PERCEPTIONS OF FARMERS, STUDENTS, AND FACULTY REGARDING UNIVERSITY-BASED EXTENSION: A CASE STUDY FROM EARTH UNIVERSITY, COSTA RICA

By

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To my family, with love and appreciation

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This study is in response to issues of sustainable development among small-scale farmers throughout Latin America and the Caribbean and specifically of importance within Costa Rica's agricultural extension system. This study is set within the context of two broader issues: the situation of small-scale farmers in Costa Rica that corroborate the need for Extension and the imperative to improve Extension services to these farmers. Limited-resource farmers in Costa Rica are in constant need of better ways to manage their farms with minimum investment and environmental impact. While innovations exist that were designed with this in mind, small-scale farmers continue to demonstrate a low rate of adoption of these sustainable technologies. Through the direction of the Community Development Program at EARTH University, a module referred to as the "Work Experience Module," (WEM) has been designed and implemented as part of the curriculum for third year students. Through this module, student agricultural engineers

and EARTH faculty act as change agents and work with local farmers to implement innovations such as an Integrated Agricultural system (IAS). The purpose of this study was to evaluate the Work Experience Module according to: 1) the perceived roles of the participants (farmers, students and faculty) in the module and 2) farmer adoption practices of components of an Integrated Agricultural System (IAS). The design of this study is a formative evaluation in the form of a mixed-method, correlational case study. The researcher used the same instrument to serve as both a structured interview guide to collect data from farmers, and a census survey to collect data from students and faculty involved in the WEM in 2004. Focus groups were also conducted with the farmers and students during the final stages of data collection. Data analysis consisted of basic descriptive statistical tests for the quantitative data. In order to identify consistencies or inconsistencies within groups of responses paired t-tests were run. Scores were assigned for responses according to a 3 pt. Likert-scale. In order to investigate the possibility that the farmers' perceptions of the student change agent affects the farmers' decisions to utilize components of an IAS, the researcher conducted quantitative statistical tests. Qualitative findings were analyzed using content analysis to identify major and minor themes which were used to clarify and/or substantiate findings revealed via the scaled questions from the interview guide. Many positive aspects of the module have been identified by its participants including the role of the students as: a means for cultural exchange; motivational factors for farmers to learn new skills; access points to information, research and expertise at the university; and other social benefits. Some interesting opportunities for improvement were revealed and participants identified effective and ineffective aspects of the module along with their suggestions.

CHAPTER 1
INTRODUCTION AND PURPOSE OF THE STUDY

Introduction to the Study

A mixed-method cross sectional case study was conducted to obtain the perceptions of farmers, students, and faculty regarding University-based Extension being carried out through the Work Experience Module (WEM) at EARTH University, Costa Rica.

The study uncovered factors of the specific module that the researcher will address at meetings, oral briefing, conferences, and through various print media in order to improve the existing module and to recommend effective aspects of the module for incorporation into other extension programs.

Overview of Costa Rica

To help set the stage, the following section provides a brief summary of the geography, climate, environment, people, history, government, and economy of Costa Rica. The information was derived from the World Fact Book, produced by the United States' C.I.A. (2004) and Costa Rica Information (2003).

Geography

Costa Rica is considered to be part of Central America and the Caribbean. The Eastern coastline meets the Caribbean Sea while the Pacific Ocean is to the West. Both coasts lined with white and black beaches. Bordered by Nicaragua to the North and Panama as its Southern neighbor, Costa Rica is a link in the Central American Isthmus. Costa Rica is located at coordinates 10 00° N longitude and 84 00° W latitude, occupying 50,900 km^2 (19,563 square miles), an area slightly smaller than West Virginia.

The interior of the country is structured by a backbone of volcanoes and mountains extending from the Andes mountain system. The mountains are a part of the Sierra Madre chain which continues along the Western side of the Americas. This chain gives rise to four mountain ranges that run North and South in Costa Rica. The Guanacaste and the Tilaran mountains are in the North, while the South is home to the Central and Talamanca ranges. The highest point is Mt. Chirripo, at 3,797 meters above sea level. Costa Rica is part of the Pacific "Rim of Fire" containing seven of the Central American Isthmus' forty-two active volcanoes and a multitude of dormant or extinct cones. Earth tremors and small quakes occur occasionally.

Climate

The climate of Costa Rica consists of Tropical and Subtropical regions. Costa Ricans experience a dry season from December until April and a rainy season that stretches from May until November. Annual rainfall averages one-hundred inches nationwide with some mountainous regions receiving only twenty-five inches on exposed Eastern slopes. The highlands experience a relatively mild climate, and temperature is determined by elevation rather than location. There is no distinct winter or summer. The mean temperature is 72 degrees Fahrenheit in the Central Valley, 82 degrees on the Caribbean coast, and 89 degrees on the Pacific Coast.

Environment

Located at the nexus of two continents (North America and South America) and two oceans, this confluence of land and water makes this region one of Mother Nature's great bottlenecks. This diminutive nation is home to a relatively high, five percent, of the world's biodiversity; containing greater than 800 species of ferns, 1,000 species of orchids, 2,000 kinds of trees, and 200 species of mammals. Current environmental issues

include deforestation and land use change, largely a result of clearing land for cattle ranching and agriculture; soil erosion; coastal and marine pollution; fisheries protection; solid waste management; and air pollution.

People

Costa Rica has a population of 3,896,092. Three-fourths of this population live in the middle of the Meseta Central, known as the Central Valley. The capital city of San José, along with the neighboring major cities of Alajuela and Heredia are located in the valley. The formerly mentioned cities also have the names of three of the seven provinces of the country. The others are: Cartago, Guanacaste, Limon, and Puntarenas. Ninety-four percent of the population is white (including mestizo), three percent is black, one percent is American Indian, and another one percent is Chinese. The great majority of Costa Ricans are Roman Catholic, followed by Evangelical, Jehovah's Witnesses, and Protestants. Spanish is the official language, while English is spoken around Puerto Limon. Literacy rate, as defined by persons age fifteen and older that can read and write is 95.9% for males and 96.1% for females. The median age for Costa Ricans is 24.9 years for males, and 25.8 years for females. An average of 2.38 children are born per woman. Life expectancy for men is 73.87 years, and 79.11 years for women.

History

Costa Rica has been known as a haven of peace. Since the nineteenth century, only two brief periods of violence hampered its democratic development. When Central America gained independence from Spain on September 15, 1821, controversy existed over whether Costa Rica should join newly independent Mexico or a new confederation of Central American States. A bitter quarrel ensued between leaders of San José and their

counterparts in Cartaga and Heredia, until a brief civil war broke out. In 1823, San José emerged the victor, uniting Costa Rica with the new confederation.

In 1824, Juan Mora Fernandez was the country's first elected head of state. His administration led to an increase in public education and encouraged the cultivation of coffee with land grants for growers. This gave rise to the Costa Rican elite, who were known as the coffee barons. In 1870, Tom Guardia, a military dictator, seized power. It was not until the Post-Guardia years that Costa Rica began the transition back to democratic development.

The next noteworthy era commenced when elected leader, Dr. Rafael Angel Calderon and his United Social Christian political party refused to step down after losing a 1948 election. A civil war broke out, the opposition being lead by a man known as Don Pepe. Supported by the Guatemalan and Cuban governments, Don Pepe became the head of the Republic after the forty day war. Don Pepe founded the Partido de Liberación Nacional (The National Liberation Party), which makes up one of the two major political parties that exist in Costa Rica today. The other is the aforementioned United Social Christian party. Don Pepe died a national hero in 1990, his deeds and policies having set the scene for the social and economic progress that would earn Costa Rica the reputation as a peaceful and stable island of democracy in one of the world's most politically unstable and often war torn regions.

Current Government

In 1986, Oscar Arias Sanchez, a lawyer, won the presidential election running on a peace platform. In 1987, five Central American presidents signed his peace plan in Guatemala City. This even earned Arias the Nobel Peace Prize. In 2002 Abel Pacheco, of the Social Christian Unity party was elected president. Recently, he has announced Costa

Rica's support toward the United States' war on terrorism. Costa Rica has no regular indigenous military forces, only an air section and the Ministry of Public Forces. As a democratic republic, the government exists with an executive branch made up of the president, two vice presidents, and a cabinet. The legislative branch is the National Assembly, consisting of fifty-seven elected members. National elections are held every four years on the first Sunday of February. A 1969 constitutional amendment deemed that the president may only serve one four year term in a lifetime. This amendment was rectified in 2004 to allow presidents to serve for two terms.

Economy

Costa Rica remains largely an agricultural country, although its economy has expanded to include strong technology and tourism sectors due mostly to the arrival of large international hotels and a strong interest in ecotourism. For this reason, foreign exchange is increasing. Foreign investors remain attracted by the country's political stability and high education levels. Industries include: microprocessors, food processing, textile and clothing, construction materials, fertilizers, and plastic products.

Agriculture exports consist largely of: coffee, sugar cane, pineapple, bananas, citrus fruits, ferns, flowers, ornamental plants, dairy farming, and beef ranching. Recently, decreased coffee prices and an overabundance of bananas have hurt the agriculture sector.

Background and Significance of the Problem

This study is in response to issues of sustainable development among small-scale farmers throughout Latin America and the Caribbean and specifically of importance within Costa Rica's agricultural extension system. This chapter will first establish two broader issues that provide the context for this particular study. The first is the situation

of small-scale farmers in Costa Rica that corroborate the need for Extension, and the second is the imperative to improve Extension services to these farmers. Most farms in tropical areas of the world, including Costa Rica, are small-scale, subsistence farms where the farm must produce most things necessary to maintain the livelihood of the family. Due to the higher susceptibility of developing countries to the problems of low agricultural productivity and environmental degradation (Mwangi, 1998), along with the high costs and difficulty in obtaining agricultural inputs such as fertilizer and animal feed, preserving the livelihoods of these systems is a challenge (Cabezas & Botero, 2001).

Studies propose that the challenge facing Extension in the 21st century will be the focus on sustainable technologies suited to the needs of small-scale farmers. The lack of resources characteristic of small-scale farmers implies a focus on low capital investment and low risk, rather than on maximization of production (Food & Fertilizer Technology Center (FFTC), 1985). The difficulty with which small-scale farmers are able to access markets for purchasing inputs and for selling farm produce must also be strongly considered by extension workers. Sustainable agricultural technologies / practices are innovations that make more efficient use of natural resources by allowing the farmer to utilize inputs that are generated by the farm outputs (and are therefore organic in nature), thereby decreasing their dependency on purchasing external inputs that are often synthetic and detrimental to the environment.

Even when these technologies exist, resource poor farmers, who constitute the majority of farmers in Costa Rica and are thought to pose the most immediate threat to the sustainability of natural resources (Swanson, 1997), demonstrate a low rate of

adoption of sustainable technologies. This may be due to the fact that the poorer farmers have few reserves to protect themselves in the event of failure of an innovation. Little or no production surplus leaves a slight margin of error, if any. Therefore, it is suggested that risk aversion plays an important role in slowing the adoption of innovations (FFTC, 1985). Studies reveal that a farmer's assessment of the level of risk associated with the adoption of a technology/practice is a composite of many factors, of which the characteristic of the innovation itself is only one. Others include the farmer's faith in the extension worker's competence, previous experience with agricultural innovations, and the amount of information he/she has received concerning the new technology (FFTC, 1985). An increased rate of adoption of sustainable innovations among small-scale farmers may be possible by uncovering obstacles to adoption (which may include problems with the innovation itself) and identifying successful educational methods to be employed by extension agents.

Situation of Extension

The prominent form of extension to smallholder farms is agricultural assistance in the form of technology transfer intended to improve the livelihood of the farmers, their families and communities. The role of extension is not to directly generate knowledge (which is done at research centers, institutions, and agricultural colleges), but to transfer knowledge and instill learning, thereby assisting farmers to implement appropriate innovations, through education. In his book, Agricultural Extension Systems: An International Approach, Frank Brewer describes agricultural extension as the largest non-formal problem-solving educational delivery system in the world that can serve as the link between people and knowledge (Brewer, 2001). However, great variability among extension systems is found throughout the world.

In developing countries, extension organizations are often under funded and lack linkages to appropriate and applied research (Brewer, 2001). The most commonly used extension system world-wide, and the dominant form of extension in Costa Rica, the General Agricultural Extension System, is often carried out through a Ministry of Agriculture and has been criticized for lacking any type of feedback from clientele in reference to their needs and problems. Due to this lack of critical upward communication, research is rarely prioritized according to field evaluations and the needs of the clientele (Brewer, 2001). Therefore, the technologies and practices being diffused are often not relevant or applicable to the end user and are consequently not adopted. There are a number of other criticisms and concerns about this type of system that will be discussed further in Chapter Two.

For decades, U.S. Extension was based on the theory that if innovative farmers were targeted to adopt innovations, other farmers would soon follow, increasing the rate of adoption of new agricultural practices (Stephenson, 2003). Goss (1979) along with other researchers found that the Innovation-Diffusion Theory, that assumed that a "trickle-down" mechanism was always in place and functional, began to fail and even result in undesirable consequences when applied to international development, particularly in Latin America (Stephenson, 2003). Everett Rogers, the father of the theory, later criticized his own rationale, stating that it presented a bias in favor of larger, wealthier, farmers who were easier to persuade into adopting. Waugh, Hildebrand and Andrew (1989) found that rather than "trickling down" from innovative farmers to smaller-scale farmers, technologies often stopped with the farmers with more resources and higher environmental quality. Rather than attributing the adoption of an innovation

to the “innovative” or “enterprising” character of the farmer, and the non-adoption to the “passive” or “conservative” farmer, studies began to identify the major cause of rejection of an innovation to be the lack of farmer resources to implement it (FFTC, 1985). Swanson (1997) states that future extension efforts will emphasize the quality of interaction between agent and client instead of on the movement of “messages” through a top-down hierarchical system or matrix of social networks, as was the focus of Roger’s Innovation-Diffusion Theory (Rogers, 2003).

Educational Principles and Interpersonal Skills

Studies have found that the educational process that extension agents use to diffuse and implement innovations is a critical component of their services to farmers (King, 1995). The farming systems movement, which will be further discussed in the next chapter, also emphasizes the importance of the problem solving process of education rather than just the communication of research results to farmers, in rural development (Waugh et al., 1989). Similarly, Hagmann et al. (1996) identifies dialogue with farmers, farmer experimentation, and the strengthening of self-organizational capacities of rural communities as the major elements to improve development and the spreading of innovations. It has been suggested that considering personal, cultural, social and situational factors, and appropriately altering the diffusion process employed by change agents can remove barriers to adoption when appropriate and facilitate the implementation of sustainable technologies (Barao, 1992). Only when the factors that influence the farmers’ behavior are understood will extension workers be effective at diffusing innovations that respond to the needs of the farmers. Increasing farmers’ capacity for making decisions when presented with available innovations and establishing

good rapport between the farmer and the extension agent are also beneficial (Mwangi, 1997).

Statement of the Problem

Due to high costs and difficulty in obtaining agricultural inputs, such as fertilizer and animal feed, and an ever increasing population in conjunction with a diminishing source of land and other natural resources to devote to agricultural production of the world's food source, utilizing the most effective and appropriate agriculture practices has become an issue for the Costa Rican government and small scale farmers, often referred to as smallholders (Cabezas & Botero, 2001). Farming practices that minimize the impact on natural resources and decrease the cost of farm inputs are utilized in integrated agriculture systems, but in order for them to be functional, the adoption of new, sustainable technologies is required. Research shows that small scale farmers in developing countries exhibit low adoption rates of these technologies and practices. Extension workers need to understand what drives the adoption or non-adoption of sustainable technologies in order to provide feedback on the innovations to the developers and to alter their educational process with farmers in a way that will increase the appropriate implementation of them.

Entities involved in extension efforts are constantly striving for improved educational methods. The aforementioned criticisms and concerns about the General Agricultural Extension System have lead to the recent interest of the Costa Rican government in the Educational Institutional Extension System. This type of system is also referred to as University-Based Extension and Chapter 2 provides more in depth information about it. Extension work through an Educational Institutional Extension System is carried out in areas of Costa Rica by the private, international college of

agriculture, EARTH (Escuela de Agricultura de la Región Tropical Húmeda) University, as well as the University of Costa Rica. Through the direction of the Community Development Program at EARTH University, a module, "Sustainable Development with the Farm Family" has been designed and implemented as part of the curriculum for third year students.

Existing entities involved in Extension efforts, such as the Ministry of Agriculture, may be able to improve their programs by incorporating components of the module, such as educational principles that are employed by EARTH students and faculty in working with local farmers, into their organization. Through the EARTH module, which is referred to as the Work Experience Module (WEM) from this point forward, student agricultural engineers act as change agents to employ the principles of knowledge, participation, and interpersonal characteristics to accomplish the following objectives: 1) To understand the life of rural families via living with them, 2) To put technical knowledge to practice via the implementation of practices that promote the sustainability of the farm, and 3) To establish a positive and respectful dialogue with the host family and to systematically communicate observations and points of view. This module seeks to emphasize the quality of interaction between the student change agent and the farmer instead of just the movement of "messages" through a top-down hierarchical system. Before recommending that components of a model or a model itself be used on a broader scale, an evaluation of the model is necessary.

Purpose and Objectives

The purpose of this study was to evaluate the Work Experience Module according to the perceptions of the participants and the level of adoption of alternative agricultural practices/systems among participating farmers.

Objective 1: Identify factors effecting the farmers' decisions to utilize components of an Integrated Agricultural System (CIAS) by:

- Objective 1a: identifying components of an integrated agricultural system being utilized on each farm
- Objective 1b: identifying the source from which the farmer became aware and learned about the component of an integrated agricultural system
- Objective 1c: identifying the farmer's reasons for adopting, rejecting, or discontinuing the use of a component of an integrated agricultural system
- Objective 1d: determining if a relationship exists between the adoption of a component, or components of an integrated agricultural system and household characteristics such as farmer gender, and availability of resources (such as land, labor, economic, and other)

Objective 2: To determine the perceptions of both student and farmer participants in relation to their role and the role of other participants of the Work Experience Module, *WEM*, through:

- Objective 2a: determining the perceptions of the student agents and farmers with respect to their own present roles in the WEM and what they perceive their role should be
- Objective 2b: determining the perceptions of the farmers with respect to the present role of the student change agents in the WEM and what they perceive their role should be (in terms of educational processes based on the principles of: knowledge, participation, and interpersonal characteristics)
- Objective 2c: determining the perceptions of the students with respect to the present role of the farmers in the WEM and what they perceive their role should be

Objective 3: To determine the perceptions of the farmers, students, and faculty with respect to the present role of the WEM (especially in community development) and what they perceive the role should be

Objective 4: To identify consistencies or inconsistencies within and between the groups of respondents (students, farmers, and faculty) through analysis and triangulation of the data obtained by objectives 2 and 3

Objective 5: To correlate the perceptions of the WEM with the level of adoption of CIAS

Operational Definitions

Change Agent: A change agent (or extension agent, extension worker) is an intermediary between the developers of the original form of a technology and its end users. In this case, the change agents are the students and the faculty from EARTH University who were involved in the 2004 Work Experience Module. "End users" in this case refers to the farmers.

Components of an Integrated Agricultural System (CIAS): The identified components of the Integrated Agricultural Systems being implemented in the study-site are: animals, crops, forest species, nutritional blocks, compost, effective microorganisms, medicinal plants, the biodigester, and lagoons.

Extension: In this study, extension refers to a nonformal, problem-solving educational delivery system that links people to knowledge.

Farmer Rationale: In this study, this term refers to the basis upon which decisions are made regarding the use of an innovation. It includes reasons that reflect the farmer's fundamental values, whether they are economic, social, cultural, or other.

Integrated Agricultural System (IAS): Integrated farm systems that are characterized by the interaction of different components such as agriculture, forest, and animals. In this system, the outputs produced from each component serve as an input for another component of the system.

Ministry of Agriculture (MAG): Translated from the "Ministerio de Agricultura y Ganadería." It is the branch of Costa Rica's central government that carries out extension services throughout the country.

Program of Community Development (PCD): Translated from "Programa de Desarrollo Comunitario, PDC." It is an EARTH University program that involves local residents in the teaching / learning process, according to a unique educational model. The objectives of the program established by EARTH are to: 1) contribute to the improvement of the equality of life of the neighboring communities of Guacimo county; 2) strengthen the social commitment of the students of EARTH University; and 3) integrate the community experience with the academic program.

Small-scale Farmers: subsistence farmers who depend on the farm to produce most of the things necessary to maintain the livelihood of the family. In this study, small-scale farmers are also referred to as "resource-poor farmers." These farmers have just enough resources to sustain the household with none or very little production that surpasses household consumption or that is sold to provide income to purchase other necessities, such as clothing or medicine.

Sustainable Technologies / Systems / Practices: agricultural practices / systems that make more efficient use of natural resources by allowing the farmer to utilize inputs that are generated by the farm outputs (and are therefore organic in nature), thereby decreasing their dependency on purchasing external inputs that are often synthetic and detrimental to the environment.

Work Experience Module (WEM): This term was developed by the researcher for simplicity to refer to the 3rd Level Work Experience Module, "Sustainable Development with the Farm Family." The WEM works within the framework of the PCD and is a required university course for third year students. On a given Wednesday in a 28 week period (2 trimesters), half of the third-year EARTH students worked on community

projects while the other half worked directly with small -scale, resource poor farmers through the WEM.

Limitations of the Study

The following are limitations of this study:

1. The results of this study are specific to the WEM at EARTH University, but the implications can be applied to Extension in general.

2. There may be subjective bias on behalf of the researcher as to how the data were interpreted which may influence the findings. Being cognizant of this throughout the process served to minimize bias.

3. Based on the researcher's experience and advice from students and faculty with experience in working with local, small-scale farmers, it was determined that a response scale including more than 3 choices would not be effective. Therefore, the interview guide consisted of questions based on a 3 point Likert-scale with some open-ended questions. In order to maintain consistency for comparison, the student and faculty surveys were also created with 3 point Likert-scales. Had the researcher been able to use a larger scale, there may have been more variability in the data.

4. Respondents were asked to recall and evaluate past experiences and self-report which may introduce measurement error.

5. Being a census study, data analysis was limited to nonparametric statistical tests.

Summary

This chapter justified the need and provided background for the research study. The importance, timeliness and relevancy of the research were described. The chapter explained the situation of small-scale farmers in Costa Rica, illustrating the opportunity and necessity for Extension services to reach these producers. The chapter also suggested ways to tailor services more effectively to small-scale farmers by focusing on the development and implementation of appropriate sustainable agricultural practices and emphasizing low capital investment and low risk rather than production maximization.

In this chapter, the importance of the relationship between the farmer and the extension worker and the educational process in which they engage were also emphasized.

CHAPTER 2
REVIEW OF THE LITERATURE

This chapter provides an overview of the available literature pertaining to criticisms and failings of past extension efforts and some of the theories and schools of thought upon which they were operating, and includes discussion on what opportunities exist to improve the efficacy of extension. It consists of the following sections: Extension Systems in Costa Rica; University-based Extension in Costa Rica; Unbiased Extension; Extension Education; Innovation-Diffusion Theory; Farmer Rationale; Conservation Technology and a New Role for Extension. An explanation and description of an "Alternative Agricultural System" is also provided, as it is being locally promoted to farmers around EARTH University as an alternative to traditional, high-input, intensive agricultural practices.

Extension Systems in Costa Rica

As was mentioned in the previous chapter, the extension systems of most relevance to this study are the General Agricultural Extension System and the Educational Institutional Extension System. The General Agricultural Extension System is the most common in the world and is found in government organizations carrying out extension programs most often through a Ministry of Agriculture or Department of Agriculture branch of central government (Brewer, 2001). The basic assumption underlying this system is that technology and information is available that would help farmers. This is often a false assumption because linkages to appropriate and applied research are lacking (Brewer, 2001). Technology transfer is the main goal of this system. Extension workers

are employees of the government and are subject to government changes in priorities and policies. The Ministry of Agriculture focuses on increasing production of agriculture in order to increase farmer income and the overall economy of the country. It assumes that the government knows what the farmers need so there is a tendency not to ask rural residents about self needs (Brewer, 2001).

Lack of participation by farmers in program priorities and offerings is a barrier to adoption. Extension officers located in a given place may encourage farmers to adopt practices not well suited to their geographic area. The extension field staff may be more interested in meeting the expectations of their supervisors than meeting the needs of local people. Some reasons may be that they are not locally accountable and that they are working in unfavorable conditions. These conditions may be characterized by low morale, lack of mobility, virtually no equipment, extremely low salaries, little transportation and lack of other resources (Nagel, 2001). Out of necessity to support their families, extension workers may promote technologies whose adoption may not be appropriate for the farmer, but may put him or her in good standing with a supervisor.

The General Agricultural Extension System is sometimes perceived as having a contradictory nature of its goals. Public interest is to guide goal setting; however, the concept of public interest is problematic. It implies serving both rural farmers and urban populations; subsistence production *and* promoting cash crops for export; and serving the needs of specific groups, extending assistance to high potential *and* resource-poor producers. Commonly, priorities are set that favor innovative individuals within the modern sector, neglecting the poorer segments of the population (Nagel, 2001). Other motivations for working with more responsive and innovative clientele include being able

to fulfill production plans and improve job satisfaction or status, and being prejudiced against certain audiences. Extension work under the Ministry of Agriculture is not purely educational, but is engaged in the following activities that may be detrimental to the relationship between the agent and the farmer: supervising repayment, policing disease control measures, and other regulatory practices (Nagel, 2001). Perhaps the dominant criticism of this type of system, found repeatedly in the literature is its lack of organized feedback from clientele.

The Unites States Land Grant System is the most famous example of the Educational Institutional Extension System. It is university-based and develops programs using nonformal education through group needs assessment at the local level. It is usually organized through the College of Agriculture with county and multi-county offices that provide localized technical knowledge. The purpose is to link research done at the university and different county locations to people in order to help them make their own decisions. The emphasis is on three components: research, teaching, and extension. Unlike the Ministry of Agriculture that must provide its own complete staff, this system has access to highly trained specialists and researchers employed through the university. While the system was originally designed to foster communication from working farmers to academic professionals who actually conduct the research, whether or not this researcher-farmer interaction exists is debatable. Rather than focusing on practical education and technology transfer, United States universities have drifted toward fundamental research that develops scientific knowledge that does not necessarily lead to applicable technology, thus leaving universities unprepared to maximize a systems approach for development (which will be discussed further) (Waugh, Hildebrand &

Andrew, 1989). Recently, it has been suggested that the land grant system refocus on the basic extension principles upon which it was created, captured by the following quote of Seaman A. Knapp used to describe the rationale behind on-farm experimentation and demonstrations conducted by the farmers themselves: "What a man hears, he may doubt. What a man sees, he may possibly doubt. What a man does himself, he cannot doubt" (Seevers, et al., 1997).

