops.

Wage Labor

Almost half of the respondents (49%) hire people to work on their farm. Most do not use permanent or full-time hired labor, but rather hire workers for a day (8 am to 2 pm) and pay from 1000 to 3750 USH (about USD .50 to 1.88) for a day’s work. The most common wage is 2000 USH (USD .99). The wages are equivalent to the wages (mean 2210.00USH) that the tea plantations on the western side of the park offer for a day’s work ($t(42)=2.621$; $p<.025$. The going rate for wage labor differs depending on the side of the park; people on the east side earn less money (mean 1833.74USH) than people on the west. This may result either from land shortage on this side or competitive impact of tea employment in the west.

Crop Productivity

What are the crop outputs and techniques for managing crop productivity currently compared to ten years ago? Fallowing land is a management technique that 60% of respondents use. However, not all farmers have the same definition of fallow; for some people this means converting land to pasture while for others it means not using it at all. Both Bakiga (54%) and Batoro (67%) fallow land. When asked how long they leave a plot of land fallowed or planted, some people responded in years while others responded in seasons thus there is a chance of inaccuracy when converting all of the responses to years.

People cultivate a field between 0.5 and 4.5 years, with 1.5 years being most common. After farming on the land for a season, people leave it fallow between 0.25 and 4.5 years, but most commonly 1 to 1.5 years, before cultivating it again. The amount of the time land is cultivated or in fallow is not fixed. Bakiga respondents have a shorter growing cycle; land is cultivated an average of 1.52 years and fallowed an average of 1.38 years. Batoro have a longer growing cycle; they cultivate land an average 1.94 years and then fallow an average 2.14 years. Based on these figures, it seems as though Bakiga practices are somewhat more intensive than Batoro, though the difference is not large.

Decisions about land use depend mainly on the health of family members, the reliability of the rains, changes in crop yields, and family composition. Rotations between growing and fallow thus change regularly based on the family's situation. In spite of this general state of flux in fallow practices, most people (73%) have not changed their use of fallowing in the last ten years. For those who have changed, more

people (63%) fallow more (by either putting more land in fallow or leaving land in fallow for longer periods of time) than they did ten years ago.

Fallowing can be investigated in more detail using a measure that Ruthenberg (1980:15) created. He calls it the *R-value* and uses it to measure intensity by looking at the relationship between the amount of time that people cultivate land out of the total land cycle (the sum of the amount of time the land is in cultivation and in fallow). This formula provides the percent of time that people cultivate land; thus a higher percent indicates that land spends more time in cultivation than in fallow and is therefore used more intensively. This measure does not account for all aspects of intensity of land use. First, many farmers have different fallowing practices for different parcels of land; asking what people generally do neglects specificity of land management. Second, crops are planted closer together on fields that are used intensively. For example, a field with only banana trees is less intensively used than a field that has another crop interspersed between the banana trees. Hence, obtaining these types of data with a reasonable degree of accuracy requires more time than was available for the study.

In spite of these problems, this measure provides one idea of land intensity that can be used in this study. The *R*-values range from 14.29 to 100 with a mean of 71.9, median of 66 and mode of 100. More than a quarter (28%) of the respondents' farming practices have an R-value of 100. In Ruthenberg's (1980) categorization, an *R*-value between 50 and 66 shows stationary cultivation with fallowing and any value over 66 is permanent farming, meaning that the soil is cultivated almost every year. Based on these categories, farming around KNP is clearly intensive.

The mean *R*-value among Bakiga (75) is higher than that of Batoro (67). Additionally, the range of R-values has a smaller minimum among Batoro (14.29) than among Bakiga (33). Both of these findings indicate that Bakiga use the land somewhat more intensively. However, the difference in mean R-values is not statistically significant ($t(86) = 1.434$; $p > .05$).

To delve further into crop productivity, people listed their output per land now and ten years ago for two of their main crops. The goal is not to compare different people's yields, but rather to look at how their yields have changed. When broadly categorized into increased, same, and decreased yield, almost everyone (94% for the first and second crop) indicated that crop yields have decreased. For people who were able to provide a numeric quantity for both their current output and ten years ago, it is possible to calculate the percent change in output over the last ten years. This calculation shows that estimated output decreases are very high – on average, -66.67% to -75.00%. The decrease in output does not vary depending on the reported length of time the farmer has used their land or the use of fallow. As demonstrated in Chapter 2, there is an absence of almost any fertilizer use in Uganda (compared to other East African countries) which is likely contributing to these decreases in output. Furthermore, if high fertility rates in Uganda continue, this will become a larger problem as population continues to grow while crop yields decrease.

Agricultural Problems

Farmers also were asked to list their main agricultural problems. The problems that arise most frequently are crop raiding (20%) and crop failure (67%), which is often for unknown reasons. While many people (62%) say that they have problems with crop raiding when directly asked, they do not include it in their list of main agricultural

problems. Many of the people who list crop raiding as a main concern, discuss damage from elephants, although fewer people have problems with elephants (38%) than have problems with monkeys (61%) (Table 4-9). These responses reflect other research findings on problems with crop raiding (Hartter 2007). Table 4-10 shows the strategies used to mitigate agricultural problems.

Crop Raiding

The main park animals that raid crops are monkeys, baboons, elephants, and bush pigs. These animals are found throughout the park and impact farms located on both the east and west sides of the park boundary. To minimize crop losses to animal raiding, people employ a variety of techniques depending on their resources and the type of animals. It is most common (55%) to guard fields. However, people who have problems with elephants note that the elephants come infrequently and at night; thus guarding the fields is not an effective long-term strategy, while using fire or clearly-marked boundaries (like elephant trenches) is more effective. Almost one-third of the people (32%) do nothing to prevent crop raiding. There is no clear trend in how raiding has changed over the last ten years: 49% of people say that it became worse while 38% say that it is better now. Bakiga and Batoro use the same techniques against crop raiding, but with different frequency. Seventy percent of Bakiga, compared to 48% of Batoro guard fields, while 42% of Batoro and 22% of Bakiga do nothing to minimize crop raiding.

Soil Fertility

Almost all questionnaire respondents (93%) say that their soil fertility has decreased in the last ten years. Techniques used to increase soil fertility, or retard its decline, include burying organic material (31%) and fallowing (20%). Almost half of

respondents (47%) do nothing; which may reflect a lack of access tor finances to purchase chemical fertilizers. However, people may use techniques without identifying the practice as a technique for increasing soil fertility. For example, only 20% of respondents say they use fallow to increase soil fertility, but 60% of people say that they fallow land when asked directly, and 80% of older people say they do nothing to increase crop productivity.

More Bakiga (60%) than Batoro (38%) report that they do nothing to increase crop productivity ($x^2(1) = 4.515$; $p<.05$). However, responses vary between different age groups; those Batoro over 61 more frequently (81%) than younger Batoro under 30 (22%) do nothing ($x^2(4) = 10.262$; $p<.05$). Only a few Batoro (3%) said that they rotate crops to increase production, but no Bakiga mentioned this technique ($x^2(1) = 4.955$; $p<.05$). More Batoro (40%) than Bakiga (21%) bury grass to increase soil fertility ($x^2(1) = 3.976$; $p<.05$).

Why do more Batoro than Bakiga say that they bury grass to increase crop production? Perhaps decision about burying versus burning grass do not fall along lines of ethnic difference, and members of both groups are equally likely to participate in these practices. However, visual observations noted more burnt fields on the west side of the park than on the east side of the park. Additionally, Farley (1996), in a study of Bakiga living in the Kabale district, notes that burying grass is a common method of land preparation. It is possible that Bakiga bury grass as a part of their land preparation without thinking about why they prepare land in this way. In this case, if asked “do you bury grass,” rather than “what techniques do you use to increase crop production,” more Bakiga would indicate that they bury grass.

The gender of the household head impacts how people address crop productivity problems. More JHH (38%) than FHH (5%) bury organic material to increase crop production ($x^2(1)=9.228$; $p<.005$). More FHH (73%) than JHH (40%) do nothing to increase crop productivity ($x^2(1)=7.494$; $p<.01$). This may be a reflection of the lack of adult male labor in FHH; without this labor they are unable to address problems.