University-Based Extension in Costa Rica

Only in the U.S. does the main extension function remain within the university. Other developing countries have integrated educational institutions into practical extension work. The distinguishing characteristic of the Educational Institutional System is the active involvement of an institution whose primary function is formal education in the nonformal out-of-classroom role of extension education (Brewer, 2001). This type of system is also referred to as University-Based Extension and its existence is emerging in Costa Rica as the MAG enters into increased collaboration with the University of Costa Rica, especially utilizing their research efforts and experiment stations (Ministerio de Agricultura y Ganadería, 2004).

Extension work through an Educational Institutional Extension System is also being carried out in the canton of Guacimo, Costa Rica by the private, international college of agriculture, EARTH (Escuela de Agricultura de la Región Tropical Húmeda) University, as well as the University of Costa Rica. Through the direction of the Community Development Program at EARTH University, a module, "Sustainable Development with the Farm Family" has been designed and implemented as part of the curriculum for third year students. Existing entities involved in Extension efforts, such as the Ministry of Agriculture, may be able to improve their programs by incorporating

components of the module, such as educational principles that are employed by EARTH students and faculty in working with local farmers, into their organization.

The Program of Community Development (PCD) at EARTH University is responsible for the development, administration, and implementation of the WEM. The following information regarding PCD and WEM was derived from documents produced by EARTH administration and faculty (EARTH University, 2004). The goal of PCD is stated as follows: "To implement an educational model that involves local residents in the teaching/learning process, improving the quality of life in their communities while helping EARTH students to develop their knowledge and skills." It is important to understand the purpose of PCD because the WEM works within this framework. The main objectives of PCD are:

1. To contribute to the improvement of the quality of life of the neighboring communities of Guacimo county through doing such things as: organizing training sessions, conducting participatory research, bringing technical assistance to the people, promoting small business ventures, strengthening community organization, and diversifying economic activities.

2. To strengthen the social commitment of the students by facilitating the incorporation of students in all levels of rural development

3. To integrate the community experience with the academic program by promoting and facilitating the effective integration of professors and students in community development

Through the EARTH module, which is referred to as the Work Experience Module (WEM) from this point forward, student agricultural engineers act as change agents to employ the principles of knowledge, participation, and interpersonal characteristics to accomplish the following objectives: 1) To understand the life of rural families via living with them, 2) To put technical knowledge to practice via the implementation of practices that promote the sustainability of the farm, and 3) To establish a positive and respectful

dialogue with the host family and to systematically communicate observations and points of view. This module seeks to emphasize the quality of interaction between the student change agent and the farmer instead of just the movement of "messages" through a top-down hierarchical system. Some of the functions of the module include the direct assessment of clients' needs, user –oriented research, quality training for those in extension work, and a strong linkage between academic education, field practice, adapting new sustainable technologies to the local environment, and commitment to rural community development.

The Need for Unbiased Extension

There is ongoing concern that extension systems are becoming privatized, especially in developing countries. This is due to the lack of revenue for public services and evidence of wasteful use of public extension resources (Evenson, 1986). In response, those working in public extension should be aware of the opportunities for improvement and address them. Recently, the private sector has become increasingly active in the development and transfer of proprietary technologies, including genetic, chemical, biological, and mechanical inputs and the commercial supply of technical information. If the private sector is driven by a profit motive and lacks the resources to look at all aspects of production and the environment, they may not address serious socio-economic and resource management problems (Swanson, 1997). Nagel (2001) feels that "It is obvious that the private sector will be active only in the case of reasonable returns and they will not be concerned with public interest issues." Public extension, therefore, has the opportunity to play a crucial role in taking these aspects into consideration. The selective participation of the private sector warrants the need for public sector responsibility in the provision of information for the public good. The collective action of public and non-

profit organizations will be essential to satisfy the needs of those in disadvantaged areas. Private extension will be accessible only to those who can pay, neglecting many resource poor farmers (Nagel, 2001). Public extension is necessary to reach these smallholders free of charge, supplying them with education and innovation options for reducing the adverse environmental effects of farming practices.

Innovation-Diffusion Theory

U.S. Extension was based on the theory that if innovative farmers were targeted to adopt innovations, other farmers would soon follow, increasing the rate of adoption of new agricultural practices (Stephenson, 2003). Everett Rogers, the father of this "Innovation-Diffusion Theory", later criticized his own rationale, stating that it presented a bias in favor of larger, wealthier farmers who were easier to persuade into adopting. Waugh, Hildebrand & Andrew (1989) agreed with this criticism, stating that rather than "trickling down" from innovative farmers to smaller-scale farmers, technologies often stopped with the farmers with more resources and higher environmental quality. Chambers (1987) provides an example to substantiate this. He describes how the success stories of hybrid rice and wheat in India and China gave the wrong impression to a generation of scientists, that agricultural scientists knew what technology would be beneficial for farmers in all conditions. The same varieties of crops failed on rainfed, resource-poor farms because the innovation was actually not just the rice or wheat, but an entirely different growing environment consisting of irrigation, pesticides, and fertilizers unattainable to the small farmers. An important lesson learned was that more productive technologies did not ensure equitable sharing of income (Waugh, Hildebrand, & Andrew, 1989).

A new type of extension called Farming Systems Research-Extension (FSRE) began to emerge that incorporated the idea that most technologies were "location specific" and that that adaptation to cultural, agricultural, and institutional conditions found in different locations must necessarily precede adoption (Waugh, Hildebrand & Andrew, 1989). Due to the lack of resources characteristic of small-scale farmers, FSRE emphasized the importance of low capital investment and low risk rather than on maximization of production (FFTC, 1985 & Waugh, Hildebrand, & Andrew, 1989). Studies suggest that risk aversion plays an important role in slowing the adoption of innovations (FFTC, 1985). Poorer farmers have few reserves to protect themselves in the event of failure of an innovation. Little or no production surplus leaves a slight margin of error, if any. Farmers assess the level of risk associated with the adoption of a technology from the following other factors: the farmer's faith in the extension worker's competence, previous experience with agricultural innovations, and the amount of information he /she has received concerning the new technology (FFTC, 1985).

Some portions of Diffusion-Innovation theory are still viable while those listed above, remain problematic. To a degree, the characteristics of the innovation, stages of the adoption process, and the effect of interaction between farmers on adoption behavior are considered to have maintained viability. Other issues that are considered theoretical flaws are listed below (Stephenson, 2003):

1. Pro-Innovation Bias- implies that an innovation should be diffused and adopted by all farmers. The acts of adopting and innovating are considered positive, while rejecting is always unfavorable. Sometimes innovations are rejected because of sound reasoning by the farmers.

2. Individual-Blame Bias- implies that individuals who do not adopt the innovation are blamed for their lack of response rather than blaming the development agency for its lack of appropriate response to farmers' needs.

3. Issues of Equality- negative impacts of the theory that had not been considered. For example: consequences in terms of unemployment, migration of rural people, equitable distribution of incomes, and the widening of socioeconomic gaps.

Swanson (2001) adds that extension agencies need to recognize and serve different types of clients defined not in terms of "adopter categories" as Rogers suggests, but by their access to markets, degree of commercialization and relative dependence on agriculture to sustain the household in order to be effective.

Criticisms of the traditional theory also began to arise when it was applied to international development. Goss (1979) observed the following undesirable consequences that resulted from applying innovation diffusion theory in developing countries (Stephenson, 2003):

- It is assumed that benefits resulting from the adoption of innovations spread and become homogeneous. But experience from Latin America showed the gap in inequalities actually widened.
- Aggregate statistics for development projects may show improvement in elements like production, but commonly the farmers most in need of help received little benefit.
- Non-adopters are affected by the diffusion of innovations process because larger farmers increase production as a result of adopting and innovation, resulting in a decrease in prices received by all farmers.

Extension Education

While agricultural extension in developing countries has historically been to foster rural development by communicating knowledge to farmers, the questions of what knowledge should be communicated, how it should be communicated, and to which farmers it should be communicated in order to achieve effective and appropriate innovation adoption remain issues. For years, efforts have been made to answer these questions through what appears to be a process of trial and error.

The development paradigms emerging from the late 1930s and post WW2 period gave rise to a conception that dominated conventional rural development for quite some time. It consisted of a top down approach, where development was viewed as something that governments did for or to people (International Institute for Sustainable Development [IISD], 2003). In accordance with this ideology, programs were developed by a centralized entity that included fixed objectives and specifications on how the program was to be implemented by the extension agents at the local, farmer level. The objective was to accomplish the most efficient transfer and dissemination of scientific and technical knowledge. "Early diffusion studies assumed that adoption of an innovation meant the exact copying or imitation of how an innovation had been used previously in a different setting" (Rogers, 2003, p. 180).

Extension has historically considered the products of agricultural science research as improvements, an assumption that Rogers refers to as "pro-innovation bias" (2003, p. 106). This assumption has lead to extension's promotion of innovations without properly considering the appropriateness to the farmers and has resulted in destructive consequences, especially for small scale farmers (Rogers, 2003). For example, in California in 1962, a mechanized tomato harvester was introduced to farmers. Thousands of small farmers were unable to afford the expensive harvesting machine. They were unable to keep pace with the increased efficiency of the producers with the tomato harvester and were consequently driven out of tomato production (Rogers, 2003).

The conventional approach to development assumed that farmers were ignorant and lacked the abilities to understand situations, analyze them, propose solutions and evaluate results. Consequently, a paternalistic and superior attitude was present among extension

personnel (Cristovao, Koehnen, & Portela, 1997). Participation of the farmers, who the programs were allegedly to serve, was not a priority, if even a consideration (Cristovao, Koehnen, & Portela, 1997). Researchers have identified this as a fault that contributed to the failures of development to improve the lives of the majority of the poor of the 'developing' world (IISD, 2003).

Eventually, in the 1970s and '80s, a more participatory approach to development that incorporated some insights from the field of social anthropology of the 1950s (IISD, 2003) emerged. Minjauw and Romney (1996, p. 26) noted:

> Dissemination has traditionally been seen by research and extension as finding effective ways of transferring technology, and passing on relevant, usable information to farmers. In complex situations, where farmers need to adjust to a changing situation-such as crop production, soil nutrient management, nutrient health and production-this approach has been shown to be inadequate because farmers are generally insufficiently involved in identifying problems, or in selecting, testing and evaluating the possible solutions.

Some underlying principles of participation include rethinking the structure of power and partnerships between development agencies, experts and farmers. An innovation should not simply be viewed as a new technology that is delivered to a target group; it is a new practice that is developed through an exchange of information and through collaboration between the stakeholders (Mayoux, 2001). With greater farmer participation, the emphasis is on a learning process where the innovation is continually adapting to new contexts and needs. The key to meeting the needs of people and even knowing in which direction to push more scientific research is through obtaining feedback and responding to it. Perhaps if those who were promoting the adoption of the hybrid varieties, in Chambers' example, had involved the farmers, both parties would have realized early on that it was not feasible.

Farming Systems Research-Extension (FSRE) emerged as a type of applied, farmer oriented, agrobiological research, supported by the socioeconomic sciences in a team effort that included extension responsibilities. Rather than embracing the paternalistic nature of previous extension efforts, this approach was centered on its flexible nature which emphasized fitting technologies to the cultural, agricultural, and institutional conditions found in different settings (Waugh, Hildebrand & Andrew, 1989). In order to understand the concept of "farming systems," an explanation is necessary. Farmers work to manage the resources on their farms in a way that transforms them into useful products either for home consumption or for sale or trade. Certain constraints direct the farmers' decisions regarding crop and livestock enterprises and the methods and timing of cultivation, harvesting, and husbandry. Over time, it has been found that farmers with similar sets of resources tend to make similar choices regarding the management of their farms. These farms can be grouped together into homogenous "farming systems," or domains for recommendation.

Farming Systems Research-Extension places an imperative on on-farm research because it brings farmers and researchers into contact and promotes dialogue between them, which consequently makes the development of technologies more efficient and appropriate (Waugh, Hildebrand & Andrew, 1989). Interestingly, the on-farm research conducted through this type of process is carried out by research teams with much of the same responsibilities that the student and faculty change agents are charged with in EARTH University's Work Experience Module. FSRE research teams are responsible for: 1) the integration of technologies into the local farming system; 2) studying alternatives at the local level; 3) evaluating technology at the local level under real farm

conditions and with the involvement of the farmer; and 4) working in collaboration with extension in the evaluation of the technologies.

FSRE does not consider the role of extension to simply communicate the results of scientific research to farmers, but emphasizes the importance of the problem solving process of education and social organization in agricultural and rural community development (Waugh, Hildebrand, & Andrew, 1989). Other studies support the finding that the educational process that the extension agents use to diffuse and implement innovations is a critical component of extension services (King, 1995). This entails how and to whom extension efforts are carried out in the process of diffusion. Barao (1992) has identified the failure of extension organizations to recognize and address the psychosocial component of technology adoption as part of the educational process as a barrier to technology adoption. The adoption process involves an interrelated series of personal, cultural, social, and situational factors (Barao, 1992). Research shows, for example, that the opportunity to witness an investment in a technology by a fellow producer with similar facilities and resources helps farmers in the decision-making and guides the changes that they ultimately adopt.

Similarly, Hagmann identifies dialogue with farmers, farmer experimentation, and the strengthening of self-organizational capacities of rural communities as the major elements to improve development and the spreading of innovations (1996). Several types of participatory techniques have been used, ranging from rapid rural appraisal, participatory rural appraisal, focus groups, and structured workshops (Chamala & Mortiss, 1990). Many of these participatory methods are utilized by FSRE interdisciplinary on-farm research teams, whose performance depends on their dialogue

and relationship with farmers and their families in order to understand the milieu of social/economic factors that influence the farmers' behavior (Waugh, Hildebrand, & Andrew, 1987). Mwangi (1997) also recognizes the importance of establishing a good rapport between the farmer and extension agent and increasing farmers' capacity for making decisions when presented with available innovations.

Farming Systems is based on themes that were neglected in previously used approaches to development that resulted in failure, in order to prevent undesirable consequences and promote a research and extension process that is more responsive to the needs of clientele through an efficient approach to development. These themes are: 1) Mutual trust and respect. This generates confidence and removes barriers to farmer involvement; 2) Involvement. The farmers identify their own problems and gain a sense ownership in the process; 3) Communication. Farmers want researchers and extension workers to know as much possible about their specific work environments, problems and challenges; and 4) High expectations. When farmers perceive that the researchers and extension workers understand their situation, they have higher expectations regarding the benefits they will receive through their collaboration with researchers and extension personnel.

Participatory methods are farmer focused. If innovation efforts have a research focus rather than a farmer focus, the end product might not ever reach a notable level of adoption because it does not fulfill a genuine need. For example, some innovations that worked well in a laboratory fail in the field. Participatory approaches ensure dialogue among all actors on the local level in order to help extension agents and researchers understand the needs and perceptions of the farmers. Only after the rationale of the

farmers is understood will successful adoption of sustainable technology take place (Vanclay, 1994).

Farmer Rationale

There has been considerable debate considering the rationale behind a person's decision to adopt a new technology. Rationale is dependent upon the values of the social system to which a person belongs. Webster has divided rationale into two types: formal and substantive (Vanclay, 1994). Formal rationality has been considered as the explicit calculation of economic factors in monetary terms and the subordination of all other goals or values in life (Mooney, 1988 cited in Vanclay, 1994). It represents what the Kwara'ae of Malatia in the Solomon Islands negatively refer to as 'ani mani capitalism', (literally, "life determined by money"). Kwara'ae villagers view the current approach their government has taken to rural development as one sided rather than holistic because it stresses economic goals over social or cultural goals (Gegeo, 1998). Substantive rationality on the other hand, is not constrained to purely formal or goal-oriented rational calculation (Mooney, 1988 cited by Vanclay, 1994). This notion of substantive rationality implies the legitimacy of value-oriented action.

The two forms of rationale are demonstrated practically in what the Kwara'ae villagers perceive as the difference between business (*bisnis*), which employs formal rationale and development (*diflopmen*), which utilizes substantive rationale. What distinguishes one project as *diflopmen* and another as *bisnis* includes the attitudes and goals of the adopter/ participant: for example, perceiving the implementation of a practice or technology as something to serve the basic needs of the community and family, with profit balanced by social goals, versus the practice as exclusively profit-oriented and the farmer who adopted it as socially superior. The latter example is incongruent with the life

represented by the philosophy of Kwara'ae people (Gegeo, 1998). The Kwara'ae people are living evidence that the rationale behind their decision-making is not strictly economical.

J.D. van der Ploeg (1990, 1993) has been classifying farmers into different groups based on the concept of farming styles. He has found that groups of farmers differ in their notions of the most appropriate ways to farm in order to fulfill a variety of objectives relating to environmental management, animal welfare, and farming techniques, not just profitability (Vanclay, 1994). Research on implementation of technologies supports the need to look beyond agricultural, biological, and economic issues towards psychosocial factors that influence change (Barao, 1992). Traditionally, agricultural extension has been based on the presupposition of calculation of farmers, or formal rationality. In fact, some farmers do not adopt some innovations, which according to formal rationality, are obviously economical, while other farmers do adopt other practices which are clearly not economical. Therefore, it may behoove extension agents to acknowledge that much farmer decision-making is not based upon formal rationality. Vanclay suggests that agricultural research and extension should place more value on farmers' concerns and opinions especially in relation to environmental management and sustainable agriculture.

Even when profitability is the main factor in deciding whether or not to adopt a technology, some foresight into economic sustainability of the innovation may cause the farmer to reject it. Through trial and error, farmers have also become aware that increased production of a certain commodity (due to perhaps an agricultural innovation) is likely to saturate local markets and lower prices even further. Higher prices may often be available at city markets, but these are usually paid to the middleman instead of the

producer, who is frequently constrained by transportation, time, and a closed network of dealers. Once again, a farmer's decision to reject a technology under these conditions is a rational response (FFTC, 1985).

Conservation Technology

Studies suggest that particular attention be paid to farmer rationale in the adoption of environmentally sound practices (Barao, 1992, Kumuk, 1995, &Vanclay, 1994). The severity of environmental problems associated with agricultural production gives an unprecedented imperative to extension (Vanclay, 1994). While extension or change agencies embody an enthusiasm for and commitment to new methods of extension, sentiment still exists that extension is not working and that farmers are reluctant to adopt the conservation technology that is being promoted (Kumuk, 1995, & Vanclay, 1994).

Many development agencies have recently implemented new programs in Costa Rica that have achieved minimal success. For example, a recent project to teach small farmers to prevent soil erosion by planting trees was intended to result in wide spread diffusion of the practice to the rest of the country. This did not occur and in fact, 80 percent of the original farmers abandoned the new practice (Sequeira, 1998). This situation, where an innovation produces seemingly favorable results but is rejected by small farmers, is common and often leaves development agencies puzzled. While technological and other innovations may be a way to achieve sustainable changes that lead to desired outcomes, often they are either rejected or abandoned by the farmers.

Rather than focusing on the adoption of a simple, single technology, the promotion of a conservation innovation may require the adoption of systems thinking and whole farm planning. Ethnographic Linear Programming (ELP) is a tool that embraces this concept and allows the selection of a combination of farm and non-farm activities that is

feasible given a set of fixed farm constraints (Hildebrand & Cabrera, 2003). This method treats the entire farm household as a livelihood *system* and maximizes a particular family goal while achieving other household goals, such as food security.

The concept of the Integrated Agricultural System (IAS) requires such systems thinking where each component takes advantage of another, using everything that is produced as an input rather than creating waste or relying on external resources. For example, integrated farms may produce organic fertilizer from crop and animal waste, have a biodigester for biogas and organic fertilizer production, and have a natural water purification system for fish production using aquatic plants that can be fed to livestock. In order for an IAS to function, appropriate technology must be implemented and utilized. The need for new sustainable farming alternatives acceptable to and appropriate for small-scale farmers is a critical issue for regional and national development in Costa Rica (Cabezas & Botero, 2001).

Resource poor farmers in Costa Rica are in constant need of renewable resources to provide alternative sources of energy with minimum investment and environmental impact (Singh, 2003). Worldwide recognition of ecological degradation and diminishing natural resources has lead to the exigent focus on conservation and calls for the continued development of sustainable technologies. The public sector of extension is encouraged to concentrate on system-based technologies that will enable resource poor farmers to increase their productivity while decreasing the environmental impacts of farming practices (Swanson, 1987). This would maintain natural resources and help reduce rural hunger, poverty, and the socio-economic costs of rapid rural-urban migration. Due to poor farm management practices, Costa Rican farmers face dilemmas concerning animal

waste, deforestation, soil infertility, high cost of farm inputs, and others. While these resource poor farmers are in need of sustainable technologies, efficiency of appropriate implementation of these technologies must be achieved through the efforts of extension agents.

Components of an Integrated Agricultural System

Congruent with their goal to help improve the quality of life of local communities, EARTH University is promoting the use of integrated farm systems, a concept that they view as a new way to achieve sustainable agriculture, which they have identified as a critical issue for the region and national development (Personal Communications with Dr. B.K. Singh on June 24, 2003). At EARTH, they refer to such systems as Integrated Agricultural Systems (IAS), and they are usually characterized (in the region near EARTH) by the interaction of different components such as agriculture, forest, and animals. Pedraza and Chara (1997) explain it succinctly (as cited in Cabezas & Botero, 2001, pp. 2) in the following quotation, "In this system, each of the components takes advantage of the other, using everything that is produced as an input. Instead of waste (resources in the wrong place because of an inefficient use or ill-applied process) these become inputs for another component of the system, forming a complete cycle of resources inside the property [farm]." The IAS addresses 3 types of sustainability: economic, environmental, and social. Economically, the farm benefits because inputs are generated from farm outputs relieving the farmer of his/her exclusive dependency on external resources. Environmental impacts are minimized because the use of organic materials diminishes the use of synthetic products. Socially, an IAS provides an alternative to farmers in order to maintain a profitable efficient farm that preserves its resources for generations to come (Cabezas & Botero, 2001).

The researcher had the opportunity to interact with Raul Botero, a scientist and recognized expert on Integrated Agricultural Systems, during her preliminary study at EARTH in 2003 and in 2004. Listed below are possible components of an IAS and a description of their potential role in the system. These components will be referred to throughout the rest of this document.

Animals - (cattle, horses, chickens, pigs). Animals are a very important component of an integrated production system. They provide a basic source of nourishment for the farmers, whether through production of meat, eggs, or milk. As part of an IAS, animal manure can be used to produce organic fertilizer and fuel for energy biogas that the farmers can cook or heat with. Birds can take advantage of forages from aquatic plants, juice of sugarcane and earthworms. Their manure can be used to make compost to fertilize crops.

Crops - (grains, vegetables, medicinal plants, fruits, pasture). Crops are important for human consumption, health remedies, and as forages for animals. Forage produced by crops can be used along with molasses, vegetable oil, fiber from crop residues, urea as a non-protein nitrogen source, salt, and lime (for adherence) to make Nutritional Blocks to feed livestock in order to increase reproduction and milk production rates.

Forest Species - Trees have a variety of uses in an IAS. They include: augmentation of the soil with organic matter, nitrogen fixation, preventing erosion, protection from rain, wind, and sun, the production of fruit and forages, wood for construction and firewood, a natural habitat for animals, aesthetic benefits, conservation of fauna and flora, and being a source for biological control of crop plagues.

Organic Fertilizer -Crop residues and animal manure are used to produce animal fertilizer.

Effective Microorganisms (EM) - EM consists of mixed cultures of beneficial and natural occurring microorganisms that help the decomposition process of organic materials, and during fermentation will produce normally unavailable organic acids, such as lactic acid, acetic acid, amino acid, malic acid and bioactive substances and vitamins. A key ingredient in this process is organic matter which is supplied by recycling crop residues, green manures and animal manure (Retrieved November 10, 2004 from http://www.wmnz.com).

Compost - Compost is produced when organic matter is broken down by bacteria and fungi. Compost contains an organic material called humus which assists the soil in holding nutrients, lessens the need for chemical fertilizers and helps prevent erosion by improving soil structure (Texas A&M University System, 1995). Improved soil structure also helps the growth of roots which hold soil in place.

Worm Compost – worms eat organic waste and transform the nutrients into a state that is more readily used by plants.

Bokashi - Dry fiber shavings are used for the bedding of corrals, stables, and pig sties. Waste materials generated while the animals are confined (food residues and manure) mix with the shavings. It is treated with EM and assists the composting process, ensuring that organic waste breaks down into nutrient rich substrate. Bokashi also reduces labor required to clean animal enclosures, and minimizes unpleasant odors, flies, and weeds (EARTH University, 2004).

Biodigester - The Biodigester is a tank that can be fed slurry of animal waste, in which a process of bio-degradation of this organic material occurs under anaerobic conditions. It initially produces two end products: methane (biogas) and organic fertilizer. When biogas is piped to an appropriate location, it can be burned and used as a source of energy for such activities as cooking or incubating piglets. The solid and liquid residues can be used as fertilizer. Residual waters increase the productivity of aquatic plants, high in protein, that are used for animal feeding (Cabezas & Botero, 2001) and be stored in a lagoon system. These plants are also used to decontaminate the waste water in the lagoons, which can then be used in fish ponds. Pollutants are transformed as waste water flows through the system creating biogas from the anaerobic fermentation process; liquid fertilizer for food crops; providing nutrients to cultivate aquatic plants which serve as animal forage and natural decontamination agents for the water that can subsequently serve as a clean habitat for fish. Throughout this process, not only are energy, nutrients and organic matter present in farm wastes being recovered, but the system also helps to resolve problems like management of human and animal excrements that pollute the ecosystem and promote plagues and diseases, and use of firewood that causes breathing problems and has negative environmental impacts (FARMESA, 1996).

The Biodigester is presently in the diffusion stage throughout Latin America and is being used to aid in the transformation of small scale farms into self-sufficient units, where the majority of the necessary inputs to maintain the system are produced by the system itself (Cabezas & Botero, 2001). The Biodigester is an age-old technology and has undergone a number of adaptations as it has been introduced and modified in Colombia, Vietnam, Africa, India, and China.

Integrated Agricultural Systems are often very visible, especially when the biodigester is utilized. Agro-ecotourism initiatives have become prevalent in Costa Rica and being able to present a functional IAS is perceived as a draw for visitors. Farmers in the area have even considered having fish ponds teeming with Tilapia to provide visitors with the option to fish. Some other examples of how components of an IAS may function as part of Agro-ecotourism efforts include the growing and processing of medicinal plants, making and selling soaps and shampoos, and providing meals for tourists, cooked with biogas technology.

An IAS can easily be depicted through a diagram (Figure 2.1) that visually represents the conversion of the outputs of one system into the inputs of another. The arrows entering each component represent an input needed for that component and the arrows departing from each component represent an output. Most components depend upon inputs that were generated from another component's output. Hence, it is an "integrated" system.

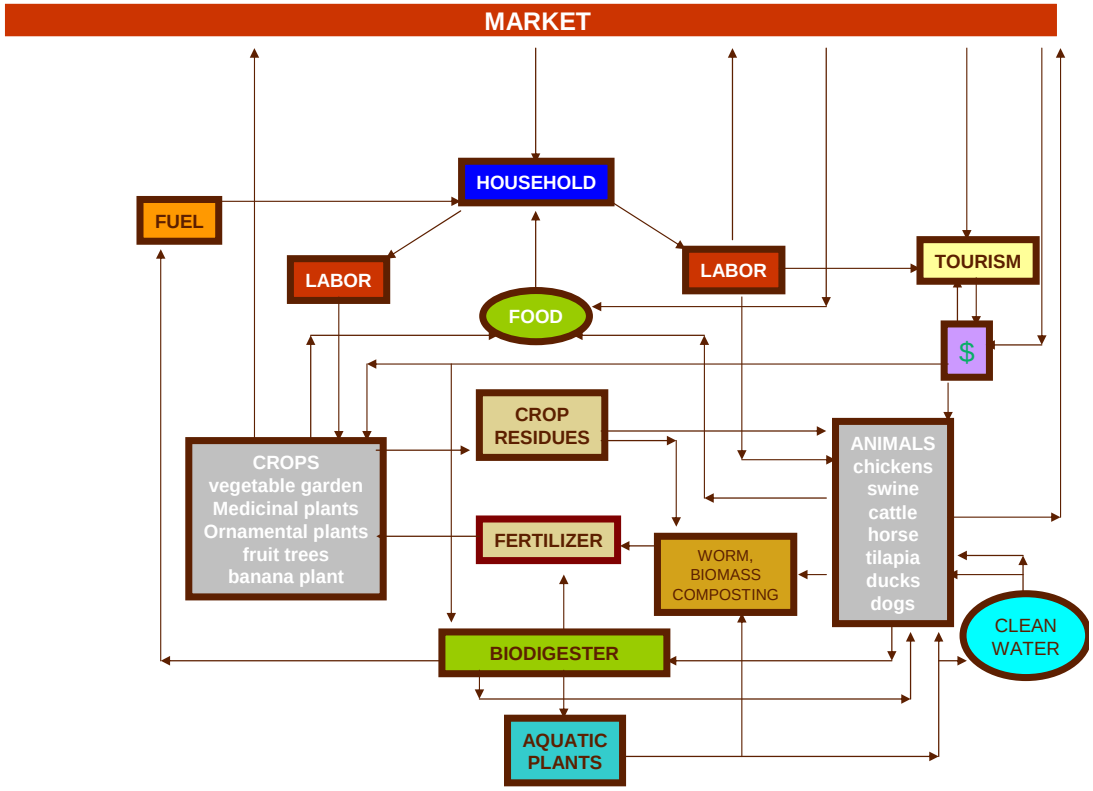


Figure 2.1. Integrated Agricultural System Model

New Role for Extension

Extension is faced with new challenges constantly. In order to remain an effective entity, it must be flexible enough to adapt and respond to those challenges. The need for agriculture and rural information in the form of advisory services is likely to intensify in the foreseeable future (Garforth, 2001). Agriculture faces the challenge of keeping pace with an increasing population and few reserves of potentially cultivable land. Extension will remain an essential tool for promoting ecologically and socially sustainable farming practices. Extension workers and farmers should be jointly involved in the verification and adaptation of new technology; thus, extension workers must respect farmers as experimenters, developers, and adapters of technology, devoting more effort on communication with them in their local area.

The future will call for more able, independent, and client-oriented extension workers who emphasize the quality of interaction between themselves and their clientele. Issues in extension used to be centered around production efficiency; now an increasingly complex matrix, called sustainability, that includes agriculture that is environmentally sound, humanly safe, bureaucratically regulated, politically controlled, and strongly influenced by world markets has been added to the agenda (Smith, 1992). At the same time, expectations of extension agents continue to rise. They are expected to practice more participatory methods, recognize and respect gender issues, identify indigenous needs and help with solutions, and serve as a link to the world outside the village.

Improved Adoption of Innovations through Improved Extension Education

Recent literature suggests ways in which the educational process employed by Extension can be altered to facilitate the appropriate implementation of sustainable technologies. They include the following: segmenting the farm population- communications should be tailored to all categories of farmers to promote awareness and information (Rogers, 1995); farms should be segmented according to type, size, resources and other characteristics, and programs should be directed specifically to these segments; encouraging participation and appropriate technology- farmers should be involved in problem identification, and development and implementation of innovations by including their local knowledge (Hagmann, 1996); focusing on the tough ones- focus should be shifted from working with wealthy innovative farmers to working with less financially advantaged farmers (Stephenson, 2003); considering consequences- extension should be aware of its impacts on clientele/farmers (Stephenson, 2003); encouraging systems thinking-the adoption of environmental agricultural innovations should be promoted in a

holistic way (Vanclay, 1994); realizing that sometimes farmers have sound rationale for opting not to adopt an innovation (Foster, 1995, Vanclay, 1994, and Barao, 1992); developing a motivated and enthusiastic attitude toward the innovation when appropriate (King, 1995); building mutual trust (Mwangi, 1998); establishing rapport with stakeholders (Mwangi, 1998); being sensitive to farmers' needs, constraints, and opportunities (Mwangi, 1998); having good technical preparation and self-confidence (Mwangi, 1998); and being a good listener (Mwangi, 1998).

Summary

This chapter provided a foundational underpinning for the research on University-based Extension. The chapter explained the present extension systems that are viable in Costa Rica and posited University-based Extension, especially through EARTH University, as a possible avenue through which to help extension programs focus on unbiased service available to all, incorporate effective and participatory educational principles, consider farmer rationale, and appropriately develop and implement sustainable agricultural practices / systems. It emphasized embracing a new role for extension in order to more effectively help farmers solve their problems.

CHAPTER 3
THE RESEARCH PROTOCOL

Introduction

This study was conducted to evaluate EARTH University's Work Experience Module (WEM) according to the perceptions of the participants and the level of adoption of components of an Integrated Agricultural System (CIAS) among participating farmers. This chapter provides an overview of the research design; an in-depth analysis of each of the areas of data collection: participants, instrumentation, data collection procedures, and data analysis used that corresponded to each method of data collection employed. This chapter explains how each group of participants functions in the WEM and why and how each data collection method was utilized for each respective group to obtain the most comprehensive data relating to the study objectives.

Research Design

The study "The Perceptions of Farmers, Students, and Faculty Regarding University-based Extension: A Case Study from EARTH University, Costa Rica" is a formative evaluation in the form of a mixed-method, correlational case study. According to Ary (2002), case studies are appropriate when the objective is to study a very large number of variables in great depth. This is the case. The researcher used the same instrument to serve as both a structured interview guide to collect data from farmers, and a census survey to collect data from students and faculty involved in the Work Experience Module (WEM), offered through EARTH University, in 2004. Focus groups

were also conducted with the farmers and students during the final stages of data collection.

Participants

The study participants consisted of students, faculty, and farmers. All third-year students and faculty at EARTH University, and farmers, who participated in the 2004 WEM were targeted in order to obtain comprehensive data about the WEM. On a given Wednesday within a 28 week period (two trimesters), half of the third-year EARTH students worked on community projects while the other half worked directly with small scale, resource poor farmers through the WEM. After about 14 weeks, the halves would trade assignments. The researcher targeted all of the students, N=94 for the study.

A total of nine faculty members were involved in the WEM and asked to complete a survey. This group included: two program chairs, one heading the program during the first phase and the other in charge during the second phase of the 2004 WEM; five faculty members, each of whom supervised one of the three communities (La Lucha, El Hogar, and La Argentina) either during the first or second phase of the module; and two support staff members who helped plan and organize the module and work directly with the program chairs.

A total of 31 farmers from the rural communities near EARTH voluntarily participated in the 2004 Work Experience Module and received student change agents on their farms either during the first or second phase of the module. The researcher interviewed a farmer from each of the households. Of the 31 farmers, 11 were from the community La Lucha, seven were from El Hogar, and 13 farmers were from La Argentina, the closest community to EARTH.

Instrumentation

The researcher developed the instrument according to the format utilized in the Student Perceptions of International Involvement Programs and Activities Survey (Irani & Place, 2004) in order to capture information related to the three specific objectives of the WEM and principles relevant and timely to extension. The questionnaire was created to be able to obtain information on the same concepts from three different audiences: the farmers, faculty, and students. The instrument was submitted to the University of Florida Institutional Review Board and was approved (Appendix G-I).

While the faculty and students were able to complete surveys, data were collected from the farmers through interviews for two reasons. The first is that many of the farmers were illiterate. The second is because the interview provided the opportunity for elaboration through collateral conversations between the researcher and farmer that helped to explain and clarify responses and capture responses that the researcher did not anticipate and incorporate in the prepared questions. Patton (2002) recommends the use of a structured interview when the researcher only has one chance to interview someone. The use of a guide also conveys efficient use of the participants' time. The researcher was the only interviewer and used consistent wording, probing, and techniques. Therefore, error due to multiple interviewers was eliminated and the validity of the study, enhanced. Relevant sections of the questionnaires were duplicated for each target group to be able to compare responses between them.

Based on the researcher's experience and advice from students and faculty with experience working with local, small-scale farmers, it was determined that a response scale including more than 3 choices would not be effective. Therefore, the interview guide consisted of questions based on a 3 point Likert-scale with some open-ended

questions. In order to maintain consistency for comparison, the student and faculty surveys were also created with 3 point Likert-scales.

The structured interview guide was reviewed by a panel of experts at the University of Florida, which consisted of faculty members and doctoral students. Slight changes in format and choice of words were made according to recommendations. Two professors at EARTH University also reviewed the instrument. Once in Costa Rica, persons (a bilingual professor at EARTH University and 3 university students) that were similar to, but not part of the study groups, were chosen to pilot test the instrument to improve the reliability and validity of the instrument and to detect any ambiguities or other problems before employing it. This was particularly important because the researcher's native language was English, and she translated the instrument to Spanish. A preliminary interview with a local farmer was also conducted using the guide. Through this process, a few questions were removed from the original questionnaire and translations were improved.

Focus Groups

Focus Groups were conducted with farmers and students during the final stages of data collection to provide the opportunity for them to elaborate on the questions from the interview/survey and to speak candidly. The focus groups were also chosen as a method of data collection because the researcher recognized them as a way to "obtain high quality data in a social context where people can consider their own views in the context of the views of others" (Patterson, 2002). Krueger & Casey (2000) found that through focus groups, interactions among participants enhance data quality because participants provide checks and balances on each other to prevent false or extreme views. Other benefits of focus groups include their low cost, and the fact that the extent to which there

is a relatively consistent view or great diversity of views can quickly be assessed. The intent of the focus groups was not to find a statistical percentage or include participants based upon their statistical respresentativeness, but to generate a list of issues, suggestions, problems, or praises to serve as the basis for more in-depth, future research (Patton, 2002).

Diverse, yet consistent qualitative methods derived from Barham and Sullivan's PRA Field Manual (2002) were employed during the focus groups. If groups were large enough (at least 6 people), the facilitators divided the large group into sub-groups for the farmers to discuss their responses to some of the questions. This was done in order to make people who had a tendency not to speak in a larger group more comfortable and more apt to voice their opinions. When a similar representation of female and male farmers was present, the facilitators also divided the group by gender to capture any differences in responses and to provide a comfortable environment for people to express their opinions without being overshadowed by anyone. When the groups were smaller, questions were posed to the entire group and one facilitator would record the responses on flip-chart paper posted on the walls.

Farmers were asked to pictorially represent their relationship with EARTH and other entities, along with how students interact on their farms and in their communities by drawing pictures and Venn diagrams (Appendix A and B). Farmers also had the opportunity to spatially evaluate what EARTH was or was not accomplishing and what it should or shouldn't be involved in by drawing dots with permanent markers where they felt it was most appropriate on a line representing a continuum. Farmers shared the markers so one color would not disclose a particular farmer's identity and all farmers

participated. After responses were given for each idea, question, or scenario, the facilitators encouraged open discussion among the group members.

The student focus groups were conducted similarly, although they were not separated by gender. In fact, when creating subgroups, the facilitators tried to have representation of each gender in each one because some activities required each subgroup to come up with a consensus ranking. Since students were able to write, they were also given time to reflect on questions individually, write them down on slips of paper, pass them in anonymously, and then the group would discuss them as the facilitator read them aloud.

Participant Data Collection

Farmers

In order to become familiar with the field, the researcher spent a couple of weeks accompanying faculty and students to the farm communities and updating community maps. When possible, EARTH faculty introduced the researcher to farmers in the community to facilitate communication, but mentioned that she was a neutral party with no affiliation to EARTH. The researcher then hired a driver in order to go to each household of the three communities that participated in the 2004 WEM to conduct interviews. The researcher started with La Lucha, then El Hogar, and finished with La Argentina. Each interview took between an hour and a half and two and a half hours. Upon returning from each day of interviewing, the researcher transferred handwritten notes and observations from each interview to field notes in a Word document.

A neutral, native-born Costa Rican faculty member with experience in participatory investigation with smallholders was identified to co-facilitate focus groups with the researcher. Through a series of meetings and planning sessions, the researcher and co-

facilitator reached a mutual initial understanding of how the focus groups would be conducted and what the objectives were. With the help of the driver, the researcher visited each potential site for the focus groups, and obtained permission to reserve the facilities. This involved presenting a detailed letter describing the activity and for whom it was held. One focus group was held at the community agriculture center and another at the community center.

At the end of each farmer interview, the researcher asked the farmers to participate in the focus group and described its purpose. Especially in La Lucha, the researcher had verbal confirmation from most of the farmers that they would attend. The researcher also sent e-mails with flyer attachments to each of the students who worked in the appropriate communities asking them to remind their farmers of the focus group, the purpose, date, and time. The researcher found that while some of the students remembered to tell the farmers, the majority did not. Therefore, two days prior to the focus group, the researcher went house by house to personally invite the farmers to the session. In El Hogar, the researcher actually brought the flyers with her and presented them to the farmer after the interview. Because most of the farmers were illiterate, the researcher made the flyers very simple and asked the younger family members who could read to do so and to remind the farmer closer to the day of the focus group. The researcher followed the same procedure for La Argentina, but also attended an EARTH workshop with the farmers where she had the opportunity to speak with some of the farmers and remind them of the focus group. For each focus group, the researcher secured refreshments for the farmers and paused for a break midway through the session in order to provide a

comfortable environment for the farmers that was conducive to their engagement in the discussions and activities.

The co-facilitator and the researcher met after each focus group session in order to collaborate, merge notes, translate, and discuss results.

Students

With permission from the appropriate professor, student surveys were distributed, completed and collected during class in a 3rd year course. Surveys were distributed with the assistance of a university student to those students who did not have that particular class, completed at their convenience and returned directly to the researcher or via an internal mailbox at EARTH University.

Two focus groups were held for the students. Since the participation of farmers in the communities of El Hogar and La Lucha was smaller than that of La Argentina, students who worked in the former two communities were combined into one focus group. The researcher sent e-mails to all of the appropriate students to advertise the focus groups and ask for participation. Flyers were posted, announcements about the focus groups were made while administering the surveys, and several students assisted in motivating other students to attend. Twelve students participated in the first focus group and 8 participated in the second.

Faculty

The researcher visited the offices of the faculty to explain the study and ask for their participation. The researcher asked the faculty to complete the questionnaire at their convenience and to place it in the researcher's internal mailbox. Introductory and follow-up e-mail messages were also sent to each of the faculty members. A professor who collaborated in the study also sent an e-mail to his colleagues, encouraging their

participation. All surveys were administered and returned to the researcher within a week.

Data Analysis

Data analysis consisted of coding data and entering it into a preset SPSS quantitative analysis program. Basic descriptive statistical analysis tests were conducted for observation of means, modes, frequencies, and standard deviation as a method of data examination.

In order to identify consistencies or inconsistencies within groups of responses between what their perceptions of what each role should be and what it actually was according to their first-hand experience as participants in the module (Objectives 2 and 3), paired t-tests were run for each *should be-actually was* pair. Scores were assigned for each answer (yes, maybe, no) according to a 3 pt. Likert-scale with the values of 2, 1, or 0, respectively. The measure that was analyzed was the mean difference between the paired scores at the .05 significance level. This level of significance was chosen because the study was exploratory rather than experimental in nature. Therefore it was more critical to reveal any potential relationships between variables and moderately risk making a Type II error than to be extremely conservative regarding making a Type I error. This level of significance is accepted and commonly used in research in the social science and education fields (Ary, 2002).

In order to investigate the possibility that the farmers' perceptions of the student change agent affects the farmers' decisions to utilize a CIAS, the researcher conducted quantitative statistical tests. First, the researcher used a data reduction technique through SPSS statistical software to test the reliability of aggregating like questions into three different constructs: knowledge, participation, and interpersonal characteristics.

Chronbach's Alpha was used to test the strength of each construct. Crosstabs analyses was used to generate contingency tables for adoption variables and each of the constructs. Then, Chi-squared values were used to determine if an association existed at $p > .05$ between the adoption variables and the questions corresponding to each construct.

Qualitative data from the interviews and focus groups were checked for quality and consistency by the researcher through discussing results and preliminary findings with faculty and students at EARTH. The qualitative data were checked an additional time for completeness and accuracy and then entered into a Word document and categorized for subsequent content analysis. Content analysis is defined by Patton (2002, pp. 453) as "any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings." Findings included major and minor themes that were used to clarify and / or substantiate findings revealed via the scaled questions from the interview guide.

Summary

This chapter provided an in-depth description of the protocol utilized for this study, which employed two primary data collection procedures: questionnaires were completed either through serving as a guide for farmer interviews or as an administered survey to students and faculty, and focus groups were conducted.

This chapter explained in detail, the steps and procedures utilized for the design and implementation of the study, and the analysis of the findings. Primary findings were via the participant questionnaire used as a survey or in the individual farmer interviews. Findings obtained via collateral conversations during individual farmer interviews and focus groups conducted with students and farmers provided richness, and breadth to the

questionnaire data. Steps taken to minimize sources of bias within data collection were also noted. The following chapter of this thesis reveals the results of the study.

CHAPTER 4
RESEARCH RESULTS

Overview of the Chapter

This chapter provides comprehensive results of the case study "The Perceptions of Farmers, Students, and Faculty Regarding University-based Extension: A Case Study from EARTH University, Costa Rica." The results are presented within the context of the five study objectives. This chapter is organized according to the results, first quantitative, then qualitative, associated with each objective. The qualitative data included in this chapter represents common themes mentioned frequently by the farmers and students that provide insight for interpreting the quantitative results.

There were two basic data collection procedures employed to achieve the objectives. The first was a quantitative questionnaire used both as a structured interview guide with the farmers and as a census survey for the students and faculty. Focus groups, among students and farmers, were utilized as the second data collection procedure. Findings obtained via both the collateral conversations during individual farmer interviews and focus groups conducted with students and farmers provided richness and breadth to the results obtained via the questionnaire.

To provide a better understanding of each group of respondents, the following demographic information was derived using basic descriptive statistics.

Students

A total of 81 students were surveyed. They had participated in the 2004 WEM, and worked in one of the three communities near EARTH (La Lucha, El Hogar, or La

Argentina) either during the first or second phase of the module. The majority of the 81 students involved in the WEM were male (66.7%). Students' countries of origins and ages are reported as well in Table 4-1.

Faculty

A total of 9 faculty members were surveyed. They were asked in which of the 3 communities they had experience working with as part of the WEM, how long they have worked at EARTH University, how long they have been involved with the WEM, and their ages (Table 4-2).

Table 4-1. Demographic Characteristics of Students in the 2004 WEM

Characteristic	No. of Students	Percent
Country of Origin		
Belize	1	1.2
Bolivia	1	1.2
Dominican Republic	1	1.2
Paraguay	1	1.2
Uganda	1	1.2
Venezuela	1	1.2
El Salvador	2	2.5
Mexico	3	3.7
Panama	3	3.7
Brazil	4	3.7
Guatemala	4	4.9
Colombia	7	8.6
Honduras	7	8.6
Nicaragua	7	8.6
Ecuador	10	12.3
Costa Rica	19	23.5
	81	100.0
Age		
19	3	4.2
20	22	30.6
21	15	20.8
22	15	20.8
23	6	8.3
24	4	5.6
25	4	5.6
26	2	2.8
27	0	0.0
28	1	1.4
	72[1]	100.0
Gender		
Female	25	33.3
Male	50	66.7
	75[2]	100.0

[1] Nine responses were missing for this item.
[2] Six responses were missing for this item.

Table 4-2. Demographic Characteristics of Faculty in the 2004 WEM

Characteristic	No. of Faculty Members	Percent
Age (years)		
26-30	1	11.1
31-35	3	33.3
36-40	3	33.3
46-50	1	11.1
51-55	1	11.1
	9	100.0
Time at EARTH (years)		
< 1	1	11.1
1-3	4	44.4
4-6	0	0.0
7-9	2	22.2
10-12	2	22.2
	9	100.0
Time involved with WEM		
< 1	3	33.3
1-3	3	33.3
4-6	0	0.0
7-9	3	33.3
	9.0	100.0
Experience in Communities		
La Lucha (L) only	2	22.2
El Hogar (H) only	0	0.0
La Argentina (A) only	1	11.1
L & H	0	0.0
L & A	0	0.0
H & A	1	11.1
L & H & A	5	55.5
	9	100.0
Gender		
Female	2	22.2
Male	7	77.7
	9	100.0

Farmers

A total of 31 farmers from the rural communities near EARTH participated in the 2004 Work Experience Module and received student change agents on their farms either during the first or second phase of the module. The researcher interviewed a farmer from each of the households. Of the 31 farmers, 11 were from the community La Lucha, 7 were from El Hogar, and 13 farmers were from La Argentina, the closest community to EARTH. The majority of farmers interviewed were male (19), 10 were female, and the researcher interviewed the husband and the wife together in two households. The responses from the couples were decided consensually between the husband and wife. Table 4-3 shows the age distribution of the farmers and the number of members each household contained. The majority (51.6%) of the farmers had between 4-7 people living on the farm more than 6 months of the year. Eight farmers had between 1-5 hectares of land; 7 farmers had between 6-10 hectares; 5 farmers had between 11-15 hectares; 4 farmers had between 16-20 hectares; 4 farmers had between 27-40 hectares; and 3 farmers had between 60-80 hectares. Half of the farmers interviewed indicated that they had another source of income apart from the farm, while the other half indicated that they did not. Most of the farmers reported having the title to their land (83.8%).

Table 4-3. Demographic Characteristics of Farmers and Households in the 2004 WEM

Characteristic	No. of Farmers	Percent
Age (years)		
26-35	5	16.1
36-45	9	29.0
46-55	8	25.8
56-65	4	12.9
66-75	4	12.9
76-85	1	3.2
	31	100.0
No. Members of Household		
1	1	3.2
2	8	25.8
3	4	12.9
4	4	12.9
5	4	12.9
6	5	16.1
7	3	9.7
9	2	6.5
	31	100.0
Gender		
Female	10	32.3
Male	19	61.3
Couple	2	6.4
	31	100.0

Objective 1. To Identify Factors Affecting the Farmers' Decisions to Utilize Components of an Integrated Agricultural System (CIAS) by:

- identifying components of an integrated agricultural system being utilized on each farm
- identifying the source from which the farmer became aware and learned about the component of an Integrated Agricultural System
- identifying the farmer's reasons for adopting, rejecting, or discontinuing the use of a component of an Integrated Agricultural Systems
- determining if a relationship exists between the adoption of components of an Integrated Agricultural System and household characteristics such as farmer gender, and availability of resources (such as land, labor, economic, and other)

Identifying Components of an Integrated Agricultural System Utilized on Each Farm

A total of 31 farmers from the rural communities near EARTH participated in the 2004 Work Experience Module and received student change agents on their farms.

Currently, the most widely used CIAS that are being promoted by EARTH University among the farmers who participated in the 2004 Work Experience Module were determined to be (number of farmers who are utilizing the practice): Forest Species (29), Medicinal Plants (24), the Biodigester (11), different types of Compost (11), Agro-ecotourism Preparations (11), and Fish Lagoons (10) (Table 4-4).

Farmer Animal Resources

During the structured interviews, the 31 farmers were asked what kinds of animals they had on their farm. A variety of animals were mentioned and the frequency and percentage distribution of farmers having each type of animal is shown in Tables 4.5-4.8. Twenty-three of all farmers interviewed (74.2%) had cattle, 25 farmers had chickens (80.6%) and the majority of the farmers had at least one horse (51.6%).

Types of Plants

All 31 farmers were asked to indicate whether or not they had each of the plant types listed in Table 4-9 on their farm. Most farmers had vegetables, fruit, medicinal plants and natural pasture (83.8%, 67.7%, 64.5%, and 51.6%, respectively). Only two farmers indicated having grain crops.

Frequency / Percentage Distribution and Reported Purposes of Forest Species

Twenty-nine of the 31 farmers reported having forest species (both natural and planted) on their farms, and 72.4% of these reported that they had planted trees (Table 4-10). The 29 farmers listed a total of 16 different types of trees and Cedro, Laurel, Chancho Blanco, Almendro, and Pilon were the most popular. Then, the 29 farmers were

asked to free-list the purposes that the trees serve on their farm (Table 4-11). The reasons for having trees that were listed most frequently were for: lumber, protection of flora and fauna, and augmenting the organic matter in the soil (24.5%, 20.2%, and 12.8%, respectively). The farmers also showed an interest in having trees for the following purposes: to decrease erosion, to provide animal habitat and for aesthetics.

Table 4-4. Farmer Reported Behavior regarding Components of an Integrated Agricultural System*

Alternative Agriculture Practice / System	Total No. of Farmers	Farmers who Implemented Practice		Farmers who Rejected Practice		Farmers who Discontinued Practice	
	N	n	%	n	%	n	%
Biodigester	31	11	35.5	19	61.3	1	3.2
Nutritional Blocks	31	4	12.9	25	80.6	2	6.4
Traditional Compost	31	11	35.5	18	58.1	2	6.4
Worm Compost	31	6	54.5	16	51.6	9	29.0
Bokashi	31	4	12.9	27	87.1	0	0.0
Fish Lagoons	31	11	35.5	18	58.1	2	6.4
Decontami-nation Lagoons	31	3	9.7	28	90.3	0	0.0
Medicinal Plants	31	24	77.4	7	22.6	0	0.0
Forest Species	31	29	93.5	2	6.4	0	0.0
Agro-ecotourism Preparations	31	11	35.5	20	62.5	0	0.0
Effective Microorganisms	31	10	32.3	19	61.3	2	6.4

* Values refer to the percentage of all responses that corresponds to each reason

Table 4-5. Frequency and Percentage Distribution of Farmers with Cattle

Number of Head of Cattle	Frequency	Percent
1-5	6	26.1
6-15	6	26.1
16-25	3	13.0
26-35	2	8.7
36-45	2	8.7
46-55	1	4.4
>55	3	13.0
	23	100

Table 4.6. Frequency and Percentage Distribution of Farmers with Chickens

Number of Chickens	Frequency	Percent
1-10	10	40.0
11-20	5	20.0
21-30	2	8.0
31-40	3	12.0
41-50	2	8.0
51-120	2	8.0
5000	1	4.0
	25	100

Table 4-7. Frequency and Percentage Distribution of Farmers with Pigs

Number of Pigs	Frequency	Percent
1-3	6	42.9
4-6	2	14.3
7-9	1	7.1
10-12	1	7.1
13-15	1	7.1
16-18	1	7.1
19-21	-	-
22-24	1	7.1
100	1	7.1
	14	100

Table 4-8. Frequency and Percentage Distribution of Farmers with Horses

Number of Horses	Frequency	Percent
1	6	37.5
2	6	37.5
3	2	12.5
4	1	6.3
>4	1	6.3
	16	100

Table 4.9. Frequency and Percentage Distribution of Farmers Growing Plants

Type of Plants	Frequency	Percent
Grains	2	6.5
Vegetables	26	83.8
Fruit	21	67.7
Natural pasture	16	51.6
Improved Pasture	11	35.5
Ornamental Plants	15	48.4
Medicinal Plants	20	64.5
	31*	

*N=31 farmers. All 31 farmers were asked whether or not they had the respective plant type on their farm.