Pests and Disease

Pests and diseases are problems for many farmers (70%) and are contributing factors to crop loss and failure. Most people (75%) say that their problems are worse now than ten years ago. However, about two-thirds (68%) do nothing to reduce the damage. More Bakiga (84%) than Batoro (57%) do nothing ($x^2(1) =6.592$; $p<.01$). Several people explained that they do not know what action to take because they do not know the causes of the problem. If people take action, they either uproot the affected crop (18%) or, if the problem is bad enough, stop growing the crop (6%). More FHH (21%) than JHH (2%) stop growing the crop in order to minimize damage from pests and diseases ($x^2(1)=8.183$; $p<.005$). People who are “less poor” more commonly (29%) than people who are “more poor” (4%) stop growing a crop to avoid pest and disease damage ($x^2(1)=6.683$; $p=.01$).

Gender Division of Labor

Most families (88%) do not divide fields or the responsibility of growing specific crops between men and women. When people talk about important income-earning crops, like tobacco or maize, mostly men are responsible, but when asked generally, people indicate either that women and men share all responsibility (43%) or that women are responsible for all of the crops (49%). Among both Batoro and Bakiga, few men are responsible for all of the crops. However, in 63% of Bakiga households men and women

share responsibility and in only 28% do women have sole responsibility, while 78% of Batoro households women have responsibility and only 19% share responsibility between men and women.($x^2(2)=14.821$; $p<.001$).

People listed those in their household who do each of the main agricultural tasks. Responses are grouped based on gender (with no age component, so that wife, mother, and adolescent daughter all fall in one category—female). Only young children are separated by age and not gender. Outside labor refers to either male or female hired labor. Table 4-11 shows who in the household does each of the main agricultural tasks. Land preparation, which involves clearing brush and debris, is done mostly by men (68%) or by outside labor (26%). In only one respondent household do both men and women work on land preparation. It is less common in FHH (40%) than JHH (75%) for men to prepare the land ($x^2(3)=11.523$; $p<.01$) (Table 4-12). This reflects the lack of an adult male in the household.

Women (61%) in the majority of households do the tilling; in 13% both men and women till, in 16% outside labor is used, and in only 7% of households do men till. All Bakiga households say that women till (Table 4-13). Batoro responses are more varied; while almost half (48%) of respondents say that women till, in 14% of households both men and women till, in 10% men till, and in 24% outside labor does this task. Additionally, among Batoro, the age of the household head influences who in the family tills. Women till in almost all (92%) households with respondents under 40 years old; in contrast, 39% of respondents over 40 years old say that women in the household till while 22% say both men and women till and 28% use outside labor for tilling

($x^2(4)=10.790$; $p<.05$). The dependency ratio of the household impacts who in the family does the tilling ($x^2(4)=15.868$; $p<.005$) (Table 4-14).

Planting is also a predominantly female (61%) task; in 7% of households it falls to men, in 13% to both men and women, and in 16% planting is done by outside labor. More men and women in Bakiga (34%) than Batoro (14%) households work together to plant. No Bakiga men work alone planting while 8% of Batoro men plant alone ($x^2(4)=11.216$; $p<.025$). Also, only one Bakiga household hires labor, while 10% of Batoro households use outside labor for planting. The age of the household head is also important in Batoro's division of labor. Only Batoro households with a household head over 61 years old hire labor for planting. In 75% of Batoro households where the household head is less than 40 years old, women do the planting. More females in households with high dependency ratios (76%) than those in households with low dependency ratios (37%) are responsible for planting ($x^2(4)=15.347$; $p<.005$). Wealth of the household has relatively little impact on the division of labor for agricultural tasks (Table 4-15).

Men and women more commonly (33%) work together for weeding than for other tasks, but women in most households (57%) weed. Only 3% of households hire outside labor. In about two-thirds of Bakiga households, women weed (66%) and in about one-third (34%) both men and women weed. No Bakiga men weed. Batoro men weed in 12.2% of households, women in 49%, both men and women in 31%, and outside labor in 6.1% of households ($x^2(4)=10.886$; $p<.05$). Additionally, younger Batoro respondents (56% of respondents under 30) say men and women work together while older respondents (especially over 40) do not. FHH (81%) more commonly use female labor

for weeding than JHH (50%) ($x^2(4)=12.929$; $p<.025$). Weeding in households with low dependency ratios is done more commonly by both males and females (52%) done by than females alone (30%), while in households with high dependency ratios it is done more commonly by females (67%) than by both men and women (26%) ($x^2(4)=13.806$; $p<.01$).

Finally, harvesting is mostly done (62%) by females; 25% of households say both men and women harvest and only 9% say that men do this task. No Bakiga men harvest alone, however in 28% of Bakiga households women and in 27% both men and women do the harvesting. The frequency that men and women work together in Batoro households (23%) is similar; fewer women (57%) harvest while in 13% of households men and in 4% outside labor harvest. Household heads younger than 40 more commonly (32%) than those of 40 (17%) say that men and women harvest together. Almost three-quarters (72%) say that their family has not made any changes in who does what tasks.

There are three main ways that households can earn money: selling crops, selling animals, and working off-farm (which includes working on other farms for pay, picking tea, and running a shop). Women in 86% of households earn money from crops, in 28% from animals, and in 10% from working outside. Among Batoro households, in 81% of households women earn money from crops, in 44% from animals, and in 13% from off-farm work. No Batoro over 51 years-old say that women in their family earn money from selling animals. Among Bakiga households, in 92% of households women earn money from crops, in 22% from animals, and in 8% from outside work.

Men in 35% of households earn money from crops, in 65% from animals, and in 54% from working outside. Among Batoro households, men in 23% of households earn money from crops, in 39% from animals, and in 69% from outside work. In Bakiga households, men in 50% of households earn money from crops, in 33% from animals, and in 33% from off-farm work.

Cultural Differences

The questionnaire asks Batoro and Bakiga to discuss how their farming practices are different from others. People who are obviously wealthier or more educated than the general population discussed examples of what people do differently, whereas others could only guess. For example, a group of research assistants who work on a biology project inside of KNP could immediately state the differences between Batoro and Bakiga farming techniques.

Over half (55%) of the respondents do not think that the farming techniques of these ethnic groups are different from the techniques that other groups of people in Uganda use. Several people (15%) explained that they could not know if farming practices vary between different groups of people because they had not encountered people of other ethnic groups.

Bakiga Views of Cultural Differences in Farming

Almost half (48%) of Bakiga respondents think there are differences between Bakiga farming techniques in the area around KNP and the area of Kabale (the original home area of most Bakiga in this area). People's explanations of what is different were vague; they most commonly said that the two regions have different seasons (35%) or that the two groups have different techniques (39%). There was no clear consensus in how the techniques differ, and many people stated that they differ but that they did not

know or could not explain what is different. Some people (12%) mention a difference in work ethic, saying that Bakiga in Kabale work harder than Bakiga near KNP.

Most Bakiga (83%) do not think that their farming is different from Batoro practices. For those who think there is a difference, 38% say it is the work ethic and 63% say it is techniques, including burying (rather than burning) grass or creating higher sweet potato mounds.

Batoro Views of Cultural Differences in Farming

Most Batoro (66%) do not think that their farming practices are different from the practices of Batoro living elsewhere. More Batoro (53%) than Bakiga say that there is a difference in farming practices between Batoro and Bakiga farmers. These differences are divided between work ethic (20%) and techniques (80%). More people who are "more poor" (90%) than "less poor" (50%) say that the difference between Batoro and Bakiga farmers is their techniques ($x^2(1)=6.171$; $p<.025$). Everyone who said that they have different techniques mentioned land preparation, specifically that Batoro burn land and Bakiga bury weeds rather than burning them. About half of Batoro (52%) who think that there is a difference between Batoro and Bakiga farming have adopted Bakiga techniques. Most of them (67%) have started burying rather than burning grass. The others have adopted larger sweet potato mounds or mulching around banana trees. Rich Batoro who regularly use hired labor commented that they prefer hiring Bakiga workers because they work harder than Batoro workers.

Climate Changes around Kibale National Park

Almost everyone (96%) says that there has been a change in rainfall. They generally describe the change as either unpredictability in when the rains start, in the duration or as and in the amount. Batoro (81%) more than Bakiga (44%) say that the

rains have become less predictable ($x^2(1) = 13.481$; $P<.001$). Similarly, more Bakiga (77%) than Batoro (29%) say that there is less rain than in the past ($x^2(1) = 20.559$; $P<.001$).

Most people (88%) say that the change in rainfalls has impacted their yields. Some say that they obtain less (64%) or that they plant less (33%) because they are afraid of losing the entire crop and do not want to use all of their seeds if this should happen.