Table 4.10. Frequency and Distribution of Farmers with Forest Species

Type*	Frequency	Percent
Natural	8	27.6
Planted	21	72.4
Total	29	100.0
Cedro	18	62.1
Laurel	17	58.6
Chancho Blanco	8	27.6
Amendro	6	20.7
Pilon	6	20.7

*Cedro, Laurel, Chanco Blanco, Almendro, and Pilon were the most frequently listed forest species; Percent refers to how the percent of the 29 farmers who have trees of the named type.

Table 4-11. Frequency and Distribution of Purposes for having Forest Species

Purpose*	Frequency	Percent
Fruit	2	2.1
Wood	23	24.5
Protection from sun, wind, rain	4	4.3
Augment organic matter in soil	12	12.8
Increase Nitrogen fixation	1	1.1
Decrease erosion	7	7.4
Protect Flora and Fauna	19	20.2
Combat natural plagues	2	2.1
For animals (habitat)	7	7.4
Aesthetics	7	7.4
Sell wood	1	1.1
Make and sell furniture	1	1.1
Substitute for paying a fine	1	1.1
Reforestation	3	3.19
Protect river and springs	2	2.1
Protect ornamental plants	1	1.1
Tourism	1	1.1
	94	100

*All farmers who had forest species were asked to free list purpose(s) the trees serve on their farms. N = the total number of purposes listed.

Lagoons

Nine of the 31 farmers reported having fish ponds, or 'fish lagoons' (29.0%). Aquatic plants and the nutrients found in waste effluent were being promoted as decontamination and waste management components of an Integrated Agriculture System (IAS) by EARTH. Farmers with fish lagoons were asked what they were using as fish food. Most of the farmers reported using fish food concentrate that they had to purchase commercially while others mentioned aquatic plants and waste (57.1%, 21.4% and 21.4%, respectively). Types of feed could be listed in combination. Only 2 of the 31 farmers had lagoons without fish. Their reported purpose of the lagoons were for waste management, to

cultivate aquatic plants, and to have a place to collect liquid fertilizer from waste effluent to use to irrigate the crops.

The Biodigester

Eleven of the farmers (N=31) reported using the biodigester (35.5%). Of these, 81.8% kept the technology under cover. When asked what they do with the effluent from the biodigester, 81.8% of the farmers answered that they apply it directly to the land as fertilizer. The remaining 18.2% of farmers reported first collecting the effluent in a lagoon (Table 4-12).

Nutritional Blocks

Only four of the 31 farmers (12.9%) reported using Nutritional Blocks. Of these, 100.0% perceived the benefits of this practice to be an increase in calving rate, and an increase in milk and meat production.

Compost

Eleven of the 31 farmers (35.5%) utilized compost on their farms. Of these, 45.5% reported using only Worm Compost, 27.3% only Bokashi, 9% Worm Compost and Bokashi, and 18% Traditional Compost.

Table 4-12 Frequency and Percentage Distribution for Biodigester purposes

Purpose*	Frequency	Percent
Gas	11	29.7
Heat	5	13.5
Mitigate Flies	5	13.5
Mitigate foul odor	5	13.5
Produce Fertilizer	10	27.0
Pasteruization	1	2.7
	37	100

*All farmers who had the biodigester were asked to free list purpose(s) the biodigester was serving on their farms. N = the total number of purposes listed.

Source of Information on Components of an Integrated Agricultural Systems

During the structured interviews, the researcher asked the farmer to free-list the sources (if any) from which they had become aware or received information on each of the eleven components of an IAS . If the farmers had no knowledge of the practice, no sources were listed. Equally, if a farmer recalled receiving information about the practice from a variety of sources, they were asked to name each as they came to mind, with no specific order. Of all the sources listed by farmers for each practice, the percentage of the responses that named each respective source is reported in Table 4-13.

EARTH University students and faculty were revealed, with a few exceptions, as the overall primary source of information about the eleven components of an IAS (Table 4-13). Sources from which information about the Biodigester was obtained were named 58 times. Of these, EARTH faculty was the source mentioned most frequently, representing 41.4% of all responses. This is the only technology for which EARTH faculty represented the majority of the sources named. Usually the EARTH faculty represents the second most frequently named source, following EARTH students as the main source. EARTH students represented a close 39.6% of the sources mentioned, followed by “neighbors” representing only 8.6%.

While EARTH students and faculty dominated the responses for Nutritional Blocks, “family” and “church” were also named, followed by Japdeva, INA, and CEDECO. Results were similar for Traditional Compost with the following sources named (in order of decreasing frequency): EARTH students and faculty, INA, MAG, church, family, and CEDECO. Data reveal that “neighbors” were the main source of information for the farmers about Fish Lagoons. They also named (in order of decreasing frequency): EARTH students, faculty, family, Japdeva, and Traditional Knowledge.

While EARTH students and faculty were the most popular source mentioned for Decontamination Lagoons, a notable 11.9% of responses named "neighbors" and 9.5% named Traditional Knowledge (Table 4-13). Traditional Knowledge was listed almost as frequently as EARTH students (20.0%, 26.7%) as a source of information about Medicinal Plants. EARTH faculty, neighbors, and publications were also named as sources. Traditional Knowledge was named as a source of information regarding Forest Species , following EARTH students and faculty. Farmers named EARTH faculty and students as their main sources for the following practices, with little or no mention of any other sources: Worm compost, Bokashi, Agro-ecotourism Preparations, and Effective Microorganisms.

Knowledge, Practice, and Dissemination of the "Integrated Agricultural System"

All 31 farmers were asked the questions listed in Table 4-10. A strong majority answered each of these questions affirmatively according to their perceptions. Most farmers had heard the term "Integrated Agricultural System" before, felt that the students were promoting that type of system, and considered their farm to be an "Integrated Agriculture System." Seventy-one percent of farmers interviewed reported that they had taught or shared new knowledge, information, or ideas with other farmers. Each farmer that answered affirmatively (22 of the 31 farmers) was then asked to elaborate by specifying what information they shared. Nineteen out of a total of 30 topics listed were alternative agriculture practices identified by this study as being promoted by EARTH University. The most frequent topic listed was "organic fertilizer" (23.3%), followed by "the biodigester" (16.2%). Of alternative agriculture practices, the following were also mentioned once: "bokashi," "conservation efforts," "construction design in the kitchen with the biodigester," "planting trees" or "reforestation," "waste management," "worm

compost," and "biofermentation." Of those practices not specifically being promoted by EARTH as part of an Integrated Agriculture System, "precision agriculture" was mentioned twice and the rest once: "improved bovine genetics," "bottle and sell clean water," "bovine nutrition," "pasture," "palmito," "coffee," "making cheese / pasteurization," "protein bank," and "medicine for chickens."

Table 4-13. Sources of Information about each Component of an Integrated Agricultural System

Alternative Agricultural Practice / System	N[a]	Source						
		Government Organizations (Ministry of Agriculture / Natural Resources)	Neighbor	EARTH Faculty	EARTH Students	Church	Family	JAPDEVA
Biodigester	58	1.7	8.6	41.4	39.6	3.5	3.5	-
Nutritional Blocks	42	4.76	-	33.3	50.0	4.8	-	23.8
Traditional Compost	53	1.9	-	37.7	49.1	1.9	1.9	-
Worm Compost	52	-	-	36.5	55.8	1.92	1.92	-
Bokashi	50	2.0	-	46.0	48.0	2.0	-	-
Fish Lagoons	39	7.7	28.2	15.38	25.64	2.56	5.13	5.13
Decontami-nation Lagoons	42	-	11.9	35.71	38.1	2.4	-	-
Medicinal Plants	45	-	8.9	17.8	26.7	2.2	2.2	-
Forest Species	52	3.8	1.9	28.8	32.7	1.9	-	-

Table 4-13. Continued

Alternative Agricultural Practice / System	N[a]	Source						
		Government Organizations (Ministry of Agriculture / Natural Resources)	Neighbor	EARTH Faculty	EARTH Students	Church	Family	JAPDEVA
Agro-ecotourism Preparations	24	-	-	41.7	45.8	-	-	-
Effective Microorganisms	47	-	-	46.8	48.9	-	-	-

Alternative Agricultural Practice / System	N[a]	Source							
		NGO	INA	TEC	Publication	CEDECO	Traditional Knowledge	ANDAR	OTHER[b]
Biodigester	58	-	-	1.72	-	-	-	-	
Nutritional Blocks	42	-	23.8	-	-	23.8	-	-	
Traditional Compost	53	-	3.8	-	-	1.9	-	-	
Worm Compost	52	-	-	-	-	1.9	-	-	[1]
Bokashi	50	-	2.0	-	-	-	-	-	

Table 4-13. Continued

Alternative Agricultural Practice / System	N[a]	Source							
		NGO	INA	TEC	Publication	CEDECO	Traditional Knowledge	ANDAR	OTHER[b]
Fish Lagoons	39	-	2.6	-	-	-	5.13	-	[2]
Decontam-ination Lagoons	42	-	-	2.4	-	-	9.5	-	
Medicinal Plants	45	2.2	2.2	2.2	8.9	-	20.0	4.4	[3,4]
Forest Species	52	3.8	-	1.9	-	1.9	19.2	-	[5,6]
Agro-eco-tourism Preparation	24	-	-	-	-	-	-	-	[7,8]
Effective Microorganisms	47	-	-	2.1	-	-	-	-	[9]

[a] All 31 farmers were asked to free list the sources (if any) from which they have received information pertaining to each alternative agriculture practice/system.
[b] These reasons were listed once or twice
N = the total number of responses for each practice/system.
[1] SUPAS (Union of livestock producers in the Atlantic region)
[2] Taiwanese
[3] CEFCA , [4] UNED (Universidad Nacional de Educación a Distancia)
[5] Code Forsa de San Carlos, [6] COES
[7] Agro-ecotourism group of San Jose, [8] Agro-ecotourism group of Guacimo
[9] Makes own

Table 4-14. Integrated Agricultural System Knowledge / Dissemination

Question	N	% Yes	% No
Have you heard the term "Integrated Agricultural System"?	31	77.4	22.6
Did the students promote this type of system?	31	87.1	12.9
Would you consider your farm to be an integrated farm system?	31	58.1	41.9
Have you taught or shared new knowledge, practices, information or ideas with other farmers?	31	71.0	29.0

Farmer Reasons for Adopting, Rejecting, or Discontinuing Use of a CIAS

Reasons for Not Implementing Practice

Of the 31 farmers, those who did not adopt each of the practices were asked to free-list the reason(s) why they decided not to adopt it. The percentage representing how frequently each reason was named per practice is reported in Table 4-15. Each practice had at least 2 non-adopters.

Nineteen (61.3 percent) of the 31 farmers did not adopt the biodigester (Table 4-4). The most frequently mentioned reasons that farmers reported for not implementing the biodigester were (in order of decreasing frequency): cost, representing 22.2% of responses; not having gotten "around to it yet" because it was not a priority; and not having sufficient animals to produce waste for bio-fuel. Reasons for not implementing the innovation unique to the biodigester were: 1. the kitchen was too far from the corral and 2. the woman of the household prefers not to cook with the gas from the biodigester.

Twenty-five (80.6%) of the 31 farmers did not adopt Nutritional Blocks. The reason mentioned most often that prevented farmers from making and using this innovation was simply because they did not own livestock. There was also a lack of understanding of the purpose and information about Nutritional Blocks. Some farmers that did understand the purpose and how to make them opted not to because the process was too time consuming. Reported reasons not to adopt that were unique to the Nutritional Blocks were: 1. they were not necessary because using other feed supplementation, and 2. they lack the machine used to harvest crop residues (a main ingredient in the Nutritional Blocks).

Eighteen of the 31 farmers (58.1%) decided not to use traditional compost and 16 farmers (51.6%) opted not to use worm compost. Both types of compost were found to

be time consuming. The most common response regarding traditional compost was that it did not fit as an appropriate component in their farm system, denoted as "Fit into System" (Table 4-15). One farmer is not using the traditional or worm compost because he/she prefers and is using Bokashi, another alternative agriculture practice being diffused by EARTH. Farmers reported that they end up applying waste directly to the land as fertilizer instead of in the form of compost because the process takes too long. Another deterrent from using worm compost was not knowing "how to use" the practice.

Twenty-seven of the 31 farmers (87.1%) reported not ever using Bokashi. The most common reason listed was that it failed to fit into the farm system followed by the complaint that it was time consuming. Other reasons were: 1. it is not necessary because I'm using my own effective microorganism, and 2. the material to make Bokashi is too difficult to obtain.

Topography was exceedingly the most frequent reason named by 18 of the 31 farmers for not implementing Fish Lagoons. Cost was the next frequently mentioned reason. Other reasons were: 1. the water is not clean and 2. there is not enough water. A strong majority of responses named "Fit into System" as a reason not to implement

Table 4-15. Farmer Reasons for Not Implementing the Component of an Integrated Agricultural System

Alternative Agricultural Practice / System	N[a]	Reasons for Not Implementing Practice*						
		Cost	Labor Intensive	Time Consuming	No Interest	Farm Size	Topography	Animals
Biodigester	27	22.2	-	7.4	3.7	-	11.1	14.8
Nutritional Blocks	43	2.3	2.3	13.9	2.3	_	_	18.6
Traditional Compost	35	2.9	2.9	11.4	8.6	-	2.9	5.7
Worm Compost	31	6.5	3.2	16.1	9.7	3.2	-	9.7
Bokashi	64	7.8	6.2	10.9	3.1	1.6	1.6	4.7
Fish Lagoons	26	19.2	-	7.7	3.8	-	26.9	-
Decontamination Lagoons	49	10.2	6.1	4.1	-	6.1	-	4.1
Medicinal Plants	16	-	-	6.2	37.5	-	-	-
Forest Species	5	-	-	-	-	-	20.0	-
Agro-ecotourism Preparation (AETP)	38	5.3	-	5.3	39.5	-	-	-
Effective Microorganisms	38	2.6	-	-	5.3	2.6	2.6	-

Table 4-15. Continued

Alternative Agriculture Practice / System	N[a]	Reasons for Not Implementing Practice							
		How to use	Purpose	Fit into System	Function	Priority	No Information	River floods	OTHER[b]
Biodigester	27	-	-	11.1	-	18.5	-	3.7	[1,2]
Nutritional Blocks	43	9.3	9.3	11.6	-	7.0	11.6	-	[3,4]
Traditional Compost	35	11.4	8.6	17.1	-	11.4	8.6	2.9	[5,6]
Worm Compost	31	12.9	6.5	12.9	3.2	6.5	6.5	-	[5]
Bokashi	64	9.4	7.8	12.5	1.6	4.7	6.2	1.6	[7,8]
Fish Lagoons	26	-	-	3.8	-	11.5	3.8	7.7	[9,10]
Decontamination Lagoons	49	6.1	8.2	28.6	-	4.1	6.1	2.0	[5,6, 11*]
Medicinal Plants	16	18.7	12.5	6.2	-	12.5	6.2	-	
Forest Species	5	20.0	20.0	-	-	-	20.0	20.0	
AETP	38	2.6	2.6	28.9	-	2.6	7.9	-	[12]
E.M.	38	26.3	26.3	5.3	-	2.6	21.0	-	[7,13]

[a] All farmers who were not or had not previously implemented the practice were asked to free list the reasons (if any) why they decided not to adopt it.
[b] These reasons were listed once or twice
N = the total number of responses for each practice/system.
* Values refer to the percentage of all responses that corresponds to each reason
[1] Kitchen too far from corral, [2] Don't want to cook with gas
[3] Not necessary because using other supplements or the grass is rich enough, [4] Need a picadora
[5] Prefers to use Bokashi, [6]applies waste directly to the land as fertilizer
[7] Not necessary because using own microorganisms, [8] Difficult to obtain material to make Bokashi
[9] Water not clean, [10] Not enough water
[11]Not necessary because waste management isn't a problem* 10.2%
[12] Don't want visitors
[13] Nobody brought it to the farm for the farmer to try it out

Decontamination Lagoons. It was also viewed as too expensive. A noteworthy, 10.2% of responses reported that the Decontamination Lagoons were not necessary because "waste management is not a problem."

Only 7 of the 31 farmers reported not having medicinal plants. Most of these stated that they had no interest in them.

Twenty-nine of the farmers reported having Forest Species on their farms, (93.5%); 21 of these planted the trees. (Table 4-15). There were only 5 responses given for not having / planting trees because most of the farmers had planted them. The 5 responses were reported with equal frequencies and named "Topography," "How to Use," "Purpose," "No Information," and "River Floods" as the reasons.

From among the farmers who reported not implementing Agro-ecotourism Preparations (64.5%)(Table 4-4), the most frequent reason given was "No Interest." This question also revealed that some farmers specifically did not want visitors on their property.

Nineteen of the 31 farmers have never used Effective Microorganisms. Of these, the most frequently reported reason was that it did not fit into the farm system. They also did not use this innovation because they lacked information about it and "nobody brought it to the farm for us to try it out."

The practices that farmers tended to reject were the following (in decreasing order): Decontamination Lagoons (90.3%), Bokashi (87.1%), and Nutritional Blocks (80.6%).

Reasons for Discontinuing Practices

Of the 31 farmers interviewed, those who had adopted a practice / system but later rejected it were asked to free list the reason(s) why they discontinued its use. Instances of discontinuance were only reported on the following 6 practices: Worm Compost, Traditional Compost, Nutritional Blocks, Effective Microorganisms, and the Biodigester.

Rate of discontinuance was highest for Worm Compost and lowest for the Biodigester. Nine farmers discontinued using Worm Compost for a number of functionality issues (Table 4-16). The "Wooden Crate" was a problem because ants were able to crawl through the cracks and reportedly ate the worms. Other noteworthy problems causing discontinuance among practices were that farmers stopped using the practice when the student change agents left; and the topography of the land, including the river flooding.

Other Potential Factors Affecting a Farmer's Decision to Utilize CIAS

Due to the nature of most of the alternative agriculture systems and practices being promoted by EARTH, it is logical to assume that farmers with animals might have a higher tendency to adopt certain innovations. For example, the Biodigester can only function with the input of human or animal waste; Nutritional Blocks are intended for livestock, and bokashi results from a composting process intended for the management of animal waste.

Table 4-16. Farmer Reasons for Discontinuance of Components of an Integrated Agricultural System*

Alternative Agriculture Practice / System	N[a]	Reasons for Discontinuance									
		Reason	%[b]	Reason	%	Reason	%	Reason	%	Reason	%
Biodigester	1	Didn't Function Correctly	100.0	-	-	-	-	-	-	-	-
Nutritional Blocks	2	Expensive	25.0	Time Consuming	25.0	Student Left	50.0	-	-	-	-
Traditional Compost	2	Size of the farm	25.0	Not enough resources	50.0	Student Left	25.0	-	-	-	-
Worm Compost	9	Labor Intensive	13.3	Didn't Function Correctly	26.7	Worms Died[1]	26.7	Wooden Crate	6.7	Time Consuming Topography Doesn't Fit w/System River Floods	6.7 6.7 6.7 6.7
Fish Lagoons	2	Didn't Function Correctly	33.3	Topography	33.3	River Floods	33.3	-	-	-	-
Effective Microorganisms	2	No more animals	50.0	Used up supply brought by students	50.0	-	-	-	-	-	-

* Values refer to the percentage of all responses that corresponds to each reason

[a] Number of farmers who discontinued use

[b] Each % sign represents the percentage that the previous reason was listed out of all of the reasons mentioned

[1] 1/4 of the worms were reported to have been eaten by birds, ¼ by ants, and ½ of the respondents didn't give a reason.

Therefore, a contingency table was used to generate a Chi-squared value to test if a relationship existed between having either pigs, chickens, horses, or cows and adopting any of the CIAS. A significant Chi-squared value was not derived and sufficient evidence did not exist to indicate a relationship between the variables.

The researcher generated Chi-squared values for each of the following demographic variables and the level of adoption for each of the practices: number of people in the household, the gender of the farmer, the size of the farm (in terms of hectares), whether or not the household was receiving outside income, and in which community the farmer lived. Chi-squared values revealed that a relationship exists between farmers who reside in the community, La Argentina, and their adoption behavior of Agro-ecotourism Preparations ($p < .001$). There was no other statistically significant evidence suggesting a relationship between the other variables.

Trends by Community

Through comparison of adoption behavior between communities, some trends became apparent (Table 4-17.). The farmers of La Argentina demonstrate a higher level of adoption of components of an IAS (CIAS) than do the farmers of El Hogar and La Lucha (Table 4-17).

La Argentina

The maximum number of CIAS adopted by any one farmer occurred in La Argentina (8 practices). Two other farmers adopted 7 different practices, 6 farmers adopted 4 practices, and 4 farmers adopted 3 practices. The mean number of practices adopted is 4.5 and the mode is 6, n=13.

El Hogar

The maximum number of CIAS adopted by a farmer in El Hogar is 6. Two farmers adopted 5 different practices, 1 adopted 4 practices, and 1 adopted 3. The mean number of practices adopted is 3.7 and the mode is 5, n=7.

La Lucha

The maximum number of practices adopted in La Lucha is 5. One farmer adopted 5 different practices, 1 farmer adopted 4 different practices, and 3 farmers adopted 3 different practices. The mean number of practices adopted is 2.6, and the mode is 2, n=11.

Table 4-17. Comparing Levels of Adoption of CIAS by Community

Community	N	Maximum No. of Practices Adopted	Mean No. of Practices Adopted	Mode No. of Practices Adopted
La Argentina	13	8	4.5	6
El Hogar	7	6	3.7	5
La Lucha	11	5	2.6	2

Qualitative Findings from Farmer Interviews

During the interviews, farmers provided examples to substantiate their responses to the researcher's questions and elaborated on topics of interest to them. The following findings represent the common themes that emerged from conversations between the farmer and researcher during the interviews. This information may provide a better understanding of the farmers' perceptions and their reasoning behind the responses, as well as illuminate important issues that were unanticipated and not included in the structured interview guide.

Farmer Interview Findings: Objective 1

As one farmer put it, "Certain characteristics of the farm make it possible or appropriate to install a technology while others don't." Many farmers reported that they did not have sufficient animals (or animals kept in an enclosed area where the waste could be

collected to supply the biodigester with fuel) to adopt the biodigester. Nutritional Blocks were also often rejected because people did not have the animals, but often, it was also because they were unaware of the purpose of the blocks. When the animals were kept in the pasture, farmers claimed that they could not easily take the time to collect waste for compost. Therefore, they felt that they did not have the material necessary to prepare compost. Often, farmers didn't realize that compost could be made from crop residues, kitchen scraps, chicken litter, etc. Farmers also mentioned that the work and time it would take to prepare the compost and then wait for weeks until it could be used as fertilizer "wasn't worth it" or "*no vale la pena*" either, especially when the farm was small. Therefore, the response that it did not fit with the needs of the farm was also reported. The resources that were lacking included the size of the farm, animals to produce enough waste, or a system that allowed easy collection of the waste.

Another factor to mention is the farmers' commitment to their "*mapa futuro*" or future map, a vision created by the farmer and an EARTH student(s) of their farm in the future . The ideas were generated usually with the first students that ever worked on the farms and the farmers and students are still committed to implementing these ideas. Farmers are usually very committed to their mapa futuros. Take for instance, this excerpt from the researcher's field notes:

> The most interesting thing about my visit to this farm (Finca Maria Jose) is that I could compare what I saw to my visit there the previous year. I was amazed. I remembered discussing plans to make a soccer field, install bathrooms and a little restaurant for tourists, etc. When I arrived, I quickly saw that those plans had quickly been brought to fruition. I was impressed. This woman is extremely motivated and she was embracing the idea of agro-ecotourism. She is an example of when the mapa futuro works! She has stuck to her vision of the ideal farm and was accomplishing it.

On one hand, it is a good way to follow through on the projects…on the other hand, some farmers have reported that they feel like they must accomplish the ideas on the map

before making other changes to the farm that are not included in the map. It sounds therefore like it might inhibit their creativity or independence.

One common sentiment among the farmers was that while they were in favor of experimenting and making behavioral and practice changes, many times it was impractical due to the high risk and monetary cost involved. As one farmer expressed, "I would like to implement the ideas the students and I come up with but it's too expensive." One farmer suggested, "The university should provide ways to obtain resources in order to be able to do more projects and experiments because it is expensive."

Sometimes, the farmers will only use an innovation if the students bring it to them to try, or if it is free and requires no investment, no risk . This is very much the case with E.M. The farmers report being very satisfied with the results of E.M. (eradication of flies, mitigation of odors, etc.), but have never actually bought it . Instead, they wait for the students to bring more for them to "try." This begs the question "Do the farmers value it enough to purchase it if they were told that the students would never again be able to bring any free samples?".

While EARTH is not the only entity involved in nonformal education and extension efforts, farmers freely expressed that their level of satisfaction with EARTH was superior to the other entities. A couple of opinions and reasons are captured in the following quotes: "The government (MAG) doesn't help me and the only assistance I have ever received is through this program [the WEM]…through the students of EARTH." "EARTH dedicates time to the farms…they don't charge, it's free. Other institutions never come around." And "I think it is a good idea to work with other institutions other than EARTH, but I strongly prefer working with EARTH for two reasons. The first reason is: because of the students,

there is constant communication. The second is: the scientists, professors…are familiar with the farm because they have physically been here."

It became obvious that the student change agents were sources of motivation for the farmers. Time and again, farmers made statements supporting this observation. One farmer said "if the students leave, so does my motivation." The students seem to create an enthusiasm in the farmers, but this enthusiasm may not last once the students are gone. For traditional extension agents, this dependency may seem as a hindrance for the farmers to "help themselves" and for the agents to create the desired "terminal relationship." For example, one farmer commented that he is dependent upon the student to come up with new ideas and bring information. He doesn't think that he should help himself to the degree that he is independent of the students; rather, he is comfortable with the continued dependency on them. This may or may not be an issue since this is not a traditional extension program, and the farms continue to receive students.

The farmers repeatedly voiced their frustration with the river flooding, especially the river, Jimenez, in La Lucha. It was identified as an obstacle to the adoption of various innovations.