Conclusion

This chapter main findings show that questionnaire participants are predominantly women farmers in households that own small plots of land. They mainly grow bananas, maize, beans, and sweet potatoes. Bakiga grow and sell more maize and beans while Batoro grow more sweet potatoes. There is no difference in dietary preferences between the two ethnic groups inter terms of the major crops of maize, bananas, and sweet potatoes. The gender division of labor varies based on household composition. In households with high dependency ratios, women do more of the agricultural tasks than households with lower dependency ratios. Also, FHH grow more sweet potatoes than JHH.

Cash crops are crops that farmers grow predominantly for sale rather than home consumption. Maize is the main food crop grown for income and the non-food cash crops that people grow are tea, coffee, eucalyptus, and tobacco. Few people grow coffee for sale. Bakiga have recently started growing tobacco to sell but many of those who have tried tobacco do not plan to continue. Smallholder tea is present on the west side of the park, but few people have tea plants because they require too much land and capital. More Batoro than Bakiga grow eucalyptus trees as a source of income.

Most households have at least one animal. Both Bakiga and Batoro have about the same number of cows and chickens, but Batoro keep more goats while Bakiga keep more pigs. Most people earn more money from selling crops than from selling animals.

The main agricultural problems are crop failure (related to soil fertility, as well as to pests and disease) and park animal crop raiding. People deal with soil fertility problems by fallowing land and burying organic material. Bakiga have shorter fallowing cycles than Batoro. More Batoro than Bakiga bury organic material to increase soil fertility. However, many people in both ethnic groups do nothing to increase soil fertility. Crop yields have universally declined. As with soil fertility, many people do nothing to minimize damage from pests and disease. Those who take action either uproot affected plants or stop growing the affected crop. People living closer to the park do not complain more about crop raiding than those who live farther away. People prevent raiding mostly by guarding fields.

Finally, few Bakiga think that their farming practices differ from Batoro. However, almost half of Batoro think that Bakiga work harder then Batoro and use different farming techniques, including burying rather than burning grass and building larger sweet potato mounds.

Table 4-1. Most important crops (in percent).

	Main crop (N=102)	Crop planted on most land (N=102)	Crop important family food (N=83)	Crop favorite food (N=93)
Bananas	93.1	35.3	12.0	50.5
Sweet Potatoes	84.2	20.6	57.8	31.2
Beans	81.2	13.7	34.9	31.2
Maize	71.6	40.2	12.0	9.7
Cassava	54.5		25.3	12.9
Irish Potatoes	37.6		18.1	17.2
Groundnut	35.6			
Millet	14.9			
Yams	9.9			
Sorghum	7.9			
Vegetables	6.9			

Table 4-2. Most important crops divided by ethnicity (in percent).

	Main crop		Crop planted on most land		Crop important family food		Crop favorite food	
	Bakiga (N=49)	Batoro (N=50)	Bakiga (N=49)	Batoro (N=50)	Bakiga (N=34)	Batoro (N=47)	Bakiga (N=45)	Batoro (N=46)
Bananas	85.7	98.0	18.4	54.0	52.9	72.3	44.4	58.7
Sweet Potatoes	81.6	88.0	12.2	30.0	58.8	57.4	24.4	39.1
Beans	91.8	74.0	12.2	16.0	61.8	17.0	42.2	19.6
Maize	91.8	52.0	65.3	14.0	20.6	6.4	8.9	8.7
Cassava	57.1	52.0			26.5	25.5	8.9	17.4
Irish Potatoes	36.7	38.0			26.5	12.8	28.9	6.5
Groundnut	32.7	38.0						
Millet	8.1	22.0						
Yams	0.0	29=0						
Sorghum	14.2	2.0						
Vegetables	6.1	8.0						

Table 4-3. Most important crops divided by household head (in percent).

	Main crop		Crop planted on most land		Crop important family food		Crop favorite food	
	FHH (N=23)	JHH (N=79)	FHH (N=23)	JHH (N=79)	FHH (N=17)	JHH (N=66)	FHH (N=20)	JHH (N=73)
Bananas	87.0	93.7	43.5	29.1	47.1	69.7	55.0	49.3
Sweet Potatoes	82.6	84.8	17.4	21.5	82.4	51.5	20.0	34.2
Beans	78.3	82.3	4.3	16.5	23.5	37.9	30.0	31.5
Maize	73.9	70.9	39.1	40.5	5.9	13.6	5.0	11.0
Cassava	34.8	59.5			29.4	24.2	10.0	13.7
Irish Potatoes	21.7	41.8			17.6	18.2	15.0	17.8
Groundnut	34.8	35.4						
Millet	21.7	12.7						
Yams	13.0	8.9						
Sorghum	13.0	6.3						
Vegetables	4.3	7.6						

Table 4-4. Most important crops divided by wealth (in percent).

	Main crop		Crop planted on most land		Crop important family food		Crop favorite food	
	Less Poor (N=13)	More Poor (N=81)	Less Poor (N=13)	More Poor (N=81)	Less Poor (N=10)	More Poor (N=67)	Less Poor (N=12)	More Poor (N=74)
Bananas	76.9	95.1	0.0	38.3	30.0	68.7	33.3	52.7
Sweet Potatoes	81.5	92.3	15.4	22.2	80.0	55.2	16.7	32.4
Beans	100.0	76.5	15.4	11.1	50.0	31.3	41.7	29.7
Maize	92.3	70.3	92.3	35.8	20.0	11.9	8.3	10.8
Cassava	53.8	53.1			30.0	26.7	0.0	16.2
Irish Potatoes	38.5	34.6			40.0	14.9	25.0	17.6
Groundnut	30.8	35.8						
Millet	7.7	13.6						
Yams	0.0	11.1						
Sorghum	0.0	8.6						
Vegetables	15.4	4.9						

Table 4-5. Crops bought and sold (in percent).

	Sell crop (N=70)	Crop most money (N=60)	Buy food (N=75)
Bananas	17.1	15.0	20.0
Sweet Potatoes	24.3		9.3
Beans	47.1	13.6	22.7
Maize	70.0	58.3	26.7
Cassava	11.4		28.0
Irish Potatoes	10.0		14.7
Groundnut	20.0	13.6	13.3
Millet			
Yams			
Sorghum			
Vegetables			8.0
Rice			28.0
Meat			10.7

Table 4-6. Crops bought and sold divided by ethnicity (in percent).

	Sell crop		Crop most money		Buy food	
	Bakiga (N=35)	Batoro (N=33)	Bakiga (N=34)	Batoro (N=25)	Bakiga (N=33)	Batoro (N=40)
Bananas	8.6	27.3	5.9	28.0	24.2	12.5
Sweet Potatoes	0.0	51.5			9.1	10.0
Beans	45.7	51.5			39.4	10.0
Maize	94.2	42.4	82.3	24.0	6.1	42.5
Cassava	2.9	21.2			9.1	42.5
Irish Potatoes	2.9	18.2			30.3	2.5
Groundnut	22.9	18.2			24.4	5.0
Millet						
Yams						
Sorghum						
Vegetables					9.1	5.0
Rice					33.3	25.0
Meat					9.1	10.0

Table 4-7. Crops bought and sold divided by gender of household head (in percent).

	Sell crop		Crop most money		Buy food	
	FHH (N=13)	JHH (N=57)	FHH (N=13)	JHH (N=47)	FHH (N=14)	JHH (N=61)
Bananas	15.4	17.5	7.7	17.0	42.9	14.8
Sweet Potatoes	15.4	26.3			14.3	8.2
Beans	46.2	47.4	7.7	15.2	28.6	21.3
Maize	7.7	68.4	6.9	55.3	28.6	26.2
Cassava	7.7	12.3			28.6	27.9
Irish Potatoes	0.0	17.5			14.3	14.8
Groundnut	30.8		7.7	4.3	14.3	13.1
Millet						
Yams						
Sorghum						
Vegetables					7.1	8.2
Rice					7.1	32.8
Meat					0.0	13.1

Table 4-8. Crops bought and sold divided by wealth of household (in percent).

	Sell crop		Crop most money		Buy food	
	Less Poor (N=12)	More Poor (N=52)	Less Poor (N=11)	More Poor (N=44)	Less Poor (N=9)	More Poor (N=60)
Bananas	8.3	15.4	0.0	15.9	22.2	21.7
Sweet Potatoes	8.3	23.1	0.0	13.6	0.0	11.7
Beans	41.7	46.2	90.9	54.5	33.3	21.7
Maize	100.0	65.4		9.1	0.0	30.0
Cassava	16.7	7.7		4.5	0.0	35.0
Irish Potatoes	0.0	11.5			0.0	16.7
Groundnut	25.0	21.2			11.1	13.3
Millet						
Yams						
Sorghum						
Vegetables					11.1	5.0
Rice					44.4	21.7
Meat					11.1	6.7

Table 4-9. Animals that cause raiding (in percent).

	Frequency Cited as Problem (N=64)
Monkeys	60.9
Baboons	28.1
Elephants	37.5
Pigs	10.9
Birds	4.7
Rodents	14.1

While baboons are a type of monkey, farmers seemed to consistently classify them differently, thus they appear as two different categories in this table.

Table 4-10. Techniques for mitigating agricultural problems (in percent).

	Soil fertility and crop production				Crop Raiding			Pests and disease		
	Fallow land	Bury grass	Rotate crops	Nothing	Guard fields	Enforce boundary (fence, fire)	Nothing	Uproot crop	Stop growing crop	Nothing
Bakiga	54.0	21.0	0.0	60.0	70.0	14.8	22.0	9.4	6.3	84.0
Batoro	67.0	40.0	10.0	38.0	48.0	0.0	42.0	25.0	5.6	54.0
Everyone	60.0	31.0	5.0	47.0	55.0	7.4	32.0	18.0	6.0	68.0

Table 4-11. Gender division of agricultural tasks (in percent).

	Prepare (N=97)	Till (N=31)	Plant (N=99)	Weed (N=99)	Harvest (N=71)
Male	68.0	2.0	4.0	6.1	5.9
Female	5.2	18.5	64.6	56.6	62.0
Male & female	1.0	12.9	24.2	33.3	25.4
Outside	25.8	16.1	6.1	3.0	2.8
Children	0.0	3.2	1.0	1.0	1.4

Table 4-12. Gender division of agricultural tasks divided by gender of household head (in percent).

	Prepare		Till		Plant		Weed		Harvest	
	FHH (N=20)	JHH (N=)77	FHH (N=11)	JHH (N=20)	FHH (N=21)	JHH (N=78)	FHH (N=21)	JHH (N=78)	FHH (N=16)	JHH (N=55)
Male	40.0	75.3	0.0	10.0	0.0	5.1	0.0	7.7	0.0	10.9
Female	15.0	2.6	63.6	60.0	76.2	61.5	81.0	50.0	81.3	56.4
Male & female	0.0	1.3	9.1	15.0	9.5	28.2	9.5	39.7	12.5	29.1
Outside	45.0	20.8	18.2	15.0	9.5	5.1	4.8	2.6	0.0	3.6
Children			9.1	0.0	4.8	0.0	4.8	0.0	6.3	0.0

Table 4-13. Gender division of agricultural tasks divided by ethnicity (in percent).

	Prepare		Till		Plant		Weed		Harvest	
	Bakiga (N=46)	Batoro (N=48)	Bakiga (N=9)	Batoro (N=21)	Bakiga (N=47)	Batoro (N=49)	Bakiga (N=47)	Batoro (N=49)	Bakiga (N=22)	Batoro (N=47)
Male	65.2	70.8	0.0	9.5	0.0	8.2	0.0	12.2	0.0	12.8
Female	8.7	2.1	100.0	47.6	63.8	65.3	66.0	49.0	72.7	57.4
Male & female	0.0	2.1	0.0	14.3	34.0	14.3	34.0	30.6	27.2	23.4
Outside	26.1	25.0	0.0	23.8	2.1	10.2	0.0	6.1	0.0	4.3
Children	0.0	0.0	0.0	4.8	0.0	4.1	0.0	2.0	0.0	2.1

Table 4-14. Gender division of agricultural tasks divided by dependency ratio (in percent).

	Prepare		Till		Plant		Weed		Harvest	
	Low (N=26)	High (N=69)	Low (N=8)	High (N=23)	Low (N=27)	High (N=70)	Low (N=27)	High (N=70)	Low (N=19)	High (N=52)
Male	76.9	63.8	25.0	0.0	11.1	1.4	14.8	2.9	15.8	5.8
Female	7.7	4.3	12.5	78.3	37.0	75.7	29.6	67.1	42.1	69.2
Male & female	0.0	1.4	37.5	4.3	40.7	17.1	51.9	25.7	36.8	21.2
Outside	15.4	30.4	25.0	13.0	11.1	4.3	3.7	2.9	5.3	1.9
Children			0.0	4.3	0.0	1.4	0.0	1.4	0.0	1.9

Table 4-15. Gender division of agricultural tasks divided by wealth of household (in percent).

	Prepare		Till		Plant		Weed		Harvest	
	Less Poor (N=12)	More Poor (N=77)	Less Poor (N=3)	More Poor (N=26)	Less Poor (N=13)	More Poor (N=78)	Less Poor (N=13)	More Poor (N=78)	Less Poor (N=6)	More Poor (N=57)
Male	83.3	68.8	0.0	7.7	7.7	2.6	7.7	5.1	16.7	7.0
Female	0.0	6.5	66.7	61.5	46.2	66.7	46.2	59.0	66.7	59.6
Male & female	0.0	1.2	33.3	11.5	46.2	23.1	46.2	33.3	16.7	29.8
Outside	16.7	23.4	0.0	15.4	0.0	6.4	0.0	1.3	0.0	1.8
Children			0.0	3.8	0.0	1.3	0.0	1.3	0.0	1.8

CHAPTER 5
DISCUSSION AND CONCLUSIONS

Introduction

This chapter discusses the most important findings and how they contribute to an understanding of farming around Kibale National Park (KNP). It begins by returning to the main research questions from the study design. Using the questionnaire results, this chapter discusses each of the four main questions: (1) cultural variation, (2) the impact of KNP, (3) the impact of gender, and (4) change over the last ten years. Then it ties many of these findings together using Boserup's (1965) ideas of intensification. Finally, this chapter proposes ideas for future study.

Original Research Questions and Study Findings

The original research questions as stated in Chapter 1 are:

(1) Are there cultural variations in land management and agricultural practices or in responses to the risks and opportunities represented by the park? Do Bakiga have more intensive farming practices than Batoro? Do Batoro and Bakiga think that their farming practices are different, and if so, in what ways do they say that their practices differ?

(2) How does the presence of KNP affect agricultural practices, income, and access to resources? In particular, how has the park affected agriculture through its impacts on institutions, infrastructure, and opportunities in the area as well as with respect to risks and restrictions that the park may generate?

(3) Are there gender-based variations in agricultural practices and in the impacts of and responses to the risks and opportunities of the park?

(4) What have been the main changes in agriculture in the last ten years, particularly with respect to the adoption of new crops, and new agricultural and land management practices? How have these varied by area and what impacts have these changes had? To what extent has the presence of the park, or proximity to the park impacted these changes?

Cultural Variation and Agricultural Practice

The research has largely confirmed that ethnicity is an important factor in people's agricultural practices. Bakiga and Batoro grow different crops for consumption and sale. Findings show that few people consider maize to be a main family food or their favorite food, but that many Bakiga grow maize as their main income-earning food crop. Data from the latest census calculate the amount of maize grown per district and show that people in the Kamwenge District (the district that most Bakiga around KNP live in) grow more total maize than people living in Kabale District (the district that Bakiga come from) (UBOS 2002). Together, these findings indicate that maize is not a dietary preference, but rather a crop that Bakiga grow predominantly for sale. These findings indicate, although no Bakiga respondents explicitly stated, that growing maize as the main income crop is not a strategy that Bakiga brought with them from Kabale; rather they started growing more maize after moving to the area around KNP.

Growing beans, however, is a Bakiga dietary preference and beans and peas are extensively grown in Bakiga "homeland" of Kabale and Kisoro (Carswell 2003; Farley 1996). The most recent agricultural census data show higher concentrations of bean plots in the Kigezi area than in the Kibale area (UBOS 2002). Around KNP, more Bakiga than Batoro grow beans, list them as an important family food, and say that beans are their favorite food. This shows that Bakiga farmers brought a preference for beans with

them when they migrated. A few Batoro farmers commented that Bakiga grow a different variety of bean than Batoro farmers. Bakiga usually plant climbing beans that grow up the stalk of another plant for support and can be planted with maize or banana trees for this purpose. Batoro plant non-climbing bean varieties that do not climb and that can be planted alone in the field.