One more factor, known as the "Human Factor" (Personal communications, on August 11, 2004, Dr. Pedro Bidegaray) may affect the farmers' decisions to adopt innovations. Bidegaray explains the Human Factor as "an intrinsic quality of certain individuals to seize the opportunity and do something with it." This is similar to Rogers Theory of Adoption (2003) which states that a person who is classified as an "innovator" will have a higher likelihood of adopting an innovation than someone who is not. The following excerpts are from the researcher's field notes and serve to illustrate the type of

person she believes might fit into Roger's "innovator" category and give importance to what Bidegaray refers to as the "Human Factor":

> *Farmer 1:* Farmer 1 and his wife, are incredible. They are young, very motivated agriculturalists. I remember that I visited Farmer 1's wife last year with B.K. Singh and we discussed her project of free-range chickens.
>
> Farmer 1 has a very impressive enterprise of Bio-fermentation on his farm. So far, he is the only farmer using this method of fertilization. He has livestock and collects the waste, mixes it with E.M., molasses, and whatever mineral is missing the soil (which he finds out through soil testing done by the students). Then, he stores this mixture in vats and uses it to fertilize his crops, especially papaya.
>
> He also has Bokashi, Fish ponds, worm and traditional compost, medicinal plants and forest species. He also uses precision agriculture and tries to teach other farmers to fertilize less frequently. In the past year, he has had groups visit his farm from both EARTH and MAG.
>
> The main reason he hasn't implemented other aspects of an IAS is because he simply hasn't had time yet…but he plans to. He also plans to start making his own EM. I asked him why he was the only one using bio-fermentation type fertilization and he said because it has just started being diffused by EARTH…in 2000.
>
> *Farmer 2:* He felt that it was really important to have an interchange of knowledge between traditional knowledge and new knowledge coming out of the universities.
>
> So far, he is the first person to use Bokashi. He seems to be very familiar with the term "Integrated Agricultural System." He considers his own farm as such and only hasn't implemented a biodigester because other priorities have held him back. He plans to in the very near future. He believes it is part of his responsibility to help diffuse sustainable agriculture practices and technology and has trained about 30 farmers…neighbors and friends during workshops, etc. Practices include waste management and precision agriculture.
>
> Some of the farmers thought that planting trees was the thing to do…mostly because it would provide wood for construction purposes when necessary (a future resource of wood) and also to help prevent contamination of the river. Farmer 2 was fully aware of just about every possible reason to plant trees.

<u>Objective 2:</u> To determine the perceptions of the participants in relation to their role and the role of other participants of the Work Experience Module, *WEM*, through:

- determining the perceptions of the student agents and farmers with respect to their own present roles in the WEM and what they perceive their role should be

- determining the perceptions of the farmers with respect to the present role of the student change agents in the WEM and what they perceive their role should be (in terms of educational processes based on the principles of: knowledge, participation, and interpersonal characteristics)

- determining the perceptions of the students with respect to the present role of the farmers in the WEM and what they perceive their role should be

Perceptions of the Role of the Student Change Agents in the WEM

Farmer Perceptions

A total of 31 farmers were asked to indicate their level of agreement that each of the 39 statements "should be" the role of the student change agents of the WEM by choosing the appropriate choice (yes, maybe, no) from a 3 pt. Likert-scale that the researcher used from the structured interview guide (Table 4-18). The possible roles were generated from the stated objectives and mission of the WEM as set forth by EARTH University and from the researcher's prior experience with participants of the program.

The majority of the farmers agreed that the students should fulfill all of the 39 potential roles discussed with them. All (100%) of the farmers agreed that the students should:

- Provide current, up-to-date information
- Consult with other resources and specialists when necessary
- Serve as an informant for bringing information
- Help in the development of problem-solving strategies
- Possess good connections /networking capabilities
- Transfer information based on research
- Work well with the farmer to develop and implement new ideas
- Take an interest in the farmers opinions, ideas, and feelings
- Think of solutions together with the farmer when there are problems

Table 4-18. Farmer Perceptions of the Role of the Student Change Agent in the Work Experience Program*

	Perceptions of What the Student Change Agent Role Should Be				
Role	Yes %	Maybe %	No %	Mean[1]	SD
Technical knowledge [k]	90.3	9.7	0.0	1.9	.30
Up-to-date information [k]	100.0	0.0	0.0	2.00	.00
Consult w/other resources, specialists [k]	100.0	0.0	0.0	2.00	.00
Help sustainable agriculture efforts [k]	96.8	3.2	0.0	1.97	.18
Committed to region's ecosystem[k]	96.8	3.2	0.0	1.97	.18
Informant role [k]	100.0	0.0	0.0	2.00	.00
Problem solving strategies [k]	100.0	0.0	0.0	2.00	.00
Practice changes [k]	93.5	6.5	0.0	1.94	.25
Good network, connections [k]	100.0	0.0	0.0	2.00	.00
Information based on research [k]	100.0	0.0	0.0	2.00	.00
Development of ideas [k,p]	100.0	0.0	0.0	2.00	.00
Conduct experiments w/farmer [k,p]	90.3	6.5	3.2	1.87	.43
Teach new skills to farmer [k,p]	96.8	0.0	3.2	1.94	.36
Interest in opinions, ideas [p]	100.0	0.0	0.0	2.00	.00
Joint problem solving [p]	100.0	0.0	0.0	2.00	.00
Joint learning/working [p]	96.8	3.2	0.0	1.97	.18
Identify community issues [p]	80.6	3.2	16.1	1.65	.75
Committed to improving quality of life [p]	87.1	6.5	6.5	1.81	.54
Increase farmer capacity to evaluate [p]	96.8	3.2	0.0	1.97	.18
Help people help themselves [p]	93.5	6.5	0.0	1.94	.25
Groups in need [p]	80.6	9.7	9.7	1.71	.64

Table 4-18. Continued

	Perceptions of What the Student Change Agent Role Should Be				
Role	Yes %	Maybe %	No %	Mean[1]	SD
Learn from farmer [p]	90.3	9.7	0.0	1.9	.30
Farmer conduct own experiments [p]	90.3	6.5	3.2	1.87	.43
Value traditional knowledge [p,ic]	96.8	3.2	0.0	1.97	.18
Value other opinions [ic]	100.0	0.0	0.0	2.00	.00
Hard worker [ic]	64.5	29.0	6.5	1.58	.62
Responsible [ic]	100.0	0.0	0.0	2.00	.00
Creative [ic]	100.0	0.0	0.0	2.00	.00
Attentive [ic]	100.0	0.0	0.0	2.00	.00
Professionalism [ic]	93.5	3.2	3.2	1.90	.40
Sincere [ic]	100.0	0.0	0.0	2.00	.00
Honest [ic]	100.0	0.0	0.0	2.00	.00
Trust in farmer [ic]	100.0	0.0	0.0	2.00	.00
Motivated [ic]	100.0	0.0	0.0	2.00	.00
Respectful [ic]	100.0	0.0	0.0	2.00	.00
Trustworthy [ic]	100.0	0.0	0.0	2.00	.00
Perceive feelings [ic]	93.5	3.2	3.2	1.90	.40
Good communicator [ic]	100.0	0.0	0.0	2.00	.00
Model of inspiration [ic]	90.3	9.7	0.0	1.90	.30

*Responses from all 31 farmers, N=31.

[1] The mean was calculated from responses corresponding to a 3 pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes

[k] Questions positioned within the *knowledge* construct

[p] Questions positioned within the *participatory* construct

[ic] Questions positioned within the *interpersonal characteristics* construct

All of the farmers also agreed that the students should be responsible, creative, attentive, an effective communicator, honest, motivated, respectful, trustworthy, and should trust the farmer. The statement that students should identify community problems, needs, and hopes received the most "no" responses of all the potential roles. Farmers were most undecided (most frequent "maybe" responses) about whether students should possess technical knowledge, help the poorest farmers of the community, learn from the farmers, be a model of inspiration, and especially whether or not they should be a hard worker (possible reasons for this will be explained later).

Farmers were then asked to indicate their level of agreement that each of the 39 statements regarding what the role of the student actually was, according to their experience with the program during 2004, by choosing the appropriate choice (yes, maybe, no) from a 3 pt. Likert-scale that the researcher had on the structured-interview guide (Table 4-19). All 31 farmers agreed that the students consulted with other resources and specialists when necessary, worked and learned together with the farmer, valued different ideas and opinions, were responsible, sincere, honest, trusted the farmer, was respectful, and trustworthy. Farmers were most undecided over whether students helped those people in the community who have the most needs (29.0%). The most "no" responses were received when farmers were asked if the students conducted experiments with them (35.5%).

Student Perceptions

Students were asked to indicate their level of agreement that each of the 39 statements "should be" their role as change agents in the WEM by circling the appropriate choice (yes, maybe, no) on a 3 pt. Likert-scale (Table 4-20). The possible roles were generated from the stated objectives and mission of the WEM as set forth by EARTH University and from the researcher's prior experience with participants of the program.

Interestingly, all of the 81 students responded "yes" to only one of the potential roles of the student change agent: that the student should be an effective communicator. Most of the students also agreed that students should:

- Have technical knowledge in the appropriate areas (98.8%)
- Provide current, up-to-date information (96.3%)
- Help in the development of problem-solving strategies (93.8%)
- Work well with the farmer to develop and implement new ideas (91.4%)
- Learn from the farmer (97.5%)
- Take an interest in the farmers opinions, ideas, and feelings (92.6%)
- Think of solutions together with the farmer when there are problems (97.5%)
- Work and learn together with the farmer (98.3%)
- Increase the farmer's capacity to analyze and evaluate situations (96.3%)

Table 4-19. Farmer Perceptions of the Role of the Student Change Agent in the Work Experience Module*

Role	Perceptions of What the Student Change Agent Actually Was				
	Yes %	Maybe%	No %	Mean[1]	SD
Technical knowledge [k]	87.1	9.7	3.2	1.84	.45
Up-to-date information [k]	96.8	0.0	3.2	1.94	.40
Consult w/other resources, specialists [k]	100.0	0.0	0.0	2.00	.00
Help sustainable agriculture efforts [k]	93.5	3.2	3.2	1.90	.40
Committed to region's ecosystem [k]	93.5	6.5	0.0	1.94	.25
Informant role [k]	93.5	3.2	3.2	1.90	.40
Problem solving strategies [k]	87.1	9.7	3.2	1.84	.45
Practice changes [k]	83.9	6.5	9.7	1.74	.63
Good network, connections [k]	90.3	6.5	3.2	1.87	.43
Information based on research [k]	90.3	3.2	6.5	1.84	.52
Development of ideas [k,p]	96.8	3.2	0.0	1.94	.36
Conduct experiments w/farmer [k,p]	51.6	12.9	35.5	1.16	.93
Teach new skills to farmer [k,p]	87.1	3.2	9.7	1.77	.62
Interest in opinions, ideas [p]	93.5	6.5	0.0	1.94	.25
Joint problem solving [p]	93.5	3.2	3.2	1.90	.40
Joint learning/working [p]	100.0	0.0	0.0	2.00	.00
Identify community issues [p]	71.0	6.5	22.6	1.48	.85
Committed to improving quality of life [p]	74.2	9.7	16.1	1.58	.76
Increase farmer capacity to evaluate [p]	96.8	3.2	0.0	1.97	.18
Help people help themselves [p]	90.3	9.7	0.0	1.90	.30
Groups in need [p]	54.8	29.0	16.1	1.39	.76

Table 4-19. Continued

Role	Perceptions of What the Student Change Agent Actually Was				
	Yes %	Maybe%	No %	Mean[1]	SD
Learn from farmer [p]	93.5	6.5	0.0	1.94	.25
Farmer conduct own experiments [p]	83.9	3.2	12.9	1.71	.69
Value traditional knowledge [p,ic]	83.9	12.9	3.2	1.81	.48
Value other opinions [ic]	100.0	0.0	0.0	2.00	.00
Hard worker [ic]	83.9	12.9	3.2	1.81	.48
Responsible [ic]	100.0	0.0	0.0	2.00	.00
Creative [ic]	90.3	9.7	0.0	1.90	.30
Attentive [ic]	96.8	3.2	0.0	1.97	.18
Professionalism [ic]	90.3	6.5	3.2	1.87	.43
Sincere [ic]	100.0	0.0	0.0	2.00	.00
Honest [ic]	100.0	0.0	0.0	2.00	.00
Trust in farmer [ic]	100.0	0.0	0.0	2.00	.00
Motivated [ic]	93.5	6.5	0.0	1.94	.25
Respectful [ic]	100.0	0.0	0.0	2.00	.00
Trustworthy [ic]	100.0	0.0	0.0	2.00	.00
Perceive feelings [ic]	90.3	9.7	0.0	1.90	.30
Good communicator [ic]	87.1	12.9	0.0	1.87	.34
Model of inspiration [ic]	93.5	6.5	0.0	1.94	.25

* Responses from all 31 farmers, N=31

[1] The mean was calculated from responses corresponding to a 3 pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes

[k] Questions positioned within the *knowledge* construct

[p] Questions positioned within the *participatory* construct

[ic] Questions positioned within the *interpersonal characteristics* construct

Table 4-20. Student Perceptions of their Role as Change Agents in the Work Experience Module

Role	Perceptions of What the Student Change Agent Role Should Be					
	N	Yes %	Maybe %	No %	Mean	SD
Technical knowledge [k]	81	98.8	1.2	0.0	1.99	.11
Up-to-date information [k]	81	96.3	2.5	1.2	1.95	.27
Consult w/other resources, specialists [k]	81	81.5	16.0	2.5	1.79	.47
Help sustainable agriculture efforts [k]	81	90.1	8.6	1.2	1.89	.35
Committed to ecosystem [k]	81	85.2	13.6	1.2	1.84	.40
Informant role [k]	81	86.4	12.3	1.2	1.85	.39
Problem solving strategies [k]	81	93.8	6.3	0.0	1.94	.24
Practice changes [k]	81	69.1	27.2	3.7	1.65	.55
Good network, connections [k]	81	67.9	29.6	2.5	1.65	.53
Information based on research [k]	81	82.7	16.0	1.2	1.81	.42
Learn from farmer [p]	81	97.5	2.5	0.0	1.98	.16
Development of ideas [k,p]	81	91.4	6.2	2.5	1.89	.39
Conduct experiments w/farmer [k,p]	81	71.6	22.2	6.2	1.65	.60
Teach new skills to farmer [k,p]	81	90.1	9.9	0.0	1.90	.30
Interest in opinions, ideas [p]	81	92.6	7.4	0.0	1.93	.26
Joint problem solving [p]	81	97.5	2.5	0.0	1.98	.16
Joint learning/working [p]	80	98.3	1.3	0.0	1.99	.11
Identify community issues [p]	81	82.7	17.3	0.0	1.83	.38
Committed to improving quality of life [p]	81	63.0	33.3	3.7	1.59	.56
Farmer capacity to evaluate [p]	81	96.3	3.7	0.0	1.96	.19
Help people help themselves [p]	81	82.7	16.0	1.2	1.81	.42
Groups in need [p]	81	72.8	25.9	1.2	1.72	.48

Table 4-20. Continued

Role	Perceptions of What the Student Change Agent Role Should Be					
	N	Yes %	Maybe %	No %	Mean	SD
Farmer conduct own experiments [p]	81	82.7	11.1	6.2	1.77	.55
Value traditional knowledge [p,ic]	81	90.1	9.9	0.0	1.90	.30
Value other opinions [ic]	81	98.8	1.2	0.0	1.99	.11
Creative [ic]	81	93.8	6.2	0.0	1.94	.24
Good communicator [ic]	81	100.0	0.0	0.0	2.00	.00
Model of inspiration [ic]	81	71.6	24.7	3.7	1.68	.54

[1]The mean was calculated from responses corresponding to a 3 pt. Likert-scale: 0 = no, 1 = maybe, 2 = yes.
[k] Questions positioned within the *knowledge* construct
[p] Questions positioned within the *participatory* construct
[ic] Questions positioned within the *interpersonal characteristics* construct

Table 4-21. Student Perceptions of their Role as Change Agents in the Work Experience Module

Role	Perceptions of What the Student Change Agent Role Actually Was					
	N	Yes %	Maybe %	No %	Mean[1]	SD
Technical knowledge [k]	80	55.0	45.0	0.0	1.45	.50
Up-to-date information [k]	81	59.3	35.8	4.9	1.54	.59
Consult w/other resources specialists [k]	81	44.4	46.9	8.6	1.36	.64
Help sustainable agriculture efforts [k]	80	55.0	38.8	6.3	1.49	.62
Committed to region's ecosystem [k]	80	36.3	51.3	12.5	1.24	.66
Informant role [k]	80	38.8	55.0	6.3	1.33	.59
Problem solving strategies [k]	80	50.0	46.3	3.8	1.46	.57
Practice changes [k]	80	33.8	57.5	8.8	1.25	.61
Good network, connections [k]	80	31.3	47.7	21.3	1.10	.72
Information based on research [k]	80	37.5	53.8	8.8	1.29	.62
Learn from farmer [p]	80	71.3	25.0	3.8	1.68	.55
Development of ideas [k,p]	80	52.5	42.5	5.0	1.48	.60
Conduct experiments w/farmer [k,p]	80	23.8	47.5	28.8	.95	.73
Teach new skills to farmer [k,p]	80	35.0	57.5	7.5	1.27	.60
Interest in opinions, ideas [p]	80	82.5	16.3	1.3	1.81	.42
Joint problem solving [p]	81	56.8	40.7	2.5	1.54	.55
Joint learning/working [p]	79	82.3	16.5	1.3	1.81	.43
Identify community issues [p]	80	43.8	48.8	7.5	1.36	.62
Committed to improving life quality [p]	80	18.8	61.3	20.0	.99	.63
Increase farmer capacity to evaluate [p]	80	40.0	55.0	5.0	1.35	.58
Help people help themselves [p]	80	42.5	47.5	10.0	1.33	.65
Groups in need [p]	80	13.8	48.8	37.5	.76	.68

Table 4-21. Continued

Role	Perceptions of What the Student Change Agent Role Actually Was					
	N	Yes %	Maybe %	No %	Mean[1]	SD
Farmer conduct own experiments [p]	80	32.1	43.2	23.5	1.09	.75
Value traditional knowledge [p,ic]	81	80.2	18.5	1.2	1.79	.44
Value other opinions [ic]	81	95.1	4.9	0.0	1.95	.22
Creative [ic]	81	65.4	33.3	1.2	1.64	.51
Good communicator [ic]	80	88.9	9.9	0.0	1.90	.30
Model of inspiration [ic]	80	51.3	42.5	6.3	1.45	.61

[1] The mean was calculated from responses corresponding to a 3 pt. Liker-scale: 0 = none, 1 = a little, and 2 = a lot.
[k] Questions positioned within the *knowledge* construct
[p] Questions positioned within the *participatory* construct
[ic] Questions positioned within the *interpersonal characteristics* construct

- Be creative (93.8%)
- Value and respect different opinions and ideas (98.8%)

Students were most undecided whether or not their role should be to: be committed to improving the quality of life of the community, have good connections and networks, help the farmer make a behavioral or practice change, or to help the poorest farmers of the community. The highest percentage of "no" responses indicated that some students did not think it should be their role as change agents to conduct experiments with the farmer or to motivate the farmer to conduct his/her own experiments.

Students were then asked to indicate their level of agreement that each of the 39 statements actually was their role as change agents in the WEM, according to their experience with the program during 2004. This was done by circling the appropriate choice (a lot, a little, none) on a 3 pt. Likert-scale (Table 4-21). Eighty percent or more of students responded that they took an interest in the farmers opinions, ideas, and feelings (82.5%); valued and respected different opinions and ideas (95.1%); were effective communicators (88.9%); and valued traditional knowledge (80.2%). The highest percentage of "no" responses indicated that some students did not think they helped the groups most in need of the community (37.5%).

Farmer Perceptions

A total of 31 farmers were asked to indicate their level of agreement that each of the 13 statements "should be" their role in the WEM by choosing the appropriate choice (yes, maybe, no) from a 3 pt. Likert-scale that the researcher used from the structured interview guide (Table 4-22).

Table 4-22. Farmer Perceptions of their Role in the Work Experience Module

Role	Perceptions of What the Role of the Farmer Should Be				
	Yes %	Maybe %	No %	Mean[1]	SD
Learn from student	100.0	0.0	0.0	2.00	.00
Development of ideas	100.0	0.0	0.0	2.00	.00
Conduct experiments w/student	77.4	22.6	0.0	1.77	.42
Teach new skills to student	90.3	9.7	0.0	1.9	.30
Value traditional knowledge	93.5	6.5	0.0	1.94	.25
Value other opinions	100.0	0.0	0.0	2.00	.00
Joint problem solving	100.0	0.0	0.0	2.00	.00
Identify community issues	93.5	0.0	6.5	1.87	.50
Help sustainable agriculture efforts	100.0	0.0	0.0	2.00	.00
Committed to region's ecosystem	100.0	0.0	0.0	2.00	.00
Informant role	100.0	0.0	0.0	2.00	.00
Model of inspiration	100.0	0.0	0.0	2.00	.00
Provide educational experiences for students	87.1	12.9	0.0	1.87	.34

[1] The mean was calculated from responses corresponding to a 3 pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes
*Responses from all 31 farmers, N=31.

All 31 farmers agreed that their role in the WEM should be to:

- Learn from the student
- Work well with the student to develop and implement new ideas
- Value and respect different opinions and ideas
- Think of solutions together with the student when there are problems
- Be committed to the ecosystem of the region
- Serve as an informant bringing information to friends and neighbors
- Be a model of inspiration to the student

The potential role of identifying the problems, needs, and hopes of the community was the only one to receive "no" responses (6.5%). Farmers were most unsure whether or not their role should be to conduct experiments with the students (22.6%) or provide educational experiences for the students (12.9%).

Farmers were then asked to indicate their level of agreement that each of the 13 statements actually was their role in the WEM (according to their experience with the program during 2004) by choosing the appropriate choice (yes, maybe, no)(Table 4-23). All 31 farmers reported that they valued different ideas and opinions, and were committed to the ecosystem of the region. Almost all of the farmers also reported that they learned from the students, worked with students to solve problems when they arose, worked together with students to develop and implement ideas, and acted as an informant, sharing information about different practices with neighbors (96.8%, 96.8%, 93.5%, 93.5%, respectively). Farmers were most undecided as to whether or not they were a model of inspiration for the students. A relatively high percentage of farmers reported that they did not conduct experiments with the students (38.7%).

Student Perceptions

Students were asked to indicate their level of agreement that each of the 13 statements "should be" the role of the farmers in the WEM by circling the appropriate

choice (yes, maybe, no) on a 3 pt. Likert-scale (Table 4-24). At least 90% of the students reported that they feel the farmers should:

- Work well with the student to develop and implement new ideas
- Value traditional knowledge
- Value and respect different opinions and ideas
- Provide educational experiences for students

Students were most undecided as to whether farmers should conduct experiments with them; identify the community's problems, needs, and hopes; and act as an informant, sharing information on practices with neighbors. The potential response that received the most "no" responses was that farmers should conduct experiments with students.

Table 4-23. Farmer Perceptions of their Role in the Work Experience Module

	Perceptions of What the Role of the Farmer Actually Was				
Role	Yes %	Maybe%	No %	Mean[1]	SD
Learn from student	96.8	0.0	3.2	1.94	.36
Development of ideas	93.5	3.2	3.2	1.9	.40
Conduct experiments w/student	51.6	9.7	38.7	1.13	.96
Teach new skills to student	90.3	3.2	6.5	1.84	.52
Value traditional knowledge	90.3	9.7	0.0	1.90	.30
Value other opinions	100.0	0.0	0.0	2.00	.00
Joint problem solving	96.8	3.2	0.0	1.97	.18
Identify community issues	77.4	9.7	12.9	1.65	.71
Help sustainable agriculture efforts	90.3	9.7	0.0	1.9	.30
Committed to region's ecosystem	100.0	0.0	0.0	2.00	.00
Informant role	93.5	6.5	0.0	1.94	.25
Model of inspiration	77.4	19.4	3.2	1.74	.51
Provide educational experiences for students	80.6	12.9	6.5	1.75	.57

[1] The mean was calculated from responses corresponding to a 3 pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes
*Responses from all 31 farmers, N=31.

Table 4-24. Student Perceptions of the Role of the Farmer in the Work Experience Module

		Perceptions of What the Role of the Farmer Should Be				
Role	N	Yes %	Maybe %	No %	Mean[1]	SD
Learn from student	79	79.7	20.3	0.0	1.80	.40
Development of ideas	79	92.4	7.6	0.0	1.92	.27
Conduct experiments w/student	79	68.4	27.8	3.8	1.65	.56
Teach new skills to student	79	81.0	17.7	1.3	1.8	.43
Value traditional knowledge	79	93.7	6.3	0.0	1.94	.24
Value other opinions	79	97.5	2.5	0.0	1.97	.16
Joint problem solving	79	96.2	2.5	1.3	1.95	.27
Identify community issues	79	77.2	22.8	0.0	1.77	.42
Help sustainable agriculture efforts	79	86.1	13.9	0.0	1.86	.35
Committed to region's ecosystem	79	88.6	11.4	0.0	1.89	.32
Informant role	79	79.7	20.3	0.0	1.80	.40
Model of inspiration	79	88.6	11.4	0.0	1.89	.32
Provide educational experiences for students	79	91.1	7.6	1.3	1.90	.34

[1] The mean was calculated from responses corresponding to a 3pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes

Respondents were then asked to indicate their level of agreement that each of the 13 statements actually was the role of the farmers in the WEM, according to their experience with the program during 2004, by circling the appropriate choice (a lot, a little, none) on a 3 pt. Likert-scale (Table 4-25). A slight majority of students agreed that the farmers fulfilled most of the potential roles discussed. The item that received the most "no" responses was that farmers conducted experiments with students (25.6%).

Qualitative Findings from Farmer Interviews

Missing Link in Communication

During the brief 2-hour or less interviews, the researcher uncovered certain dilemmas the farmers were facing that they said they had not revealed to the students that worked with them for 15 weeks. For example, one farm family had some medicinal plants but were unsure how to use them. They specifically requested a guidebook to help them make proper use of them. When probed if they had mentioned the interest to the EARTH student, the answer was, "no." Another farm household could not use their biodigester because it acquired a hole in the polyethylene bag. They said that they had never considered asking students or faculty from EARTH to help them repair it.

When a farmer informed the researcher that they would like the student to bring E.M. to the farm to use and possibly buy, the researcher asked the respective student about the request. The student said that EARTH did not currently have a supply of E.M. and had to put a hold on making it due to a shortage of necessary ingredients. The researcher asked scientists at the university and went to the university store. Not only was there no such shortage, the store was stock-piled with E.M. These instances substantiated some of the farmers' claims that students should communicate better. It also must be noted that

although these examples existed, most of the farmers commented that their students had good communication skills.

Interpretation of "Hard Worker"

There was some discrepancy with the meaning of the word "trabajador." The researcher was attempting to convey the notion of a "hard-worker," but realized that the translation is not universally understood as such. Most of the farmers were skeptical about this word because they were afraid that if they answered affirmatively, it would appear that they were slave-drivers or were only interested in cheap labor. Most of the farmers tried to communicate that while it is important that the students work hard, they were just as interested, if not more, in their abilities as consultants, informants, sources of ideas, and the like. They were more interested in the information brought by the students than the manual labor they could provide. Often times, this resulted in a "maybe" response.

Table 4-25. Student Perceptions of the Role of the Farmer in the Work Experience Module

	Perceptions of What the Role of the Farmer Actually Was					
Role	N	Yes %	Maybe%	No %	Mean[1]	SD
Learn from student	78	55.1	41.0	3.8	1.51	.57
Development of ideas	78	47.4	48.7	3.8	1.44	.57
Conduct experiments w/student	78	20.5	53.8	25.6	.95	.68
Teach new skills to student	78	51.3	34.6	14.1	1.37	.72
Value traditional knowledge	78	65.4	30.8	3.8	1.62	.56
Value other opinions	78	76.9	17.9	5.1	1.72	.56
Joint problem solving	78	53.8	39.7	6.4	1.47	.62
Identify community issues	78	29.5	57.7	12.8	1.17	.63
Help sustainable agriculture efforts	78	52.6	38.5	9.0	1.44	.66
Committed to region's ecosystem	78	46.2	43.6	10.3	1.36	.66
Informant role	78	33.3	56.4	10.3	1.23	.62
Model of inspiration	78	61.5	32.1	6.4	1.55	.62
Provide educational experiences for students	78	59.0	26.9	14.1	1.45	.73

[1] The mean was calculated from responses corresponding to a 3pt. Likert-scale: 0 = none, 1 = a little, and 2 = a lot

Technical Knowledge

The rationale behind farmers' answers to whether or not students should have technical knowledge in the appropriate area was usually one of the following:

- The student should have technical knowledge in the areas that the farmer wanted help with…or else, what good would they be?
- Wasn't the point of the course to help them improve this knowledge? So, their technical knowledge doesn't have to be great…hopefully by the end of their time with the farmer, it will have improved.

A few farmers placed a high importance on the students having technical knowledge because they never had the opportunity to receive a formal education. This was their only way to become educated.

Theoretical and Practical Knowledge Dyad

Another common theme was the opinion that the combination of theoretical and practical knowledge was optimum and only achieved when a two-way exchange of knowledge occurred. According to the farmers, this meant that the students brought the theoretical knowledge and they shared their practical knowledge with them.

Environmental Consciousness

Many farmers expressed having awareness of the importance of the environment and the health of the rivers in particular. Farmers were emphatic that the students helped educate them on the negative effects that animal waste and the use of fertilizers can have on the environment and served to motivate them to use fewer chemicals and plant trees.

Professionalism

Most farmers interpreted the question asking if students acted in a professional manner in a way unanticipated by the researcher. The farmers perceived this question to mean that the student conducted him or herself in a manner that reflected superiority over

the farmer. Most farmers responded that the students should not, and did not act professionally.

Trust as a Prerequisite for Communication

Just as communication came through as an important interpersonal characteristic, so did trust. Farmers perceived trust actually as a prerequisite to good communication. As part of the students preparation for working with the farmers, the researcher witnessed faculty encouraging students to eat whatever food is placed in front of them when at all possible, as a matter of courtesy. Interestingly, the researcher found that the example the farmers used most to substantiate that the students were honest and sincere was when students were honest about what they did or did not like to eat.

Social Benefits

While many of the farmers looked to the students to bring knowledge, ideas, information, and motivation, some farmers were more interested in the social benefits of having the students. One farmer recounts. "I don't have daughters and my last student filled that space for me. The students feel like part of the family and I like to just spend time with them…talking, even watching T.V." This sentiment of the farmers was not gender specific.

Gender

During the interviews, it was noted whether the farmer had males or females working on their farm. If the farmer had more than one student, the farmer was asked to evaluate each of them. There was no significant differences reported by gender. The following statements were made: "[male] had more technical knowledge than [female] because he has a farm background," " [female] was a little more creative than [male]," "[female] taught me more skills that I could actually apply than [male]."

Students as a Link to Experts

Farmers elaborated on the importance of the students as links between them and the university. Even when the students did have the information themselves, the farmers viewed the students as their access to the information of the professors and relied on them to bring the information they requested to the farm. They are seen as necessary in order to guide research studies done at the university so they are applicable to the farmers.

When this system of communication was said to be weak, the lack of professor involvement was always the reason given. Farmers expressed the desire to have more contact with the professors, especially in La Argentina.

Qualitative Findings from Farmer Focus Groups

During the final stage of data collection, the researcher organized and facilitated focus groups in each of the farming communities to clarify questions and comments that arose during the farmer interviews and to provide the opportunity for farmers to elaborate and speak candidly. Focus groups contained from four to seven participants. Only one farmer attended the proposed meeting in the community, El Hogar, so an interview was conducted with him and results were incorporated into those from the farmer interviews. Therefore, focus groups were only conducted in the other communities; two in La Argentina and one in La Lucha. A neutral facilitator with experience in participatory investigation whose native language is Spanish was identified at EARTH University to co-facilitate the farmer focus groups with the principle researcher.

Farmer Focus Group Findings: Objective 2

Roles of the farmers and students

When farmers were asked what they felt was (were) the role(s) of the students, two themes emerged. It was evident that the farmers perceived the students' role to be to give

as well as to receive. The concept of an exchange is constant throughout their responses. Some farmers felt that the students taught the farmers, while others felt as though the farmers were doing most of the teaching. In terms of giving, the farmers viewed the students as bringing knowledge and ideas, and helping the farmers to network. Farmers were aware that both theoretical and practical knowledge were most effective when used as a dyad and felt that the students contributed greatly to their base of theoretical knowledge. Farmers mentioned that they felt that the students also contributed to knowledge in the areas of sustainable agriculture, waste management, and practices that reduce agricultural impacts on the environment. Farmers did recognize that students were not experts, but perceived them as their point of access *to* the experts, and other knowledgeable entities and sources of information through EARTH. The farmers expressed that they wanted an environment for mutual learning. It was emphasized repeatedly that the farmers preferred that students bring new ideas and information than manual labor. This concept was also evidenced in the farmers' hesitance at using the word "trabajador," discussed previously. In fact, farmers listed their fear that the student may feel enslaved as one of their preoccupations. However, when asked to free-list the hopes and expectations the farmers had of their students, the *female* farmers listed such things as, "a hard worker," "physically able," a student that is physically big and can do double the work of one man," and "the savior."

The second dominant theme that emerged was that the students were also supposed to receive something from this experience. The farmers felt that they were supposed to be giving the students a genuine perspective of the real life of the farmer… "our food, our values, our customs…" Farmers felt that it was their role to teach the students how people work in the country… "people that don't have formal education…to see that the manner in

which they work is different and that we can exchange practices." Farmers stated that the students truly received an accurate perspective of the farmers' way of life: "This is a real experience for the students…the farmers don't act artificially because the students are here…for example, when it rains, the farmers don't work…and so neither do the students. The farmers don't continue to work in the rain just for the sake of the students."

One role of the students that the farmers admitted they hadn't counted on was their company. A farmer recounted, "The company of the students…it was like they were friends, sons, or daughters…part of the family…" The farmers portrayed their relationship with students as very strong, evidenced by the fact that the students stayed in contact with the farmers long after they were finished with the module. "[Besides everything else] they teach us English, to write, help us translate letters, and stay in contact from the moment they leave."

Qualitative Findings from Student Focus Groups

During the final stage of data collection, the researcher organized and facilitated student focus groups to clarify questions and comments that arose during the student surveys and to provide the opportunity for students to elaborate and speak candidly (n = 8-12). Representative students from La Argentina, La Lucha, and El Hogar attended the focus groups. A bilingual student was chosen to co-facilitate both focus groups with the principle researcher.

Findings from Student Focus Groups: Objective 2

How farmers perceived the students

In order to gain an understanding of the dynamic of the relationship between the student change agent and the farmer, the researcher asked the students to describe how they *think* that their host farmer perceived them (the students themselves). Common themes

were that the farmers recognized the students' willingness to work, their contribution to solving problems, their desire to make a difference, and potential as an opportunity for cultural exchange. Students also mentioned that instead of being seen as consultants, they were often seen as a: spectator, child, friend, or visitor. While most students felt that the farmers acknowledged their motivation and interest in helping the farmer, one student reported that his farmer only saw him as "a student who needed to pass the class."

How Students Perceived the Farmers

Students were then asked how they perceived the farmers, in their own words. Many contradictions arose. While some students reported comments such as, "Conservative and closed minded: not willing to make changes on the farm," others presented their farmers more like "a visionary…a dreamer who found motivation in life…" Overall, the students found their host-farmers to be "good people," or "buena gente."

Purpose of Course and Achievement of Stated Purpose

Students were first asked to name as few or as many purposes of the WEM that they believed existed, in their own words. Once these purposes were recorded, clusters of 2 or 3 students were asked to come up with a score for each purpose, indicating if had been achieved according to their experience in the WEM. The purposes that were reported as being well accomplished, given a score of 5, were the following: To discover possible solutions and alternatives with the farmers, to acquire experience, to put university knowledge to practice, to develop our (student) knowledge, to grow professionally, to help develop farm goals with the farmer, and to grow personally. Some other purposes accomplished well (a score ≥ 4) were: to expose the students to reality and to let the farmers know our (students') technical competency and capacity to make a difference through problem solving. Purposes stated by the students that they felt were hardly

accomplished (score ≤ 3.5) included: contributing to the equality of life of the farm family and encouraging an entrepreneurial mentality (within the farmer). One group felt that they had made effective use of participatory methods (score of 5) while another group identified this as a weakness (score of 2).

Positive Experiences

Students were give slips of paper and asked to brainstorm about their experiences in regard to the WEM. Then, they were asked write down positive experiences (if any) on one side of the paper, and negative experiences (if any) on the other side of the paper. Students then anonymously handed in the papers. Students recounted a myriad of rich experiences that ranged from applying knowledge and principles to various situations, building trust and the skill of being empathetic, and even making soaps, candles, and Bokashi while at the same farm! Students mentioned learning how to work with farmers even when they were reluctant to try something, and having the opportunity to apply their knowledge directly to issues on the farm.

Negative Experiences

Students also described negative experiences. The most common theme related to gender. The following quotes depict it most accurately: "The farmer always looked to the male student for confirmation of everything and anything I said; only he had credibility and had to validate what I said" and "My student partner was more of a 'machista' [chauvinist] than the farmer and challenged me the whole time…[regarding] who could do more manual labor…so, I didn't learn anything valuable." Other students reported having their progress impeded by problems between partners regardless of gender as well. Other themes were the lack of motivation of the farmer to work on projects with the students and that rain prevented them from working.

Utilization of Time

Students were asked to discuss the good and poor uses of time during the WEM. It was clear that the students valued their social time with the farmers, learning, and making progress in terms of their projects. Common good uses of time were: lunch time to share and chat with the farmer; in the morning hours…work in the morning is always more productive; working on specific projects on the farm; exchanging knowledge with the farmer; learning; when the farmer is excited about new projects aside from his / her daily routine and chores. Students offered severe criticism of both the WEM workshops held at the university for the students, and the workshops put on for the farmers. The students claimed that the workshop for students "are repetitive…you don't learn anything and they are boring and the material is obvious." They also stated that "farmers are unmotivated to go to the workshops in the community because they are expected to go year after year " and "…the topics are not of interest to the majority of the farmers." Students considered the following poor utilization of time: the workshops for the students held at EARTH ("They take time away from us working with the farmers because we have to leave early to return to campus and the workshops stink"); the workshops held in the community; the topics at the workshops; and when the farmers don't want to work because of rain or because they want to rest in the afternoon.

Objective 2 (previously stated), and Objective 3. To determine the perceptions of the farmers, students, and faculty with respect to the present role of the WEM in community development, and what they perceive the role should be. This part of the chapter combines objectives 2 and 3 because many of the questions regarding the role of the WEM relate directly or indirectly to community development.

Perception of the Participants regarding the role of the Work Experience Module (WEM)

Faculty Perceptions

The faculty were asked to indicate their level of agreement that each of the 16 statements "should be" the role of the WEM by circling the appropriate choice (yes, maybe, no) on a 3 pt. Likert-scale (Table 4-26). The possible roles were generated from the stated objectives and mission of the WEM as set forth by EARTH University and from the researcher's prior experience with participants of the program.

A strong majority of faculty answered "yes" to all of the roles listed except the role stating that the WEM should "Support individual projects only." A strong majority disagreed with this statement. All 9 faculty members thought that the roles of the WEM should include:

- The WEM should function as a point of educational interchange between students, professors, and local farmers
- It should function to aid efforts in sustainable agriculture
- It should identify aspects where the university should focus its research
- It should serve as a communication link between research and the farmers
- It should be used to transfer information to farmers that is based on research
- It should use the students as a link between technology, knowledge, and services of other institutions that work in the humid tropic region and the farmers
- It should serve as a component of an integrated extension system that would consist of EARTH, the Ministry of Agriculture (government extension service), and other entities that are involved in extension efforts
- It should be a means to inform and teach farmers about global events (ie. NAFTA, CAFTA) that affect agriculture markets

The most faculty reporting to be undecided on an item (indicating "maybe") occurred with the statement that the WEM should improve the quality of life of the farmers.

Faculty members were then asked to indicate their level of agreement that each of the 16 statements actually was the role of the WEM, according to their experience with the program during 2004 (Table 4-26). Most of the faculty felt that in 2004, the WEM served: to aid in efforts of sustainable agriculture, to provide information to the farmers that was based on research, as a point of communication between the researchers and the farmers, to help farmers to make practice and behavior changes on their farms, and as a point of interchange between students, professors, and local farmers (96.8%, 93.5%, 93.5%, 87.1%, 83.9%, respectively). The majority of the faculty did not think that the WEM served: to support only individual projects of farmers (rather than supporting farmers working together), as a component of an integrated extension system, to help farmers work collectively (80.6%, 54.8%, and 51.6%, respectively).

The last page of the questionnaire contained space for the faculty to comment or perhaps elaborate or explain why they responded a certain way on the questionnaire. The following comments were made:

"It's necessary to do more participatory research in the communities with a systematic methodology rather than improvising" and "State institutions are very paternalistic and we shouldn't just give things to the farmers [like free hand-outs]. When the institution takes away its support, they abandon the producer, leave him with nothing, and all the work and effort is lost."

Table 4-26. Faculty Perceptions of the Role of the Work Experience Module.

Role	Perceptions of What the Role of the WEM Should Be (%)						Perceptions of What the Role of the WEM Actually Was (%)					
	N	Yes	Maybe	No	Mean[1]	SD	N	Yes	Maybe	No	Mean[1]	SD
Point of educational interchange	9	100.0	0.0	0.0	2.00	.00	9	77.8	11.1	11.1	1.67	.71
Behavior, practice change	9	100.0	0.0	0.0	2.00	.00	9	66.7	33.3	0.0	1.67	.50
Efforts in sustainable agriculture	9	100.0	0.0	0.0	2.00	.00	9	55.6	44.4	0.0	1.55	.53
Aid members of the community in greatest need	9	44.4	44.4	11.1	1.30	.71	9	44.4	44.4	11.1	1.30	.71
Compliment MAG	9	33.3	0.0	66.7	0.67	1.00	9	44.4	11.1	44.4	1.00	1.00
Improve community quality of life	9	100.0	0.0	0.0	2.00	.00	9	66.7	33.3	0.0	1.67	.50
University research efforts focused on community needs	9	77.8	22.2	0.0	1.78	.44	9	22.2	44.4	33.3	0.89	.78
Point of communication between researchers and farmers	9	88.9	11.1	0.0	1.90	.33	9	33.3	22.2	44.4	0.89	.93
Incorporate national priorities	9	44.4	11.1	44.4	1.00	1.00	9	22.2	22.2	55.6	0.67	.87
Provide information based on research	9	100.0	0.0	0.0	2.00	.00	9	33.3	66.7	0.0	1.30	.50
Use students as a connection	9	88.9	0.0	11.1	1.78	.67	9	22.2	66.7	11.1	1.11	.60
Component of an integrated extension system	9	55.6	44.4	0.0	1.56	.53	9	22.2	77.8	54.8	1.22	.44
Inform about global events	9	77.8	22.2	0.0	1.78	.44	9	33.3	55.6	11.1	1.22	.67
Support individual projects only	9	11.1	11.1	77.8	.33	.71	9	11.1	22.2	66.7	.44	.73
More support for urgent problems/issues	9	77.8	11.1	11.1	1.67	.71	9	55.6	33.3	11.1	1.40	.73
Help farmers work collectively	9	88.9	0.0	11.1	1.78	.67	9	44.4	55.6	0.0	1.40	.53

[1] The mean was calculated from responses corresponding to a 3 pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes

Student Perceptions

The students were asked to indicate their level of agreement that each of the 16 statements "should be" the role of the WEM (Table 4-27). The possible roles were generated from the stated objectives and mission of the WEM as set forth by EARTH University and from the researcher's prior experience with participants of the program.

Most of the students agreed with each of the possible roles except that the WEM should only support individual projects (rather than farmers working together) and that it should compliment the extension activities of MAG. On these two particular items, the majority of student responses were split between "no" and "maybe." At least 83% agreed that the following should be roles of the WEM (from the highest percent):

- The WEM should function as a point of educational interchange between students, professors, and local farmers
- It should serve as a communication link between research and the farmers
- It should function to aid efforts in sustainable agriculture
- It should be used to transfer information to farmers that is based on research
- It should use the students as a link between technology, knowledge, and services of other institutions that work in the humid tropic region and the farmers
- It should help farmers make behavioral and practice changes on their farms
- It should provide more support for student projects that reflect the most urgent problems and needs of the community
- It should help farmers work collectively
- It should identify aspects where the university should focus its research

Students were then asked to indicate their level of agreement that each of the 16 statements actually was the role of the WEM, according to their experience with the program during 2004 (Table 4-27). The majority of students felt the WEM did serve as a

point of educational interchange between students, professors, and farmers; that it helped farmers make behavioral and practice changes; and that it helped farmers work collectively (51.3%, 57.7%, and 51.3%, respectively). The potential role that received the most "no" responses was that the module complimented the Ministry of Agriculture's extension efforts.

Farmer Perceptions

Farmers were asked to indicate their level of agreement that each of the 16 statements "should be" the role of the WEM by circling the appropriate choice (yes, maybe, no) on a 3 pt. Likert-scale (Table 4-28). The possible roles were generated from the stated objectives and mission of the WEM as set forth by EARTH University and from the researcher's prior experience with participants of the program.

Table 4-27. Student Perceptions of the Role of the Work Experience Module.

Role	Perceptions of What the Role of the WEM Should Be (%)						Perceptions of What the Role of the WEM Actually Was (%)					
	N	Yes	Maybe	No	Mean[1]	SD	N	Yes	Maybe	No	Mean[2]	SD
Point of educational interchange	80	93.8	5.0	1.3	1.93	.31	78	51.3	39.7	9.0	1.42	.65
Behavior, practice change	80	86.3	12.5	13.8	1.85	.39	78	57.7	38.5	3.8	1.54	.57
Efforts in sustainable agriculture	80	91.3	8.8	0.0	1.91	.28	78	50.0	46.2	3.8	1.46	.57
Aid members of the community in greatest need	80	72.5	25.0	2.5	1.70	.51	78	42.3	47.4	10.3	1.32	.65
Compliment MAG	80	45.0	31.3	23.8	1.21	.81	78	21.8	35.9	42.3	0.79	.78
Improve community quality of life	80	76.3	20.0	3.8	1.73	.52	78	42.3	48.7	9.0	1.33	.64
University research efforts focused on community needs	80	83.8	15.0	1.3	1.83	.41	78	32.1	46.2	21.8	1.10	.73
Point of communication between researchers and farmers	80	90.0	10.0	0.0	1.90	.30	78	41.0	43.6	15.4	1.26	.71
Incorporate national priorities	80	68.8	25.0	6.3	1.63	.60	78	29.5	48.7	21.8	1.08	.72
Provide information based on research	80	91.3	8.8	0.0	1.91	.284	78	46.2	44.9	9.0	1.37	.65
Use students as a connection	80	88.8	10.0	1.3	1.88	.37	78	43.6	39.7	16.7	1.27	.73
Component of an integrated extension system	80	63.0	27.5	8.8	1.55	.65	78	19.2	51.3	29.5	0.90	.65
Inform about global events	80	81.3	16.3	2.5	1.79	.47	78	33.3	35.9	30.8	1.03	.81
Support individual projects only	80	38.3	30.0	31.3	1.08	.84	78	25.6	42.3	32.1	0.94	.76
More support for urgent problems/issues	80	86.3	12.5	1.3	1.85	.39	78	35.9	48.7	15.4	1.21	.69
Help farmers work collectively	80	83.8	15.0	1.3	1.83	.41	78	51.3	30.8	17.9	1.33	.77

[1] The mean was calculated from responses corresponding to a 3pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes
[2] The mean was calculated from responses corresponding to a 3pt. Likert-scale: 0 = none, 1 = a little, and 2 = a lot

The majority of the farmers agreed that the WEM should fulfill all the 16 potential roles except that it should only support individual farmer projects (rather than supporting farmers working together). All 31 farmers agreed that the role of the WEM should include:

- The WEM should function as a point of educational interchange between students, professors, and local farmers
- It should function to aid efforts in sustainable agriculture
- It should identify aspects where the university should focus its research
- It should serve as a communication link between research and the farmers
- It should be used to transfer information to farmers that is based on research
- It should use the students as a link between technology, knowledge, and services of other institutions that work in the humid tropic region and the farmers
- It should serve as a component of an integrated extension system that would consist of EARTH, the Ministry of Agriculture (government extension service), and other entities that are involved in extension efforts
- It should be a means to inform and teach farmers about global events (ie. NAFTA, CAFTA) that affect agriculture markets

Farmers were most undecided on whether or not the role of the module should be to improve the quality of life of the community. The majority felt strongly that the module should not only support projects of individual farmers.

Farmers were then asked to indicate their level of agreement that each of the 16 statements actually was the role of the WEM, according to their experience with the program during 2004, by choosing the appropriate choice (yes, maybe, no) from a 3 pt. Likert-scale (Table 4-28). Most of the farmers reported that the WEM aided in efforts in sustainable agriculture, served as a communication link between researchers and farmers, and provided information based on research (96.8%, 93.5%, and 93.5%, respectfully). Table 4-28 provides the complete results. The majority of farmers felt that the module did

not only support individual projects and did not serve as a component of an integrated extension system. Interestingly, 48.4% of the farmers answered "yes" that the module complimented the extension efforts of the Ministry of Agriculture (MAG) and 48.4% of the farmers answered "no," indicating that the module did not complimented MAG. The items that received the most "maybe" responses were whether or not the module improved the quality of life of the community, and whether or not university research efforts were actually focused on community needs.

Table 4.28. Farmer Perceptions of the Role of the Work Experience Module.

Role	Perceptions of What the Role of the WEM Should Be (%)						Perceptions of What the Role of the WEM Actually Was (%)					
	N	Yes	Maybe	No	Mean[1]	SD	N	Yes	Maybe	No	Mean[1]	SD
Point of educational interchange	31	100.0	0.0	0.0	2.00	.00	31	83.9	6.5	9.7	1.74	.631
Behavior, practice change	31	93.5	6.5	0.0	1.94	.25	31	87.1	9.7	3.2	1.84	.45
Efforts in sustainable agriculture	31	100.0	0.0	0.0	2.00	.00	31	96.8	3.2	0.0	1.97	.18
Aid members of the community in greatest need	31	90.3	3.2	6.5	1.84	.53	31	61.3	29.0	9.7	1.52	.68
Compliment MAG	31	96.8	0.0	3.2	1.94	.40	31	48.4	3.2	48.4	1.00	1.00
Improve community quality of life	31	90.3	9.7	0.0	1.90	.30	31	64.5	22.6	12.9	1.52	.72
University research efforts focused on community needs	31	100.0	0.0	0.0	2.00	.00	31	64.5	25.8	9.7	1.55	.67
Point of communication between researchers and farmers	31	100.0	0.0	0.0	2.0	.00	31	93.5	6.5	0.0	1.94	.25
Incorporate national priorities	31	96.8	3.2	0.0	1.97	.18	31	74.2	9.7	16.1	1.58	.76
Provide information based on research	31	100.0	0.0	0.0	2.00	.00	31	93.5	6.5	0.0	1.94	.25
Use students as a connection	31	100.0	0.0	0.0	2.00	.00	31	48.4	9.7	41.9	1.06	.96
Component of an integrated extension system	31	100.0	0.0	0.0	2.00	.00	31	35.5	9.7	54.8	0.81	.95
Inform about global events	31	100.0	0.0	0.0	2.00	.00	31	74.2	9.7	16.1	1.58	.76
Support individual projects only	31	12.9	6.5	80.6	.32	.70	31	12.9	6.5	80.6	0.32	.70
More support for urgent problems/issues	31	93.5	3.2	3.2	1.90	.40	31	58.1	25.8	16.1	1.42	.76
Help farmers work collectively	31	90.3	3.2	6.5	1.84	.52	31	32.3	16.1	51.6	.81	.91

[1] The mean was calculated from responses corresponding to a 3 pt. Likert-scale: 0 = no, 1 = maybe, and 2 = yes.

Objective 4. To identify consistencies or inconsistencies within and between the groups of respondents (students, farmers, and faculty) through triangulation of the data obtained by objectives 2 and 3

Differences between what *Should Be* and what *Actually Was*

In order to identify consistencies or inconsistencies within groups of responses between what their perceptions of what each role should be and what it actually was according to their first-hand experience as participants in the module, paired t-tests were run for each *should be-actually was* pair. Scores were assigned for each answer (yes, maybe, no) according to a 3 pt. Likert-scale with the values of 2, 1, or 0. The measure that was analyzed is the mean difference between the paired scores at the .05 significance level.

Paired t-test for the Role of the WEM

Faculty Paired Response Test

Table 4-29 shows the faculty paired response test with respect to the role of the WEM. Six of the 16 were found to be significant at the .05 level. Results indicate a significant discrepancy between what farmers felt the role of the WEM should be and what it actually was in 2004 in terms of the following (with the mean differences of .60 or greater): serving as a communication link between research and the farmers (1.0); identifying aspects where the university should focus its research (.89); being used to transfer information to farmers that is based on research (.67); and using the students as a link between technology, knowledge, and services of other institutions that work in the humid tropic region and the farmers (.67).

Student Paired Response Test

Table 4-30 shows the student paired response test with respect to the role of the WEM. All 16 items were found to be significant at the .05 level for a number of items.