Bakiga and Batoro also use different techniques to increase crop production and to deal with agricultural problems. Bakiga more commonly guard fields to protect them from crop raiding while Batoro more frequently do nothing about this problem. It is important to note that tea plantations occupy a portion of the border with the west side of the park, providing a boundary between the farm and the park. Without tea plantations on the east side of the park, Bakiga farmers commonly farm (maize) contiguous to the park boundary.

More Batoro (40%) than Bakiga (21%) listed burying grass as a technique that they use to increase soil fertility. When discussing cultural differences in farming practices, 80% of Batoro, who think that there is a difference between Bakiga and Batoro farming techniques, say that Bakiga bury grass while Batoro burn fields. Burying grass puts organic material back into the soil. This is accomplished by using a hoe to mix the dead grass into the soil and then leaving the material to decompose. Burning the organic material left on the field is a method of destroying the seed base for weeds and therefore preventing them from growing back. It is less labor intensive because it does not require this extra turning of the soil. About two-thirds of Batoro who have adopted Bakiga techniques now bury rather than burn grass. Similarly, several Bakiga explained that Bakiga in Kabale traditionally bury grass but that some Bakiga living

around KNP have changed their practices and now burn grass. When discussing this difference, all of Bakiga talked in general terms and did not indicate that they had changed and now burned grass.

In general, there seems to be little cultural learning occurring between the groups; few people indicate that they have adopted farming practices from another ethnic group. During ten weeks of research, no instances of ethnic tensions arose, thus it appears that Bakiga and Batoro coexist peacefully in close geographic proximity. One reason for the lack of cultural learning may be that people rarely interact with members of other ethnic groups. Many respondents indicated that they have never encountered people of another ethnic group, and thus have no idea if they have different farming practices. Even respondents who answered questions about ethnic differences in farming practices often seemed to be guessing when responding to the question rather then basing their answer on lived experience.

One specific question within the theme of cultural variation is if Bakiga have more intensive farming practices than Batoro. There are several agricultural strategies that are generally understood as comprising more intensive agricultural land use. They include increased planting frequency and reduced (or eliminated) fallow periods, increased labor inputs, increased nutrient inputs to maintain soil fertility, and denser planting of crop fields. Both Bakiga and Batoro have relatively short fallow periods and only one farmer mentioned using chemical inputs, which he purchases in Fort Portal.

Fallowing practices are one indication of land use intensity; shorter or no fallow is indicative of more intensive farming practices. The calculation of the percent of time that land is cultivated out of the total growing cycle, Ruthenberg's (1980) *R*-value, shows a

slight but not statistically significant difference between Batoro (mean *R*-value 68) and Bakiga (mean *R*-value 76) land management. However, this intensification measure does not take into account all aspects of intensive land use such as planting density, nutrient inputs, or labor inputs. Furthermore, since bananas are a permanent crop, land that has bananas planted on it is not generally on a fallow cycle. Since more Batoro (98%) than Bakiga (86%) grow bananas, the number of Batoro who say that they do not fallow partly reflects the presence of banana plantations, which artificially raises the *R*-value for Batoro farmers.

Additionally, Bakiga have a set of practices that indicate that they are more intensive farmers than Batoro: working harder and longer hours, having men and women work together on agricultural tasks, and planting crops more densely. Working harder and longer hours is evidenced in several Bakiga practices. Farley's (1996) study of Bakiga living in the Kabale and Kisoro Districts found that traditionally, women did the majority of agricultural work and men made small contributions, compared to women; assisting with land preparation and harvesting. The present study similarly shows that land preparation is the only agricultural task that Bakiga men do alone. However, in about a third of Bakiga families living around KNP, both Bakiga men and women plant, weed, and harvest; this is more common than in Batoro families. Additionally, Bakiga men and women more commonly share responsibility for crops while in Batoro families one individual holds all responsibility. Batoro hire labor for agricultural tasks more often than Bakiga farmers. This could be another method of increasing labor inputs on a field. However, Batoro frequently commented that they hire labor to replace, and not supplement, their labor. If hired labor is a replacement for household labor, there is no

net increase in the total labor input. This differs from Bakiga practice where two adult household members, rather than one, contribute to the same agricultural task. Finally, Batoro commented that a normal Bakiga work day is several hours longer than a Batoro work day. When compared to Farley's (1996) description of the division of labor among Bakiga farmers in Kabale, this suggests Bakiga living in Kamwenge are investing more labor—both male as well as female—than Bakiga farmers in Kabale.

In addition to the number of hours worked, it is also possible to consider the amount of work completed per labor hour. Batoro farmers describe Bakiga as hard-working people who are always "digging" (i.e., working in the fields). Bakiga do not consider Batoro to be hard workers. Rich Batoro families who hire permanent labor prefer Bakiga to Batoro laborers because they work harder. Batoro also note that the normal agricultural work day for a Bakiga is longer than their work day. Bakiga in Kabale are also known as hard workers; Turyahikayo-Rugyema (1974) and Carswell (2003; 2007) describe Bakiga as especially industrious, working long hours in their fields.

This scenario resembles Stone et al.'s (1990; 1995) description of Kofyar's labor inputs and their ability to intensify their agriculture. They argue that several aspects of Kofyar's labor inputs differ from other neighboring ethnic groups. First, Stone et al. (1990) studied the number of hours worked, and found that Kofyar have a higher labor input than other African farmers. Second, unlike neighboring Muslim communities that have more rigid divisions between male and female space, Kofyar men and women work together farming the same field (Stone et al. 1995; Stone and Stone 2000). Two people, rather than one, working on the same field allowed Kofyar to increase their labor inputs and develop more intensive agricultural practices. Third, Stone et al. (1995) posit

that Kofyar brought their work ethic and knowledge of intensive farming practices with them to the new territory where this intensification occurred.

Accounts of Bakiga in Kabale indicate that they have a high work ethic and knowledge of intensification that they could have brought with them to the area around KNP. Collecting data on the number of hours put into agricultural tasks was out of the scope of the present study, thus it is impossible to compare quantitatively Batoro and Bakiga labor inputs as Stone et al. (1990; 1995) could do in their work with Kofyar farmers. However, the differences in the gender division of labor between Batoro and Bakiga, as well as their comments about the other group's agricultural practices, suggest a consensus view in the area that Bakiga have higher labor inputs than Batoro.

Bakiga practices also resemble several other agricultural groups that were described in Chapter 1 as "colonizing intensifiers." People categorized in this group all moved from a homeland area to a new territory. Once in the new territory, they used their previous knowledge and farming practices, but adopted them in relation to their new landscape and neighbors. In each of these cases, the people living in the new territory were eventually farming in a more intensive manner than the people in the homeland. Bakiga farmers may fit into this category; their move from Kabale District (a densely populated area) to Kamwenge District (a less densely populated area when they started migrating) can be seen as a pioneer transition to more available land. However, as population density has increased in the area around KNP, Bakiga farmers have once again adopted intensive practices. Their practices may be more intensive than Bakiga farmers in the homeland if they input more labor in their fields by using both

male and female labor for the same tasks than Bakiga living in Kabale only use male or female labor to complete.

Together these findings indicate that ethnicity is an important determining factor in agricultural practices. Batoro and Bakiga live in close proximity to each other and farm in similar geographic conditions, yet they have different practices regarding the main crops that they grow for consumption and sale, the techniques that they employ to deal with agricultural problems, and the way that they divide household labor for agricultural tasks. In addition to differing from each other, each of these ethnic groups' farming practices may also differ from the practices of people still living in the homeland.

The Impact of Kibale National Park

Based on the responses to this questionnaire, the park has relatively little impact on people's agricultural practices. The farming techniques that people use and the crops that they grow do not differ based on how far they live from the park. People who live less than one kilometer from the park boundary say that they have problems with animal raiding more frequently than those who live farther away. However, when asked to describe their main agricultural problems, people living closer to the park do not list crop raiding more frequently than those who live farther away. Their main agricultural concern, crop failure, is mainly the result of problems with soil fertility, pests, and diseases, which are not linked to the park's presence. Additionally, people living closer to the park do not grow different crops than people who live farther away.

Ascertaining the park's impact on people's access to resources using only the questionnaire is more difficult. Few people admitted that they currently take resources from the park. This may reflect that resource extraction is usually illegal (although in some cases permits can be obtained for wood, medicinal, or other extraction), and that

as a result, people do not volunteer information about their participation in illegal activities. However, if resource extraction were a contentious issue, it would most likely have come up in conversation. When answering questions about finding fuelwood, people did not complain that they could not take wood from the park. Only two elderly people mentioned that they used to get firewood from the park and can no longer do so because of policy changes. Not mentioning the park as a fuelwood resource is another factor that indicates that the park does not have a major impact on people's access to resources.