Those with the greatest mean differences between what the students felt the role of the WEM should be and what it actually was in 2004 were: informing and teaching farmers about global events (ie. NAFTA, CAFTA) that affect agriculture markets (.77); identifying aspects where the university should focus its research (.73); serving as a component of an integrated extension system that would consist of EARTH, the Ministry of Agriculture (government extension service), and other entities that are involved in extension efforts (.70); supporting projects that reflect the most urgent problems facing the community (.65); serving as a communication link between research and the farmers (.65); and using students as a link between technology, knowledge, and services of other institutions that work in the humid tropic region and the farmers (.62).

Table 4-29. Faculty Paired Response Test: Role of the Work Experience Module.

Role	Mean[1]	SD	t	Significance
Behavior, practice change	.33	.50	2.000	.081
Efforts in sustainable agriculture	.44	.53	2.530	.035
Improve community quality of life	.33	.50	2.000	.081
University research efforts focused on community needs	.89	.93	2.874	.021
Point of communication between researchers and farmers	1.0	.87	3.464	.009
Provide information based on research	.67	.50	4.000	.004
Use students as a connection	.67	.50	4.000	.004
Component of an integrated extension system	.33	.50	2.000	.081
Inform about global events	.56	.53	3.162	.013

[1] Refers to the mean of the differences, calculated by: *should be – was* responses.

Table 4-30. Student Paired Response Test: Role of the Work Experience Module.

Role	Mean[1]	SD	t	Significance
Point of educational interchange	.50	.64	6.904	.001
Behavior, practice change	.31	.67	4.053	.001
Efforts in sustainable agriculture	.46	.60	6.835	.001
Aid members of the community in greatest need	.41	.67	5.384	.001
Compliment MAG	.44	.82	4.722	.001
Improve community quality of life	.41	.63	5.722	.001
University research efforts focused on community needs	.73	.75	8.602	.001
Point of communication between researchers and farmers	.65	.72	8.047	.001
Incorporate national priorities	.56	.70	7.170	.001
Provide information based on research	.54	.66	7.222	.001
Use students as a connection	.62	.71	7.690	.001
Component of an integrated extension system	.70	.80	7.524	.001
Inform, global events	.77	.85	7.977	.001

Table 4-30. Continued

Role	Mean[1]	SD	t	Significance
Support individual projects only	.13	.57	1.998	.049
More support for urgent problems/issues	.65	.74	7.851	.001
Help farmers work collectively	.50	.73	6.015	.001

[1] Refers to the mean of the differences, calculated by: *should be* – was responses.

Farmer Paired Response Test

Table 4-31 shows the farmer paired response test with respect to the role of the WEM. Eleven items were found to be significant at the .05 level. Results indicate a significant discrepancy between what farmers felt the role of the WEM should be and what it actually was in 2004 in terms of the following (with the mean of the differences of .60 or greater): serving as a component of an integrated extension system that would consist of EARTH, the Ministry of Agriculture (government extension service), and other entities that are involved in extension efforts (1.19); helping farmers work collectively (1.03); and complimenting the extension efforts of MAG (.94).

Paired t-test for the Role of the Farmer in the WEM

Student Paired Response Test

Table 4-32 shows the student paired response test with respect to the role of the farmer in the WEM. All 13 items were found to be significant at the .05 level. Mean differences of at least .60 between means of what students felt the role of the farmer should be and what it actually was in 2004 were reported for the following (with the mean of the differences for each): conducting experiments with the student (.69); and identifying the communities problems, needs, and hopes (.60).

Farmer Paired Response Test

Table 4-33 shows the farmer paired response test with respect to their role in the WEM. Only 3 items were found to be significant at the .05 level. The only mean difference of at least .60 between means of what farmers felt their role should be and what it actually was in 2004 was reported for the following: conducting experiments with the student (.65).

Paired t-test for the Role of the Student in the WEM

Student Paired Response Test

Table 4-34 shows the student paired response test with respect to their role in the WEM. Twenty-seven of the 28 items were found to be significant at the .05 level. Mean differences of at least .60 between means of what students felt their role should be and what it actually was in 2004 were reported for the following (with the mean of the differences for each): helping those of the community most in need (.96); conducting experiments with farmers (.70); stimulating farmers to conduct their own experiments (.68); teaching the farmer new skills (.63); and being committed to improving the quality of life of the community (.60); and being committed to the region's ecosystem.

Table 4-31. Farmer Paired Response Test: Role of the Work Experience Module.

Role	Mean[1]	SD	t	Significance
Point of educational interchange	.26	.63	2.278	.030
Aid members of the community in greatest need	.32	.65	2.752	.010
Compliment MAG	.94	1.00	5.220	.001
Improve community quality of life	.39	.80	2.683	.012
University research efforts focused on community needs	.45	.68	3.724	.001
Incorporate national priorities	.39	.80	2.683	.012
Use students as a connection	.94	.96	5.404	.001
Component of an integrated extension system	1.19	.95	7.026	.001
Inform about global events	.42	.77	3.053	.005
More support for urgent problems/issues	.48	.72	3.719	.001
Help farmers work collectively	1.03	1.10	5.323	.001

[1] Refers to the mean of the differences, calculated by: *should be – was* responses.

Table 4-32. Student Paired Response Test: Role of the Farmer in the Work Experience Module.

Role	Mean[1]	SD	t	Significance
Learn from student	.30	.63	4.157	.001
Development of ideas	.49	.62	6.953	.001
Conduct experiments w/student	.69	.74	8.219	.001
Teach new skills to student	.42	.72	5.248	.001
Value traditional knowledge	.32	.57	4.969	.001
Value other opinions	.26	.59	3.833	.001
Joint problem solving	.47	.60	7.017	.001
Identify community issues	.60	.61	8.720	.001
Help sustainable agriculture efforts	.42	.64	5.885	.001
Committed to region's ecosystem	.54	.70	6.825	.001
Informant role	.56	.64	7.829	.001
Model of inspiration	.35	.58	5.296	.001
Provide educational experiences for students	.46	.64	6.385	.001

[1] Refers to the mean of the differences, calculated by: *should be – was* responses.

Table 4-33. Farmer Paired Response Test: Their Role in the Work Experience Module.

Role	Mean[1]	SD	t	Significance
Conduct experiments w/student	.65	.84	4.284	.001
Identify community issues	.23	.56	2.244	.032
Help sustainable agriculture efforts	.10	.30	1.793	.083
Model of inspiration	.26	.51	2.794	.009

[1] Refers to the mean of the differences, calculated by: *should be – was* responses.

Table 4-34. Student Paired Response Test: Their Role in the Work Experience Module.

Role	Mean[1]	SD	t	Significance
Technical knowledge	.54	.50	9.582	.001
Learn from farmer	.30	.54	4.995	.001
Development of ideas	.41	.65	5.675	.001
Conduct experiments w/farmer	.70	.70	8.934	.001
Farmer conduct own experiments	.68	.67	9.000	.001
Teach new skills to farmer	.63	.58	9.607	.001
Value traditional knowledge	.11	.42	2.390	.019
Value other opinions	.04	.19	1.754	.083
Joint problem solving	.43	.55	7.118	.001
Up-to-date information	.41	.57	6.487	.001
Consult w/other resources, specialists	.43	.55	7.118	.001
Creative	.30	.511	5.219	.001
Interest in opinions, ideas	.11	.36	2.830	.006
Good communicator	.10	.30	2.963	.004
Joint learning/working	.18	.42	3.783	.001
Identify community issues	.46	.62	6.726	.001
Help sustainable agriculture efforts	.41	.61	6.049	.001
Committed to improving quality of life	.60	.63	8.540	.001

Table 4-34. Continued

Role	Mean[1]	SD	t	Significance
Committed to region's ecosystem	.60	.67	8.040	.001
Informant role	.53	.55	8.528	.001
Increase farmer capacity to evaluate	.61	.58	9.373	.001
Problem solving strategies	.48	.57	7.413	.001
Practice changes	.40	.65	5.519	.001
Model of inspiration	.24	.56	3.815	.001
Help people help themselves	.49	.55	7.913	.001
Good network, connections	.55	.67	7.308	.001
Groups in need	.96	.70	12.270	.001
Information based on research	.54	.59	8.092	.001

[1] Refers to the mean of the differences, calculated by: *should be – was* responses.

Farmer Paired Response Test

Table 4-35 shows the farmer paired response test with respect to the role of the student change agent in the WEM . Only 4 of the 39 items were found to be significant at the .05 level. Mean differences of at least .60 between means of what the farmers felt the role of the students should be and what they thought it actually was in 2004 were reported for none of the items.. Interestingly, students being a 'hard worker' received a -.23, indicating that farmers perceived that students actually were more hard working than they thought they should be.

Objective 5. To correlate perceptions of the WEM with the level of adoption of CIAS

In order to investigate the possibility that the farmers' perceptions of the student change agent affects the farmers' decisions to utilize CIAS, the researcher conducted quantitative statistical tests. The questions regarding the role of the student change agent on the farmers' interview guide were developed to fit into one of the following categories: knowledge, participation, and interpersonal characteristics. Using summative scales to analyze the questions falling within each category, the researcher used a data reduction technique through SPSS statistical software to test the reliability of aggregating like questions into 3 different constructs. Chronbach's Alpha was reported at an acceptable level (.728) for the knowledge construct but not for the constructs of participation or interpersonal characteristics. The researcher then conducted a crosstabs analysis of the knowledge construct (which represented all of the 'knowledge' questions) with questions pertaining to farmer adoption of alternative agriculture practices. Crosstabs were also run for each of the questions within the participation and interpersonal characteristics categories, and the same questions pertaining to farmer adoption of alternative agriculture practices. Two-by-two contingency tables were created and no statistically reported chi

squared values were reported for each of the set of variables ($p > .05$). Therefore, there was not enough evidence that a relationship existed between farmer perceptions of student change agents and their adoption of CIAS.

Table 4-35. Farmer Paired Response Test: The Role of the Student Change Agent in the Work Experience Module

Role	Mean[1]	SD	t	Significance
Conduct experiments w/farmer	.065	.44	0.812	.001
Farmer conduct own experiments	.16	.52	1.718	.096
Teach new skills to farmer	.16	.52	1.718	.096
Value traditional knowledge	.16	.45	1.976	.057
Hard worker	-.23	.62	-2.038	.050
Creative	.10	.10	1.793	.083
Good communicator	.13	.34	2.108	.043
Committed to improving quality of life	.23	.67	1.880	.070
Problem solving strategies	.16	.45	1.976	.057
Practice changes	.16	.60	1.793	.083
Groups in need	.32	.60	2.997	.005
Information based on research	.16	.52	1.718	.096

[1] Refers to the mean of the differences, calculated by: *should be – was* responses.

Summary

This chapter presented the results of the research pertaining to EARTH University's Work Experience Program in terms of the perceptions of its participants, and the level of adoption of alternative agricultural systems / practices among participating farmers. Basic descriptive statistics were used to analyze responses from the coded questionnaire that was utilized as a census survey for students and faculty and as a structured interview guide for individual farmer interviews. This data generated an understanding of each group of participants' perceptions of their own role and the role of the other participants involved in the 2004 WEM. Data from the questionnaire also revealed participant perceptions of the role of the WEM as a whole, and adoption practices of components of an integrated agricultural system (IAS) among participating farmers. Qualitative data was also collected from focus groups with students and farmers and from conversations during farmer interviews. Triangulation through comparing quantitative and qualitative findings and results among and between respondents provided a way to more fully understand the phenomena being studied and provided more credibility to the analyses. The next chapter will present conclusions for each of the five research objectives accompanied by discussion.

CHAPTER 5
SUMMARY AND CONCLUSIONS

Introduction

This chapter presents the conclusions for each of the five research objectives and its components, accompanied by discussion. The chapter begins with a brief overview of the objectives and methodology utilized followed by discussion and conclusions for each of the objectives. Throughout the discussions are recommendations to assist change agents in their efforts to help farmers adopt and implement appropriate sustainable technologies by giving farmers the opportunity to provide direct feedback regarding educational principles and interpersonal skills employed by EARTH faculty and students in the Work Experience Module (WEM). This information may then be used to establish a model recommended for broader scale adoption or to guide modifications to the existing model.

Objectives of the Study

The general purpose of the study was to evaluate the Work Experience Module according to the perceptions of the participants and the level of adoption of components of an Integrated Agricultural System (IAS) among participating farmers. To accomplish this, the following research objectives and sub-objectives were formulated:

1. Identify factors effecting the farmers' decisions to utilize components of an Integrated Agricultural System (CIAS) by:
    a. identifying components of an integrated agricultural system being utilized on each farm;

b. identifying the source from which the farmer became aware and learned about the component of an integrated agricultural system;

c. identifying the farmer's reasons for adopting, rejecting, or discontinuing the use of a component of an integrated agricultural system;

d. determining if a relationship exists between the adoption of a component, or components of an integrated agricultural system and household characteristics such as farmer gender, and availability of resources (such as land, labor, economic, and other);

2. To determine the perceptions of the participants in relation to their role and the role of other participants of the Work Experience Module, *WEM*, through:
a. determining the perceptions of the student agents and farmers with respect to their own present roles in the WEM and what they perceive their role should be;

   a. determining the perceptions of the farmers with respect to the present role of the student change agents in the WEM and what they perceive their role should be (in terms of educational processes based on the principles of: knowledge, participation, and interpersonal characteristics);

   b. determining the perceptions of the students with respect to the present role of the farmers in the WEM and what they perceive their role should be;

3. To determine the perceptions of the farmers, students, and faculty with respect to the present role of the WEM (especially in community development) and what they perceive the role should be;

4. To identify consistencies or inconsistencies within and between the groups of respondents (students, farmers, and faculty) through triangulation of the data obtained by objectives 2 and 3; and

5. To correlate the perceptions of the WEM with the level of adoption of CIAS.

6. The results provide feedback to EARTH University regarding the WEM and information to other entities involved in extension efforts who are seeking to improve their extension educational programs and services to their clientele.

Methodology

This study specifically focused on the participants' perceptions of the WEM as a means for evaluation of the module. There were three basic data collection procedures employed to achieve the objectives. The first method was a census survey, given to faculty and students, using a quantitative questionnaire . The second method utilized the

same questionnaire as a structured interview guide for interviews with farmers. Focus groups, among students and farmers, were utilized as the third data collection procedure. Findings obtained via both the collateral conversations during individual farmer interviews and focus groups conducted with students and farmers represents common themes mentioned frequently by the farmers and students that provide insight in interpreting the quantitative results obtained via the questionnaire.

Objective One—General Conclusions and Recommendations Regarding the Use of Components of an Integrated Agricultural System by Participant Farmers

A total of 31 farmers from the rural, surrounding communities of EARTH University participated in the 2004 WEM and received student change agents on their farms. In an effort to achieve sustainable agriculture, EARTH University offered agricultural alternatives that when put to use concomitantly, form an integrated agricultural system, or IAS. Students enrolled in the WEM and supporting faculty work with the local, limited-resource farmers in the process of adopting and implementing these system components. Some of the components are innovations and technologies that are also being promoted by local non-governmental organizations, churches, associations, or other entities in the area. It might be useful to know which other entities are involved in promoting different innovations and technologies in order to compare strategies, results, or embark in collaborative efforts in working with the farmers. A detailed description of an IAS and components for one defined for this study is contained in chapter two of this thesis.

There are various components of an IAS for which the most salient adoption was behavior was reported. Farmers provided many reasons why they chose to adopt, reject, or discontinue the use of them. Of the components of an IAS, the highest percentages of

farmers implemented the following: forest species (93.5%), medicinal plants (77.4%), the biodigester (35.5%), traditional compost (35.5%), fish lagoons, and agro-ecotourism preparations (35.5%).

The sources of information from which the farmers reported receiving information about forest species were EARTH students (32.7%), EARTH faculty (28.8%), and traditional knowledge (19.2%), which refers to knowledge of the local (or indigenous) people that has existed and / or developed over time and has been spread mostly through word of mouth or by observing practices of family members or members of the community. When farmers were asked what purpose the trees served on their farms, their knowledge regarding the use of forest species for protection of flora and fauna and augmenting organic matter in the soil was considerable. The farmers that lived nearest the rivers also emphasized the importance of reforestation on the health of the river. The farmers attributed this knowledge to their interactions with EARTH University, and especially with the students through the WEM. Having trees around the houses for aesthetics and as a source of wood for construction purposes were also the main reasons for farmers to have trees. Of the farmers with trees, 72.4% planted them, with the most common types being: Cedro, Laurel, Chanco Blanco, Almendro, and Pilon. It is also interesting to note that one farmer planted trees as an alternative, offered by the government, to paying a fine for illegally logging.

Farmers reported that they received most of their information about medicinal plants from EARTH students (26.7%) and through traditional knowledge (20.0%). Farmers used medicinal plants as homeopathic remedies of illnesses such as headaches, and nausea, and to make soaps and shampoos. As part of agro-ecotourism preparations,

farmers also started processing medicinal plants to sell for the aforementioned purposes to visitors. While medicinal plants were frequently used among the farmers, the most common reasons for not having them were that the farmer had no interest in them or was unsure how to use them. Since the students were the most common source of information regarding medicinal plants, this discrepancy might indicate that there is room for improvement of the students' efforts to educate farmers about this component.

The biodigester was the only component for which the farmers named EARTH faculty (41.4%) as the main source of information. This was because the farmers were only comfortable making such an investment when the innovation was not only proposed by the students, but was also endorsed by the faculty. In addition, EARTH faculty usually directed the installation process on the farm. EARTH faculty and students recommended keeping the biodigester under cover to prevent damage to the apparatus, and 81.8% of farmers with a biodigester followed this recommendation. However, EARTH faculty and students were also promoting the biodigester not just as a sustainable technology, but as a system. An important part of the biodigester system was a series of lagoons for the resultant effluent. Only 18.2% of the farmers with biodigesters used lagoons. They reported that they did not see the value in a lagoon system and preferred to allow the effluent to flow directly onto the land. It is evident that more effective educational messages about the value of the entire IAS is warranted. Particularly, a stronger effort needs to be made in to involve the farmers in the development of the Integrated Agricultural Systems so that they truly address the needs of the farmers and are created and promoted in a way that emphasizes the value to the farmers. Educational

messages are also important to ensure that the adoption of environmental innovations is promoted in a holistic manner (Vanclay, 1994).

The most common reasons why farmers did not implement the biodigester were the cost, that they did not have enough waste to run the biodigester, and that they simply had not gotten around to it yet. One farmer also mentioned that the corral where the manure was collected was too far from the kitchen. Mooney's findings that value-oriented action often times supplants priority given to economic factors over all other goals and values in life, referred to as "formal rationale," (Mooney, 1998 cited in Vanclay, 1994) were substantiated by the following instance regarding a farmer's rejection of the biodigester. As explained earlier in this thesis, the biodigester produces methane gas, or biogas, with which to cook. One farmer had the means, resources, and faith in the biodigester system, but his wife refused to cook with biogas out of personal preference. Therefore, they did not adopt the system.

The only reason that farmers stopped using the biodigester was in a couple of instances where it did not function correctly. The researcher spoke with farmers who mentioned that there was a tear in the polyethylene tubing, but neither had they received help from anyone at EARTH in repairing it, nor had the farmers asked for assistance from EARTH. Hagmann (1996) identifies dialogue with farmers as one of three major elements to improve the development and spreading of innovations. Although the farmers were constantly engaging in dialogue with the student change agent, steps should be taken to examine the *quality* of these conversations. For example, are the real needs of the farmer being identified through discussions? In instances cited in Chapter 4 of this thesis, farmers disclosed issues and problems to the researcher with whom they interacted

on one occasion that they never mentioned to the student change agents. In addition to Hagmann's comments on the development and diffusion of innovations, the sustainability of these innovations needs to be addressed. This implies that EARTH should increase the emphasis on the maintenance of technologies already implemented and continue to seek out farmer feedback periodically after the innovation has already been adopted.

Traditional compost was also promoted most heavily by EARTH students, and then faculty as compared to other sources. Most of the farmers that reported not using traditional compost named that it did not fit into their farm system, or that it was time consuming as the reasons why they did not adopt it. Through farmer interviews, it also became evident that the farmers did not realize that they could compost with crop residues, kitchen waste, or other organic outputs generated from farm activities, other than animal manure. Farmers also reported discontinuing composting when the students left, indicating that rather than the value of the practice itself, perhaps the students were the motivating factor for them to adopt it.

Of the sources named for all of the components of an IAS, the sources listed most frequently that might present the greatest opportunity for cooperation and collaboration with EARTH were: INA, CEDECO, and JAPDEVA. The following innovations received a low reported level of adoption among the farmers. EARTH students and faculty were also named as the main sources from which the farmers received information regarding these same components of an IAS: nutritional blocks, decontamination lagoons, and effective microorganisms. Therefore, EARTH University might be in a prime position to make a significant impact regarding the adoption of these particular components.

When farmers mentioned that the innovation did not fit into the system, they concluded this because they either did not see the benefit of the innovation or because they lacked the resources to use it. This was the most commonly mentioned reason why farmers did not implement an IAS component. It can be inferred that the farmers did not perceive the innovation as meeting a real need. It may be worth exploring whether the innovation, in fact, does not solve their problems or address their needs, or if the benefits of the innovation are just not being communicated properly to the farmer. Ensuring that a two-way exchange of knowledge, information, and ideas is occurring would help better understand the issue. Interestingly, the intensity of labor did not seem to be a limiting factor in adopting innovations; however, the time an innovation was perceived to consume was. Farmers associated high cost with the biodigester, the fish lagoons (especially the cost of dredging and buying fish food concentrate), and decontamination lagoons (cost of dredging). Of the farmers not involved in agro-ecotourism preparations, the main reasons were lack of interest in turning their farms into places for tourists and the concern that such activities would disrupt the regular farm activities. This finding provides further support for Vanclay's (1994) emphasis on value-oriented action; the farmers placed more value on preserving their farms as a "home" rather than transforming them into tourist attractions intending to earn a profit.

Of the components, the highest rate of discontinuance corresponded to worm compost (9 instances). Most farmers reported that the worms succumbed to death either by ants or birds. In this case, there seems to be an inherent problem with the characteristic of the technology itself. Traditional compost, effective microorganisms, fish lagoons, nutritional blocks, and the biodigester also had one or two instances of

discontinuance. It is important to note that the farmers did not hesitate to mention that the students were often their main motivation for implementing an innovation. This is evident in the frequent response that the reason they stopped using a particular practice was because the student(s) left. Another unanticipated result was that many farmers were prevented from implementing components of an IAS, such as lagoons, and compost because of the frequent flooding of the nearby rivers.

Appendix B depicts the adoption trends of each CIAS by community in order to present an overall picture according to which the most efficient efforts may be made. For example, adoption of agro-ecotourism preparations were much more prevalent in La Argentina than for the other communities. Through the WEM and through continuing adult education in La Argentina, PCD had a specific initiative to increase agro-ecotourism activities in that community. This may be perceived as a positive outcome of their efforts. Interviews and focus groups did reveal, however, that income-generating abilities of these preparations (building cabins, nature trails, crafts, and others) were little to none. In fact, all of the farmers expressed that they invested more money in them than they had received. They did consider it an "investment" however and were patient about the tourism sector growing in the area. Considering that presently, the farmers most active in preparing for tourists only receive visitors 2-3 times per year, there are doubts that this is an appropriate initiative for this region. The farmers also complained that the infrastructure and road system is not adequate for tourists. Meanwhile, the agro-ecotourism initiative has brought excitement to the farmers and has motivated them to diversify their farms and learn more skills, such as making handcrafts and using computers to create labels for their processed products. In La Argentina, the farmers

have started an agro-ecotourism association as well. While the economic benefits do not yet look favorable, the social benefits, benefits in terms of life quality and the future return on investment of these activities are yet to be determined.

Statistical tests were run to determine if a relationship exists between the adoption of components of an IAS and the following household characteristics: number of people in the household, the gender of the farmer, the size of the farm (in terms of hectares), whether or not the household was receiving outside income, and in which community the farmer lived. Chi squared values only revealed that a relationship exists between farmers who reside in the La Argentina and their adoption behavior of agro-ecotourism preparations. There was no other statistically significant evidence suggesting a relationship between the other variables.

Predominantly, EARTH University students were the most frequently mentioned source of information regarding the CIAS, followed very closely by EARTH faculty. While EARTH is not the only entity involved in nonformal education and extension efforts, farmers freely expressed that their level of satisfaction with EARTH was superior to that of the other entities. This was due to their constant communication with the students and the role the students played as a link between the farmers and the university experts, and because the faculty has physically been out to the farmers' properties and was familiar with them. This section has provided the most noteworthy issues pertaining to the different components of an IAS and has presented opportunities where, if EARTH chose to focus efforts, would be apt to make the most impact.

The study revealed some overall aspects that influenced farmers' decisions regarding the components of an IAS, overall. Most of the components addressed the

issue of waste management and utilizing waste as an input for the farm system. If the farmers did not have sufficient animals, or animals that were confined in order to collect manure, this was often times the limiting factor to adoption. Another factor that influenced the farmers' decisions to adopt was priority. If the farmers had incorporated the component in their "Mapa Futuro" or future map, that they developed with the students and which served as a blueprint for farm modifications, they perceived it as a priority. If not, the farmers felt as though they had to abide by the plan and gave other innovations lower priority.

For "lower risk" technologies, such as effective microorganisms, and worm compost, the students seemed to provide the greatest motivation to the farmers to adopt. The farmers even admitted that if the students left, so would their motivation to try new things and diversify their farms . In some cases, the farmers discontinued use of the innovations when the students left. This will be discussed in later sections, but begs the question whether the farmers really perceived the value in the innovation itself, or why exactly the farmers felt compelled to adopt an innovation only when the students were around. In regard to "higher risk" innovations, such as the biodigester or lagoons, farmers seemed to insist on the endorsement of the faculty before adopting. Therefore, this study substantiated the claim that risk aversion plays an important role in slowing the adoption of innovation and that farmers assess risk according to the faith they place in the [change agents'] competence (FFTC, 1985).

Innovators and the "Human Factor"

Lastly, some farmers appeared to be exceptionally progressive and appeared to give validity to Rogers' (2003) "innovator" adopter category and what Bidegaray refers to as the "human factor" (Personal communications, November 14, 2004). Still, at least in one

case, a farmer that seems to fit in the "innovator" category had substantially more resources than the other farmers involved in the WEM. It would be interesting to find out the history of the farmer to determine which phenomenon occurred first; Did the farmer's innovative personality lead him to adopt more innovations which allowed the farm to prosper and grow, resulting in more resources…or did he first have more resources than others that allowed him to manage failures without crisis and implement more innovations? Perhaps, the latter is true and supports Waugh, Hildebrand, & Andrew's claim (1989) that the reason why farmers adopt technologies is because they have more resources rather than because they have a particular type of character. If this is the case, attention should be paid that the rich are not becoming richer while the poor are becoming relatively poorer.