These findings contradict a large portion of the social science literature on parks and people that argues that protected areas are negative for the people living around them. It contributes to Hartter and Goldman's (in press, n.d.) argument that most of the literature does not pertain to mid-altitude forest parks (including KNP) as it is does to savanna parks. One reason that forest parks differ from savanna parks is because they are more likely to have mainly immigrant human populations (Hartter and Goldman, in press n.d.). Unlike many savannah parks, the human history around forest parks is not one of expulsion, but rather of colonization of a new frontier (Goldman et al. 2009b). Most of the older respondents in this sample (as well as in a previous questionnaire [Goldman et al. 2009a]) indicate that when they first moved to the area near KNP – mostly between the 1940s and 1960s – land was fairly readily available, and population density was low. Older residents describe that population in the area has increased rapidly during their lifetime. Few people talk about a time when they used to be able to use resources from the park. Instead, most residents (or their families) migrated to the

area around KNP because of the land availability. They were colonizing a new frontier and converting it for agricultural production, well after the creation of the national park.

Gender Issues, Household Composition, and Household Strategies

Another set of factors that contribute to agricultural strategies is household composition, dependency ratios, and the age and gender of the household head. Smaller households or households with only elderly and children more often do nothing to deal with agricultural problems. Younger household heads grow Irish potatoes as a main crop more frequently than older household heads. Older household heads are more likely to have moved to their current property from a different district while younger household heads more commonly come from the same district. Older household heads more commonly grew coffee at some point, but there is no difference today between older and younger household heads; few people, regardless of age, currently grow coffee.

Among Batoro, the age of the household head impacts who in the family tills the fields. Younger household heads say that either men or women till; mid-age to older respondents say that both men and women plow; and people over 61 say that they hire outside labor to till. Additionally, elderly Batoro more commonly do nothing to increase crop production than younger Batoro. This indicates that labor availability contributes to farming decisions.

There are several differences in the way that jointly-headed households (JHH) and female-headed households (FHH) responded to the questionnaire. About two-thirds of the heads of FHH are widowed, thus the differences between types of household head may also reflect that the women in FHH are elderly. Anthropological literature has shown that FHH are often disadvantaged because they are missing male labor and lack

access to resources that only males can acquire (Doss and Morris 2001; Greico 1997; Guyer 1988; Sachs 1996). However, in this sample, JHH are not more wealthy than FHH and FHH do not have higher dependency ratios.

Both FHH and JHH predominantly grow the same crops for consumption and sale. Differences exist in growing cassava as a main crop (more common among JHH than FHH) and growing sweet potatoes as an important crop for family food (more common among FHH than JHH). It is not surprising that FHH depend more on sweet potatoes because sweet potatoes have labor requirements that are less time sensitive than other crops (such as maize), they need little processing, they can be left in the ground for a longer period of time until the family is ready to eat them, and they are not a cash crop. However, these characteristics are also true of cassava, thus it is unclear why more JHH than FHH grow cassava.

Most female household heads did not indicate that they have reduced access to resources when compared to male household heads. Some elderly widowed women complain that they have no money and no opportunities to make money. However, older women often care for grandchildren as a way of helping their adult children as well as providing older widows with access to cash and labor. Grandmothers provide housing, food, and general care, grandchildren provide some labor, and the adult child provides monetary support for their off-spring's care. In this way, elderly women are provided with access to important resources that might otherwise be difficult to obtain.

There are some differences between the farming strategies that FHH and JHH use. In general, FHH use farming techniques that are less labor intensive. More commonly than JHH, they do nothing to increase crop productivity and stop growing

crops in order to mitigate pest and disease problems. More JHH bury grass to increase crop productivity, a task which requires an additional tilling of the soil with a hoe.

Finally, households divide labor among household members differently. It is more common in JHH than in FHH for men to prepare the land and more common in FHH for women to do the weeding alone. Both of these differences may reflect the lack of adult male labor in FHH. The dependency ratio of a household also impacts how the household divides agricultural tasks. In households with high dependency ratios it is more common for women to till, plant, and weed. Trends in the division of labor in households with low dependency ratios are less clear; different households use a greater variety of types of labor. The majority of these differences between different types of households (based on household composition and age or gender of the household head) are reflections of labor availability. Households with fewer working-age members employ farming techniques that are less labor intensive than those that have more labor available to them.

When asked about cultural differences in farming practices, women respondents had difficulty answering the question, and they could not describe differences between the two ethnic groups because they had little experience with the other group. Men, especially those with education and who were wealthier, provide more details on cultural differences; educated and poorer men provided briefer and more vague responses. Thus, the differences in comments between male and female respondents most likely reflect inequalities in education and access to wider circles of knowledge and interaction.

One final gendered dimension of this research is important to investigate. Both Batoro and Bakiga are patrilineal societies where inheritance is passed from father to son, leaving wives/mothers dependent on either her son or her family (she would have to return to her natal household) for land after her husband's death. However, none of the female household heads indicated that they were concerned about maintaining land ownership and most of them implied that they owned, managed, and were farming the same land that they had farmed when their husband was alive. Additionally, there is no difference between the amount of land that FHH and JHH own. As discussed in the previous section, the area around KNP was is a frontier area that people have only recently inhabited. It is possible that traditional practices and rules of land tenure are not applied in this new environment. This reflects the new frontier structure because in traditional patrilineal society, women had to give up the land or marry a dead husband's brother or relative to stay on the land.

Agricultural Change

Many people grow the same crops today as they did in the past. Older residents commonly explained that they eat the same foods currently that they ate when they were children. One exception is that younger people grow Irish potatoes more commonly than older people. Also, some older Batoro mentioned that maize is a relatively new crop that was not common when they were children. This is a potentially important change that further research could investigate since one of the main differences between Batoro and Bakiga farmers is their use of maize as an income-earning crop. Changes in people's purchasing habits seem mostly to be associated with changes in household composition (births and deaths) and do not reflect changes in the prevalence or preference of certain crops over others.

The main change in crops has been Bakiga adoption of tobacco within the last five years. All Bakiga who started growing tobacco did so to earn additional income. Only one farmer says that he grows tobacco to reduce raiding problems connected to his proximity to the park boundary, even though UWA officials encourage tobacco for this reason. Successful tobacco farmers say that it is possible to earn a lot of money with this crop. Additionally, many people who have tried tobacco say that they will not continue to grow it because it makes them feel sick.

Farmers generally say that agricultural problems (decreased soil fertility and crop productivity) are worse now than in the past. . They report declines in crop yields that average -66.67% to -75.00%. These trends of decreasing soil fertility are likely to continue until farmers increase their use of inputs or techniques to replenish soil nutrients. Additionally, the majority of farmers have more problems with pests and disease now than ten years ago. Another challenging aspect of farming is change in the local climate. With decreasing predictability of the beginning, consistency, and duration of the rainy seasons, farmers face more risk in their planting and other agricultural decisions and investments.

The one agricultural problem that does not follow this trend is crop raiding by park animals. Older respondents explain the raids are not as bad today as when they first settled in the area but other responses are divided between problems getting worse and getting better. Together, these general conditions make it more difficult for farmers to produce crops today.

Many farmers have not tried any new techniques to mitigate these problems. However, about half of Batoro have adopted Bakiga agricultural techniques over their

farming lifetime. Most commonly, they have stopped burning their fields and instead started burying the organic material left on the surface as a part of land preparation, and as a way of increasing soil fertility. Some people have adopted Bakiga's larger sweet potato mounds, to produce bigger sweet potatoes, as well as mulching around banana trees to increase productivity. All of these tasks require greater labor inputs.

In general, little has changed in regards to both Batoro and Bakiga farming strategies. This may, however, lead to future problems if soil fertility and crop production continue to decline while population density continues to increase. The literature criticizing protected areas for their negative affects on people frequently argues that parks create and perpetuate poverty for the people who live around them (Brockington and Igoe 2006; Cernea and Schmidt-Soltau 2006; Roe 2008; Schmidt-Soltau 2009; West et al. 2006). In the case of farmers living around KNP, the park seems to have little impact on poverty in the area. It is instead the conditions of high fertilizer rates (resulting in increasing population density) combined with increased pest and disease problems, increased climatic variation, and decreased soil fertility that contribute to poverty in this area. Additionally, the lack of options available to farmers contributes to creating and perpetuating poverty. Fertilizer use in Uganda is virtually non-existent (FAO 2009); yet fertilizers are one of the most effective ways of slowing soil fertility declines. When asked how they deal with pest and disease problems, farmers answered that they uproot the affected crops, stop growing a crop altogether, or do nothing. These responses indicate that they do not have many choices for mitigating the harmful affects of pests and disease. Additionally, no farmers mentioned involvement with either governmental or non-profit agricultural development programs. Without

adopting new techniques for managing soil fertility decline, farmers will have a hard time growing food for consumption and sale.

Only a small portion of the population grows any of the non-food crops of tea, coffee, tobacco, and eucalyptus. Smallholder coffee has generally declined in the region; tea has remained stable; eucalyptus has been increasing; and tobacco is relatively new. Of these, only eucalyptus does not require purchasing infrastructure for successful smallholder production. For people without any capital to invest (to develop businesses such as a store in a trading center or transportation—by car or motorbike), opportunities for wage employment seem to be limited to plucking tea and working as daily labor on other people's farms. Standard wages in the area (for work on tea plantations and as daily wage labor) are about half of the World Bank's (2009) 2USD per day poverty line. Not only is this considered poor on an international scale, but locally it does not provide much purchasing power; a soda at a general store in a village costs the equivalent of about .50USD and at a restaurant in Fort Portal, it costs the equivalent of about .75USD. People have few options for participating in activities to increase their family's income and when they do participate in income-earning activities, they earn little.

Future Research

This case study suggests more avenues to research that will contribute to understandings of Bakiga and Batoro farmers living around KNP, the impact of protected areas on the people living around them, and how frontier migration impacts people's farming practices. This research did not look in much depth at how people sell their crops; yet farmers may make decisions based on their sale possibilities. How does the presence (or absence) of markets impact decisions about what crops are grown? Is

there a difference between selling at larger markets compared to smaller trading centers? Are new markets emerging that are impacting what crops people grow? Over half of the questionnaire respondents say that they call a trader to come to their farm to buy agricultural products, thus the farmers do not transport agricultural goods themselves. People living on the west side of the park live closer to the major town, Fort Portal, than those living on the east side of the park (who must cross through the park on a road that is about 15 kilometers long before arriving on the west side of the park). Roads on the east side of the park, especially the road that traverses the park, are especially difficult to use during the rainy season. While not the size of Fort Portal, the village of Bigodi on the east side of the park is a large area where people congregate and crops can be sold. This is currently the location where the auction for tobacco leaves occurs. In addition to these main centers, there are many small trading centers on both the east and west side of the park. Does proximity to a trading center impact farmers' decisions of what crops to grow? Does it matter what trading center is closest to the household?

This research has noted that there may be differences between farming strategies used by Bakiga living in Kamwenge District and those living in the homeland Kabale District. Additionally, it has noted that female household heads living around KNP may have more opportunities (especially the possibility of owning their deceased husband's land) than is commonly seen in traditionally patrilineal societies. Both Bakiga and Batoro residents around KNP are migrants. How do these migrants' practices in the new territory differ from farming practices in Bakiga and Batoro homelands? To answer this question, future research would first need to investigate FHH living around KNP in more

depth. What differences exist between female heads who never married, are divorced, and are widowed? Do they have access to different resources (like land) and employ different farming strategies? Then, research should be conducted with farmers in Bakiga and Batoro homelands in order to better determine if farming practices, especially relating to the gendered division of labor, differ between the homeland and frontier land farmers.

Finally, there are several research avenues that would contribute to a better understanding of agricultural change and whether or not intensification is occurring around KNP. Since intensification is a long-term process, the best way of obtaining this information is to conduct long-term research in the area on agricultural practices. In the interim, more precise questions on land management would contribute to an understanding of agricultural change. This study asked farmers to describe their fallowing practices. Future work could visit all land held by a household and ask questions about how the household used each plot of land in each season of the last ten years. Additionally, visual observations noted that Bakiga farmers plant crops more densely than Batoro farmers. Research investigating if this is the case and measuring the plant density would increase understanding of the intensification of land use.

Conclusions

There are several important findings of this research worth reiterating. Essentially, proximity to KNP has little influence on people's farming practices. While crop raiding is a problem for people living near the park, almost everyone has other non-park related concerns that are more important for the success of their farming outputs. This finding differs from the majority of social science research on parks and people that states that protected area negatively impact people. Much of the literature

implies that the presence of the park is the most important aspect of people's lives. In the case of Batoro and Bakiga farmers living around KNP, this does not fit. Hartter and Goldman (in press, n.d.) argue that forest parks are different from savanna parks because they have different settlement histories. Goldman et al. (2009b) posit that the settlement history around KNP is the colonization of a frontier; people moved to this area to start farming after the creation of the park. This research confirms these arguments that KNP is not the main factor creating and perpetuating poverty among the people who live in the surrounding areas.

Ethnicity is an important factor in determining agricultural practices. Batoro and Bakiga grow different crops for consumption and sale, use different techniques to deal with agricultural problems, and divide household labor among agricultural tasks differently. Peoples' ethnicity is more important than their proximity to KNP in determining their farming practices. Both groups migrated to the area around KNP; Batoro migration occurred first and Bakiga migration followed and still continues today. Bakiga farmers' migration from their homeland in Kabale, colonization of new relatively "empty" land near KNP, and subsequent adoption of specific agricultural practices (growing maize and tobacco) fit a pattern of peoples that can be classified as "colonizing intensifiers." Other peoples who can be considered "colonizing intensifiers" have migrated from a homeland area and over time have developed intensive agricultural practices in order to claim and maintain new frontier land. The colonizing aspect of these groups means that they are frequently brushing up against other ethnic groups as they expand into new territories. Finally, in spite of living in close geographic proximity, there is relatively little cultural learning between Batoro and Bakiga farmers.

Household composition is another aspect that impacts farming strategies. Households with less labor (households with higher dependency ratios or with female heads) grow less labor intensive crops, like sweet potatoes, and often do not use any techniques to mitigate agricultural problems like declining soil fertility, animal raiding, or pests and disease. However, there is no difference in the wealth and land holdings of households based on the gender of their head. It is interesting that female household heads in these patrilineal societies, where land tenure is often restricted to men, seem to own and manage farmland. Perhaps migration to this new environment, that is geographically distant from natal family groups, has resulted in a loosening of societal rules about land tenure. This is an arena for future research to investigate; has migration to a new frontier land resulted in increased access to opportunities for women?

Finally, almost all farmers have experienced soil fertility decline and decreasing crop productivity over the last ten years. Bakiga have adopted tobacco within the last five years; while farmers can earn a lot of money from selling tobacco, it is unclear if they will continue growing it because they say that it makes them sick. Some Batoro have adopted Bakiga farming strategies, specifically burying grass rather than burning fields as a part of land preparation. Based on responses to this questionnaire, there has therefore been relatively little change in either Batoro or Bakiga farming strategies. However, over the last ten years, fertility rates have remained high and population density is increasing. Access to inputs like fertilizers and pesticides remains minimal, thus farmers have few options available to them for increasing soil fertility. Employment opportunities for people living around KNP are limited and wages remain low (below the

World Bank's [2009] 2USD poverty line). These conditions of increasing population density with limited land, employment possibilities, and agricultural innovation create a situation similar to what Boserup (1965) describes as the conditions in which agricultural intensification occurs through the increased input of labor. It is unclear, however, from these findings if agricultural practices are more intensive than they were previously. More apparent from these findings is that these conditions (increasing population, limited land, and minimal access to resources and employment) are more important factors in creating and perpetuating poverty in the area than the presence of the national park.

APPENDIX
RESEARCH QUESTIONNAIRE

Agricultural change among Batoro and Bakiga farmers neighboring Kibale National Park, western Uganda

Karen Kirner, University of Florida, July/August, 2009

Form for Household Interviews

Interview #:	SP:	Assistant:
Date	Time Start	Time End
GPS (N)	GPS (E)	WGS84 UTM 36N
Village / Parish	Subcounty	County

M / F	Age	Tribe
Main occupation	Spouse Age	Spouse Tribe
Spouse main occupation	Spouse other occupation?	Present at interview**:**
House Category	*(Description of house or site)*	

How many people are living in this household? (fill in by age group below)

Under 16 years old	16-40 years old	41-60 years old	Over 60 years old	**Total**

<u>History of settlement & land use</u>
I'd like to ask you some questions about the land when you first came here.

1. When did you (or your family) first settle in this place and start to farm here?

2. Where did you (or they) come from?

3. How did you / your family get land here when you first came to this place?

4. What was the land here like when you (or your family) first came here? *(What was most of the land? What other kind of land was here?)*

Forest _____ Farmland _____

Grassland _____ Wetland swamp _____

5. What were your main problems when you first started farming here?

If animals: Which animals gave you the greatest problems then? Why? What did you do about the animals then?

Land Holdings

Now I have some questions about how you use your land.

6. About how much land do you own? (acres) Do you use other land? How much?

7. How does the amount of land you have now compare to the amount you had 10 years ago?

8. Of the land you have today, what proportion do you use for each of the following (most years)?

Crops _____ Pasture _____ Resting _____

Planted trees (eucalyptus or other) _____ Natural trees/forest _____

9. Ten years ago, what proportions did you use for each of the following?

Crops _____ Pasture _____ Resting _____

Planted trees (eucalyptus or other)_____ Natural trees/forest _____

What are the reasons for the change(s)?

What do you grow, raise, buy, and sell?

Crops

I'd like to ask you some questions about the crops that you grow.

10. What are the main crops (including bananas) you grow for your family's food? (include crops grown during both seasons in the past year) (List up to 5-8)

11. Which crop(s) is/are planted on the most land?

a. *Why don't you grow more maize/bananas?*

12. Which crop is most important for your family's food?

13. Are you eating any new foods that you didn't eat 10 years ago? What foods?

14. Are there foods that you ate 10 years ago that you eat rarely or don't eat anymore?

15. Of the main food crops that you grow, which do you most like to eat?

16. Do your other family members prefer the same main food(s)? What do they like most?

17. Do you buy foods in addition to the crops you grow? What foods do you buy most often?
    a. [*If preferred food*] *Why do you not grow enough?*

18. Do you buy more foods now than you did 10 years ago? Why or why not?

19. Do you grow crops to sell for money? What crops?

20. Which crop(s) earn(s) you the greatest total amount of money in 1 year?
    a. How do you sell? Are they buying to themselves or to resell?

    b. Do you sell more or less now than you did 10 years ago? What has made it possible for you to sell more than in the past?

21. Are you growing any new crops to sell that you didn't grow or didn't sell 10 years ago?
    a. What crop(s)? Why did you start to grow these crops?

22. Are there any crops that you used to sell and no longer sell?
    a. *Why did you decide to stop growing them? When did you stop?*

23. Specific tobacco questions for east side:
    a. Do you grow tobacco? Why or why not?

    b. When did you start growing tobacco? How did you begin (company; neighbor?)

    c. How much land do you plant in tobacco? Do you plant it every season?

d. Do you use any inputs for your tobacco (fertilizers, pesticides, etc)? Do you buy these on credit, or with cash? Do you also use these inputs on your other crops?

e. Do you have any problems with growing tobacco? What will you do about them?

f. How do your earnings from tobacco compare to earnings from selling other crops?

g. Are there other advantages to growing tobacco compared to other income crops?

24. Specific tea questions for west side:

a. Did you ever grow tea? If not, why not?

b. Do you grow tea today?

c. Have there been changes in how you grow tea?

d. What are the problems and benefits of tea?

25. Specific coffee questions:

a. Did you grow coffee in the past?

b. Do you grow coffee today?

d. Who do you sell to?

c. Why has there been a change?

Trees

26. Do you have eucalyptus?

a. Where do you plant them? (*bottomland?*)

b. Do you have: (a) a few scattered trees; (b) a medium size grove; (c) a large size grove / Are you growing more (or less) trees now than you did 10 years ago? Why?

c. What do you do with those trees (sell; use for own fuelwood, poles, etc)? Who do you sell to? / For what purposes do you sell eucalyptus (school fees, others, etc)? / Where do you get fuelwood?

27. How has the cost of fuelwood in this area been changing in the last 5 years?

Livestock

Now I would like to ask you some questions about animals.

28. What animals (number and type) do you have now?

Chickens (eggs)	
Cows	
Goats	
Pigs	

29. Have the numbers or types of animals you have changed in the last 10 years?

a. Why have you changed the number / type of animals you have?

30. Do you produce milk?

a. For your family? Has that changed in the last 10 years? How?

c. To sell? To whom? How often? Has that changed in the last 10 years? How?

31. Do you buy milk?

a. From whom?

b. Buy more or less now? For more family members or to drink more milk?

32. Do you sell animals for money? When? To whom?

33. What is/are your largest problem(s) in raising animals?

Income

34. In a year, do you make more money from selling animal products or from selling crops? What income do you use to pay for school fees?

35. Do you hire people to work on your farm?

a. How much does it cost to hire a person to do farm work for a day?

b. Can you find enough people to work for this price?

Land Use

36. In general, when do you put land in fallow?

37. In general, how long do you leave land in fallow?

38. Has the way you fallow land or rotate crops changed in the last 10 years? How?

Crop Productivity

39. For your 2 main crops, about how much did you normally produce 10 years ago?

Crop: _____ Output: _____ Land: _____
Crop: _____ Output: _____ Land: _____

40. For these crops, about how much did you produce in the last season you planted them?

Crop: _____ Output: _____ Land: _____
Crop: _____ Output: _____ Land: _____

41. Why has this changed?

Agricultural Problems

Now I have some questions about the challenges of farming here.

42. What is your largest agricultural problem?

a. Has this changed in the last 10 years? What was your main problem in the past?

Soil Fertility

43. Has soil fertility increased, decreased, or stayed the same in the last 10 years?

a. If worse, is this in some or in all of your fields?

44. Have you tried to increase your soil fertility? How? Do you still do this?

Insects and diseases

45. Do you have any problems with insects or diseases with your crops?

a. Which crops [including bananas] are most affected? What pests cause the damage?

46. How do the presence of pests and disease now compare to 10 years ago?

47. What do you do to minimize damage from pests and disease?

Crop Raiding

48. Do you have any problems with crop raiding?

49. Which animals cause the greatest problems?

Baboon		Elephant		Birds		Rodents	
Monkey		Bushpig		Civet		Chimp	
Mongoose		Omwaga					

50. Are there any crops that are not raided? Which ones?

51. What have you done to avoid crop raiding?

52. Is crop raiding better, the same, or worse now than it was 10 years ago?

a. Why? What do you believe has caused crop raiding to change?

<u>Gender and Generational Labor Divisions</u>

Now I'd like to ask you some questions about how responsibilities are divided between members of your family.

53. Are you responsible for growing different crops than your wife/husband? Which crops?

54. I'm going to list several agricultural tasks. For each task, can you tell me who **in your family** (man, woman, elder, child, or some combination) normally does that task?

a. Preparing field _____

b. Planting_____

c. Weeding _____

d. Harvesting _____

55. Has this changed since you started farming?

56. Do you keep the money you earn separate from the money your spouse earns?

a. What activities do you earn money from? / What activities does your spouse earn money from?

Cultural Perceptions

Now I'd like to ask you about differences in farming techniques.

57. What are the main ways you think that farming in this area is different from farming in other places or by other groups of people?

For Bakiga:

58. Is there a difference between the way that people farm here and the way people farm in Kabale? Please describe.

a. Why do these differences exist?

59. Is there a difference between the way the Bakiga and Batoro who live here farm?

a. Why do these differences exist?

60. Have you adopted any farming practices from the Batoro?

a. Why not? Why did you adopt these practices? What practice(s)?

For Batoro:

61. Is there a difference between the way that people farm here and the way that Batoro living elsewhere farm? Why do these differences exist?

62. Is there a difference between the way the Bakiga and Batoro who live here farm?

a. Why do these differences exist?

63. Have you adopted any farming practices from the Bakiga?

a. Why not? Why did you adopt these practices? What practice(s)?

Climate and Seasons

Finally, I'd like to ask you about the seasons here.

64. Do you think the rains are different now than they were 10 years ago? How?

65. In the past, when did you plant the first crops?

66. Has this changed? When do you plant your first crops now?

67. Have the changing seasons impacted how much you grow? How?

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BIOGRAPHICAL SKETCH

Karen was born and grew up in Allentown, Pennsylvania. In 2008, she graduated Summa cum Laude from Dickinson College with a Bachelor of Arts in anthropology and environmental studies. The fall following graduation, she started graduate studies in cultural anthropology at University of Florida to pursue her interests in small-scale agriculture and human-environment interactions and earn her masters degree in cultural anthropology.