Socioeconomic Gap

As Goss observed (1979, cited in Stephenson, 2003) in Latin America, the unequal spreading of innovations actually lead to a wider socioeconomic gap among the people. This concept also refers to the characteristics of the farmers that participated in the WEM as compared to the characteristics of the farmers in the communities that did not participate. This is an area that should be addressed and may be appropriate for further research. Data, discussed farther ahead in the chapter, reveal that the WEM is not reaching or targeting the most needy farmers of the community to participate in the module because their reluctance to experiment with new ideas as a means to avert risk would prevent them from providing a valuable experience for the students. If farmers were paid a stipend in exchange for providing a learning environment for the students (rather than a free handout) perhaps the poorer farmers would have the means to

participate and the opportunity to engage in joint inquiry, exploration, and learning with the student change agent.

Objective Two-General Conclusions and Recommendations Regarding the Perceptions of the Participants in Relation to Their Roles and the Roles of Other Participants and Objective Four-Triangulation to identify Consistencies or Inconsistencies within and between the Groups of Respondents

Conclusions and recommendations for these two objectives are reported together to clearly triangulate between and within groups and to avoid redundancy. The farmers were asked to indicate their level of agreement that each of the 39 statements "should be" the role of the student change agents of the WEM (Table 4.15). Then the farmers were asked what "was" the actual role of the students during 2004 according to their experience

The students were surveyed indicated their level of agreement that each of the 39 statements "should be" their role as change agents in the WEM by circling the appropriate choice (yes, maybe, no) (Table 4.17). Then they were asked to indicate their level of agreement that their actual roles reflected the potential roles by circling the appropriate choice (a lot, a little, and none).

Major Themes and Triangulation of Student and Farmer Responses: The Role of the Student

The majority of the students and farmers agreed that the students should: provide current, up-to-date information; help in the development of problem-solving strategies; work well with the farmer to develop and implement new ideas; take an interest in the farmers' opinions, ideas, and feelings; and think of solutions together with the farmer when there are problems.

Farmers felt that the role of the students should not be to identify the problems, needs and hopes of the community. This finding was consistent with a relatively high

percentage of farmers that thought that the students did not do this. A discrepancy exists however, because while 90.3% of the farmers think that students should conduct experiments with the farmers, only 51.5% of farmers said that the students actually did conduct experiments with them. Farmers reported that they feared the economic risks associated with failure and recommended that experimentation and innovations had the direct endorsement by the faculty, which substantiates findings by FFTC (1985) that a change agent's credibility is a major factor in a farmer's assessment of the level of risk associated with adoption of a technology or practice. Farmers also mentioned that if EARTH provided them with more of the materials needed to experiment, they would do so more often.

Another minor difference occurred because while 100.0% of the farmers thought the students should be good communicators, 87.1% of the farmers said that the students actually were good communicators. Overall, what the farmers thought the role of the students should be, and what it actually was during the 2004 WEC were consistent. Farmers were most undecided about whether or not students should be a hard worker; should possess technical knowledge; should learn from farmers; should be a model of inspiration for the farmers; and should help farmers who are the most in need of the community. Farmers were also undecided whether or not students actually did help farmers most in need in the community. Elaboration regarding the rationale of the farmers behind these perceptions is included in the discussion later in this chapter regarding findings from farmer focus groups.

Although the farmers thought it was the role of the students to conduct experiments with them (90.3%), only 71.6% of students felt it was their role. While only 51.5% of

farmers thought that students actually did conduct experiments with them, even fewer students reported that they conducted experiments with farmers (23.8%). Farmers and students thought that students should stimulate farmers to conduct their own experiments (90.3% and 82.7%, respectively), but a considerably higher percentage of farmers reported that the students actually did stimulate them to conduct their own experiments than the students reported (83.9 % and 32.1% respectively). Perhaps the students were unaware of the magnitude of the impact they had on the farmers or maybe students that a farmer received one trimester lead them to experiment at a later point in time, unbeknownst to the students. Like the farmers, students were not sure if it should be their role to help the farmers most in need of the community, and only 13.8% of the students felt that they actually did do this. Only 18.8% of the students felt that they were committed to improving the quality of life of the farmers, but 74.2% of the farmers felt that the students were. Only 63.0% of the students thought it was even their role to be committed to improving the farmers' quality of life, while a significantly higher, 87.1% of farmers thought this should be the role of the students.

It was very important to the farmers that students possess good connections to specialists and information. In fact, all of the farmers indicated this. On the other hand, only 67.9% of the students thought it was their responsibility to have good connections, and only 31.3% of the students actually thought they possessed such connections. A low percentage of students (33.8%) felt that they helped the farmers make a practice change, but a much higher 83.9% of farmers felt that the students helped them make a practice change. Accordingly, 93.5% of the farmers thought it was the student's role to help them

do this, while only 69.1% of the students thought it was their responsibility to help the farmers make a practice change.

Major Themes and Triangulation of Student and Farmer Responses: The Role of the Farmer

Farmers only responded with a "no" to one of the items referring to their role in the WEM (6.5%). This item stated that it should be their role to identify the problems, hopes, and needs of their community and the rest of the farmers. This sounds deceiving, however, because still, 93.5% of the farmers (all of the remaining) thought that it should be their role. Still, it supports the qualitative findings that the farmers were not united in their views regarding whether or not the community should work collectively or each farm individually. Fewer farmers, 77.4% thought that they actually did this, and even much fewer students (29.5%) thought the farmers identified the problems, needs, and hopes of their community. Students weren't sure whether this should be a role of the farmers or not (22.8%). Only 68.4% of students and 77.4% of farmers reported that they thought the farmers should conduct experiments with the students, but many more farmers thought that they actually conducted experiments with the students (51.6), than the students perceived (20.5%). This is concurrent with the results of the previous section and the discussion regarding farmer experimentation applies here as well.

The farmers emphasized the importance of good communication throughout the interviews. Farmers repeatedly mentioned that trust was the foundation and prerequisite of communication, and substantiated Mwangi's (1998) findings that interpersonal characteristics are key to the success of educational processes.

It is important for participants of the WEM to have a mutual understanding of each of their roles so that the module does not result in disappointments, frustration, or unmet

expectations. Overall, the perceptions of the farmers and students coincided rather well, but instances where they did not should be looked into and the roles should be better defined and understood through the input of each of the participant groups.

Insights Gained From Farmer Focus Groups

When farmers were asked what they felt was (were) the role(s) of the students, two themes emerged. It was evident that the farmers perceived the students' role to be to (1) give, as well as (2) receive. The concept of an exchange is constant throughout their responses. Farmers were aware that both theoretical and practical knowledge were most effective when used as a dyad and felt that the students contributed greatly to their base of theoretical knowledge.

Farmers did recognize that students were not experts. The farmers were generally satisfied with the level of technical knowledge the students possessed because their expectations were not very high. Results from this research still supported Mwangi's findings (1998) that good technical knowledge is a necessary attribute of a change agent, however, because farmers perceived the students as an indirect source of technical knowledge. To clarify, farmers perceived the students as their point of access *to* the experts, and other knowledgeable entities and sources of information through EARTH. It was emphasized repeatedly that the farmers preferred that students bring new ideas and information rather than manual labor. However, when asked to free-list the hopes and expectations the farmers had of their students, the *female* farmers listed such things as, "a hard worker," "physically able," "a student that is physically big and can do double the work of one man," and "the savior."

The second dominant theme that emerged was that the students were also supposed to receive something from this experience. The farmers felt that they were supposed to

be giving the students a genuine perspective of the real life of the farmer… "our food, our values, our customs…" Farmers stated that the students truly received an accurate perspective of the farmers' way of life.

Objective Three—General Conclusions and Recommendations Regarding the Perceptions of the Participants in Relation to the Role of the Work Experience Module (WEM) and Objective Four-Triangulation to identify Consistencies or Inconsistencies within and between the Groups of Respondents

Triangulation of Faculty, Farmer, and Student Responses: The Role of the WEM

All three groups of participants were surveyed regarding the role of the WEM itself. The conclusions and recommendations for these two objectives are reported together to clearly triangulate data between and among groups and to avoid redundancy. The first two participant groups (farmers and students) were described above and the third group consisted of the faculty. A total of 9 faculty members were surveyed.

None of the three participant groups thought it should be or actually was the role of the WEM to only support projects that farmers worked on individually rather than collectively. In other words, no groups were opposed to projects being done collectively. Both faculty and students did not think the WEM complimented the Ministry of Agriculture (48.4% and 42.3%, respectively). Farmers, faculty, and students also did not perceive the WEM to be a component of an integrated extension system made up of other entities involved in extension efforts working in the humid tropic region (54.8%, 54.8% and 29.5%, respectively). A modest 55.6% of the students and 63.0% of the farmers thought that the WEM should be a component of an integrated extension system, while all of the faculty members thought this definitely should be a role of the WEM. Faculty and farmers were in agreement again, that the WEM should improve the quality of life of the communities (100.0% and 90.3%, respectively) but the students reported less support

for this role (76.3%). Concurrently, only 42.3% of the students felt that the WEM actually did improve the quality of life of the farmers in the communities, while the farmers and faculty had a slightly more favorable perception (64.5% and 66.7%, respectively). Only 33.3% of the students and 55.6% of the faculty thought the WEM informed farmers about global events, but 74.2% of farmers felt that it did. All of the farmers thought this should be the role of the WEM, while fewer students and faculty agreed (81.3% and 77.8%, respectively).

Of the 16 items included in the questionnaire regarding the WEM, some of them received a variety of different responses from within the faculty group. Questionnaires administered to faculty were coded in order to classify responses according to program chairs, supporting PCD staff, and supervising faculty members. This was done because the faculty directed the module, and it is crucial that they share the same mission and goals for it. The following section describes both consistencies and inconsistencies within the faculty.

The two program chairs were in agreement on most of the items. They both indicated that the module should not and did not do the following: complement the extension services of the Ministry of Agriculture (MAG), and promote national priorities in agriculture. The support staff (two individuals) indicated that the WEM should indeed complement the extension services of MAG but currently, was not. Neither of the chairs nor the support staff thought the WEM should only support individual farmer projects in lieu of group projects, and three of the four individuals indicated that the module did not do this while one person indicated that “maybe” it did. One program chair indicated that the WEM should help the university identify areas where it should focus its research but

indicated that presently, he did not feel this was happening. The other chair responded "maybe" on both questions. The two chairs were divided on one issue: one felt that the WEM should support projects that responded more to the urgent problems and needs of the community, and that the WEM actually did that. The other chair felt that that should not be a role of the WEM, and that in his opinion, it was not. While the support staff both felt that the WEM should support projects that responded more to the urgent issues of the community, they were divided between "yes" and "maybe" that the WEM actually did.

The program chairs and the support staff all believed that the WEM should help the farmers work collectively, but half of each group were split between "yes" or "maybe" that this was occurring. Hagmann (1996) named the strengthening of self-organizational capacities of rural communities as a major element to improve the development and adoption of innovations. It was evident that particularly in the community, La Argentina, PCD was making group formation efforts. This study revealed that the farmers perceived strong social barriers and resistance to working collectively, but the majority expressed a desire to overcome these obstacles to work together effectively. Further research should be conducted in this area, particularly to understand the farmers' reasoning behind both their perceived negatives and positives associated with working collectively.

Of the supervising professors, the majority felt undecided whether the WEM should or did help the groups of the community in the greatest need. While the majority of the professors felt that the WEM should not compliment the extension services of MAG, the majority also felt that it was currently doing so. All of the professors viewed the WEM as a way to identify aspects where the university should focus research, but

only one individual thought this was occurring. In contrast to the views of the program chairs, the majority of the professors felt that the module should promote national agriculture priorities. Concurrent with the chairs, though, they felt that it currently did not. All of the professors thought that the WEM should serve as a point of communication between research and the farmer but only two of the five felt that this was accomplished; two thought the module was not serving this role, and one individual was unsure.

Like the rest of the faculty, the majority of the professors felt that the module should not and did not support individual farmer projects in lieu of group projects. Like one of the program chairs and the support staff, the professors thought the WEM should support projects more that responded to the urgent needs of the communities. The majority of the professors thought the module was currently doing that. All of the professors, chairs, and staff felt that the module should help the farmers work collectively, and the majority of professors thought that the module was currently achieving that.

Unlike the students and faculty, the farmers completed the questionnaires in the form of a survey, allowing them the opportunity elaborate on their responses. Farmers were divided over the scope of audience the course is supposed to benefit. Namely, should the students help with community development, or stick mostly with the farm to which they are assigned? Another point the farmers raised was that if the students were improving households and farms, they were probably indirectly helping the community. This statement represents the sentiment of about half of the farmers, “It is not the responsibility of the students to worry about the needs of the whole community and their

quality of life because it is too difficult an expectation of students who are only on the farms one day during the week."

Farmers also mentioned that the program should only focus on individual farmers because trying to get the farmers to work together is a "waste of time." Farmers reported the "distrust and corruption" among farmers in the community, and said that they were resistant to working together, illustrated by the following quote, "I don't want to be involved with the problems of the community as a whole because they don't know anything."

Other farmers felt that "Because nobody lives in isolation, a community problem is a problem for everyone to be concerned with. It is important that students identify problems outside the immediate farm as well." Farmers encouraged efforts to help the farmers to unify, but recognized that not everyone will work together, so the module should also work with individuals.

While the majority of farmers said that although they would like the program to help farmers to work together, they weren't effective at doing so. In La Lucha especially, farmers noted that the students and faculty were more concerned with the needs of the community and helping farmers to work in groups this year.

When asked if the module should send students to work with farmers who were the most in need of the community, the majority said no. The reasons for this were that farmers were aware that the responsibility of choosing the farms was not entirely EARTH's. The farms had to agree to participate. Also, farmers recognized that if the farmer had no resources, they would be less likely to adopt innovations or experiment. One farmer stated, "The course can't always decide who it is going to help because it

depends on which farmers want to participate. The course will help the most, the farmers who take the information and follow through with it." As stated previously, past research strongly indicates that not including the farmers most in need will contribute to the widening of the socio-economic gap that already exists. In addition to recommendations already mentioned on how to include this population, further attention must be paid to this issue. If it cannot be directly addressed through the farmers' participation in the WEM, perhaps, EARTH can specifically target them for involvement in other extension education programs.

Insights Gained from Farmer Focus Groups

The farmers were asked, "If you could anonymously give recommendations to the people in charge of the WEM, what would they be?" The strongest theme that can be noted from the farmers' recommendations was their desire that professors be more involved with the program and the students. There were two main reasons why the farmers advocated more professor involvement. First, the farmers believed that they could access the faculty's expertise and rich network of specialists. The farmers emphasized the importance of the visits that professors make to the farms first in terms of their expertise, and then referred to their value as contacts for other sources of knowledge. The following quote illustrates the farmers' reasoning regarding the value of professors as access points, "There should be more integration between the professors that visit the farm and those at the university because the ones who visit don't have all the knowledge but can coordinate with another professor who has knowledge in a particular area." The second reason for having more faculty involvement is that the farmers would perceive implementing new ideas as less risky if the professors were available to validate the students' suggestions.

Another strong theme that emerged from the focus groups was the interest of the farmers in having much more of a feedback and monitoring role regarding the students. They would like the opportunity to report on their progress, and feel that "The professor or someone from the university should ask how the farmers feel with the student in case the farmer or student is unhappy." Similarly, farmers suggested that the professors do a previous evaluation of the farms and students in order to match them up appropriately.

The farmers mentioned repeatedly, that when studies, tests, and impact assessments are done, the results are never given or shown to the farmers. They claimed that they never get the opportunity to see the reports done of their farms, such as soil and water analyses. The following quote adequately reflects this sentiment, "We would like to have a copy of the final report, about the farm and the progress within the 15 week course, that the students hand in to their professor to see if it reflects the reality of what actually occurred during the months of the course." Another farmer mentioned that she has asked to see the results of water analyses done on her farm, but to no avail.

Other suggestions include: "The meetings shouldn't be so early…should begin at 4 in the afternoon instead of 2 pm", and, "The program should continue…it's very useful in terms of exchanging experiences where information is given and received."

Insights Gained from Student Focus Groups

In contrast to other responses, the students were united in their recommendations. The students mentioned that they were constantly trying to improve their credibility as consultants with the farmers. They felt strongly that the administration could assist them by "presenting the students as competent, capable, bright professionals instead of like kids coming to work on the farm." Currently, they feel like "PDC doesn't seem to

recognize the technical capacity of the students, what we are capable of doing and they underestimate our skills and abilities."

Students expressed a lack of direction and not knowing quite what to do once they arrived on the farm. In order to prevent this, students made a few suggestions including that the administration should better explain what their function is on the farm. They feel that "the students should have a specific responsibility on the farm; have one thing to be in charge of instead of random areas; have a FOCUS area" and that perhaps, "PDC should first go out and identify necessities on the farm and then put the student(s) in charge of this specific area of need to solve problems or make improvements."

Students also mentioned problems with having the same households participate over the years. They feel that "with the farmers that have had students for 10 years, anything that *can* be done on their farm, already *has* been done." They also suggest that PDC should make sure that the farms they do select are "receptive to ideas and interested in making and expect to make changes." The students expressed their frustration that farmers were not motivated to spend time on their "joint projects" but preferred to work on regular farm activities and "chores." If the innovations, referred to by the students as their *projects* were in fact meeting a real need of the farmer, why would the students have such a difficult time vying for time for the farmer to devote to the projects instead of on other farm activities? Again, this refers to the quality of the dialogue between the farmer and student. Mayoux (2001) identifies the exchange of information and the collaboration between the farmer and change agent as imperative to adapting an innovation to the contexts and needs of the farmer. If this is not done, the innovation will not have value to

the farmer and will either be rejected or cause undesirable consequences (Chambers, 1997).

The students recommended conducting fewer, but better planned workshops in the community, that address the specific needs of the community. The students also suggest that they stop having the farmers present their "Plan of Work" and "Mapa Futuros" at the beginning and end of the course each trimester. They feel that it is a loss of time for the farmers because it is too frequent.

Objective Four-Significant Differences within Groups of Respondents Between Their Perceptions of What Each Role Should Be and What It Actually Was and Recommendations for Addressing Opportunities for Improvement

Reasons for dissatisfaction and opportunities for better communication among participants can be revealed by identifying differences between what respondents think should be role of participants and the WEM itself, and what they perceive that those roles actually were during 2004. Paired t-tests were run for each *should be-actually was* pair in order to identify inconsistencies.

Participant Responses Regarding the Role of the WEM

Faculty data indicated that of all the potential roles, the most significant discrepancies existed between the following roles: to help farmers make behavior and practice changes; to improve the quality of life of the community, and to serve as a component of an integrated extension system consisting of other entities involved in extension efforts in the humid tropic region. In all cases, higher scores were reported for the *should be* response, indicating that all of the aforementioned areas present opportunities for improvement.

Farmer data indicated that of all the potential roles, the most significant discrepancies existed between the following roles: to serve as a point of educational

exchange between farmers, students, and professors; to improve the quality of life of the community; and to incorporate national agriculture priorities. In all cases, higher scores were reported for the *should be* response. Steps should be taken to better incorporate these priorities of the farmers into the planning of future WEMs.

Student data indicated that all of the potential roles showed a significant discrepancy between what the students thought the role should be and what it actually was. For all three groups of respondents, a difference between the response pair with a mean difference of .60 or more was found for the following roles: to inform and teach farmers about global events (ex. NAFTA or CAFTA) that affect agriculture markets; to identify aspects where the university should focus its research; to use students as a link between technology, knowledge, and services of other institutions that work in the humid tropic region and farmers. Since all three groups feel that the module has not functioned to its potential regarding these areas, efforts for improvement should be focused here.

Participant Responses Regarding the Role of the Farmer in the WEM

Farmer data indicated that four of the potential roles had a significant mean difference but only a mean difference of .60 or more was reported for the role: to conduct experiments with the student. Student data indicated that each response pair demonstrated a significant mean difference with only the following three roles having a mean difference lower than .60: to value traditional knowledge; to value and respect opinions and ideas different than one's own; and to be a model of inspiration and education for the students. It is evident that both the students and farmers expressed a desire to conduct more experiments, so particular attention should be paid to this issue and the reasons given by both groups that the farmers are prevented from engaging in more experiments. It has already been found that risk aversion is a key barrier to experimentation by the

farmers and previous discussion in the chapter offers suggestions for ameliorating risk. A stronger effort also needs to be made to provide more direction and a systematic way to determine what experiments would reveal the most needed information on each farm. Innovations should also have some type of endorsement by the faculty because the students don't carry enough credibility with the farmers.

Participant Responses Regarding the Role of the Student in the WEM

Student data showed that 27 of the 28 items were found to be significant at the .05 level by the paired response t-test. Mean differences of at least .60 between what the students felt their role should be and what it actually was were reported for the following roles: to help those of the community most in need; to conduct experiments with the farmers; to stimulate the farmers to conduct their own experiments; to teach the farmer new skills; to be committed to improving the quality of life of the community; and to be committed to the region's ecosystem. On the other hand, farmer data only showed four of 39 items to be significant at the .05 level, and none of the mean differences were .60 or higher. Interestingly, students being a "hard worker" received a -.23, indicating that farmers perceived the students to be harder workers than the farmers actually expected. It should be noted that through both quantitative and qualitative results, the rapport that existed between the student change agents and the farmers was excellent. Farmers rated students exceptionally high on questions of trust, honesty, sincerity, respect, and empathy. According to Mwangi (1997) good rapport between the farmer and the change agent is necessary to carry out participatory programs.

Objective Five-General Conclusions Regarding an Association between Farmers' Perceptions of the Student Change Agent and the their Level of Adoption of CIAS

In order to investigate the possibility that the farmers' perceptions of the student change agent affects the farmers' decisions to utilize components of an IAS, the researcher conducted quantitative statistical tests. The researcher conducted a crosstabs analysis of questions regarding the farmers' perceptions of the roles of the student change agents with questions pertaining to farmer adoption components of an integrated agricultural system. Chi squared values were determined for each set of variables. No statistical significant values were derived, providing no evidence to support an association between the variables.

There are a number of possible reasons why no association was found to be significant. First, an association might not have been revealed because of the small number of farmers involved in the study. If a sample were taken from the population and parametric statistics were conducted, associations may have emerged. Secondly, due to the matter of consistency for triangulation, the response scales were limited. A 3 pt. scale does not allow for much variability and may have prevented some trends from emerging.

An association between the farmers' perceptions of the students and their level of adoption of CIAS may still exist but may be unable to be captured through the particular design of this study for a few reasons. The instrument used to gather information regarding farmer adoption practices did not collect data on the time frame when the farmer adopted each of the technologies. Therefore, the farmers' adoption behavior can not simply be compared to the farmers' perceptions of the students during 2004. The farmer may have adopted or rejected an innovation in 2000, for example, because of the influence of the students that worked on his or her farm that year. The farmer may have

rated those students entirely differently than the student or students from his or her most recent experience with the WEM in 2004. It cannot be assumed that the students of 2004 are representative of the students the farmer had during the time he or she made the decision to adopt or reject a particular technology. If the farmer made the decision to adopt, reject, or discontinue using an innovation in 2004, it would be logical to make the comparison, but information on the time of the adoption or rejection was not collected. It was imperative, however to ask the farmers to answer the questions in regard to the students of 2004 in order to assist EARTH in the evaluation of the most recent form of the module. Information on students from previous years would have been obsolete and ineffective in guiding modifications of the 2004 WEM.

Overall Conclusions and Implications for Extension

Extension programs and services, especially those carried out by the Ministry of Agriculture (MAG), are being criticized and scrutinized due to claims that they are inefficient and fail to meet the needs of the farmers they are intended to serve. Consequently, the Costa Rican government has taken an interest in improving their extension services. One strategy currently underway is an increased involvement and cooperation between MAG and educational institutions. So far, MAG has formed a cooperative agreement with the University of Costa Rica, but has not collaborated with EARTH University, another college in Costa Rica. Through what are referred to as the Community Development Program and Work Experience Module, EARTH faculty and students engage in extension efforts with local farmers in the Guacimo area of Costa Rica. Through evaluation of their interaction with farmers, areas where EARTH is particularly effective have been identified. By identifying the strengths of their approach in working with farmers, other extension entities can strengthen their own programs by

incorporating procedures and educational principles utilized by the students and faculty of EARTH. The overall conclusions and recommendations for EARTH University may also be appropriately applied to Extension in general.

Although the main purpose of the WEM is to be an educational module to help EARTH students develop their knowledge and skills in a real world setting, it has many of the same goals that have historically been those of extension organizations in terms of the interaction that EARTH students and faculty have with the rural communities near the university. Specifically, a main role of the students and faculty in the WEM is to be agents of change among the resource-limited farmers. This entails many of the responsibilities that extension workers have, such as educating farmers, helping them to put technical knowledge to use via the implementation of practices that promote the sustainability of the farms, working with the farmers to solve problems and developing their capacities to evaluate and analyze and many others. In an effort to improve and effectively meet the needs of the farmers, EARTH University conducts an annual evaluation of the WEM. Results of this study will be incorporated into that evaluation and will not only be used to strengthen the effectiveness of the module, but also to offer ideas and recommendations to other extension organizations interested in improving their programs.

Overall Conclusions and Recommendations for EARTH University

Specific conclusions and recommendation for the WEM were included in each section of this chapter but some general themes emerged that are worth emphasizing.

Adoption and Perceptions of an Integrated Agricultural System (IAS)

The farmers in the three communities studied demonstrated a considerable level of environmental consciousness through the importance they placed on reforestation,

protecting the nearby rivers, increasing organic matter in the soil and using organic production when possible. Based on conversations with the farms, this can be attributed mostly to the education they received from EARTH students and faculty.

While most of the farmers knew what an IAS was, a strong majority of them only had a few components of an IAS on their farms. It can be inferred that a stronger effort needs to be made to involve the farmers in the development of the IASs so that the systems truly address the needs of the farmers. The farmers' lack of interest and resistance to implement more than a few components of an IAS suggest that they do not perceive a significant benefit associated with adopting an IAS. If the systems were created and promoted in a matter that emphasized what is of value to the farmer, educational messages promoting more holistic adoption of environmental innovations might have a greater impact. Of the sources named for all of the components of an IAS, those listed most frequently, other than EARTH students and faculty, that present the greatest opportunity for cooperation and collaboration with EARTH should this be an interest of the university were: CEDECO, JAPDEVA, and INA.

Quality Dialogue

One of the strengths of the WEM, noted by the farmers is the frequent and constant contact the farmers feel they have with EARTH University through the students. Farmers highlighted the fact that an ever-present dialogue with EARTH students exists. However, *frequent* dialogue does not equal *quality* dialogue. This point is raised because based on the results of this study, an area found to be very much in need of improvement is the proficiency of the students in assessing the needs of the farmers. This conclusion was arrived at for a number of reasons.

First, in instances cited in Chapter Four of this thesis, farmers disclosed issues and problems to the researcher that they never mentioned to the student change agents. Such needs included basic issues such as having a tear in the polyethylene tube of the biodigester that needed repair and the desire to have a guide book or other source of information about the types and different uses of medicinal plants because a family had the plants but was unsure of their implications.

Students also mentioned problems with having the same households participate over the years. They feel that "with the farmers that have had students for 10 years, anything that *can* be done on their farm, already *has* been done." They also suggest that PDC should make sure that the farms they do select are "receptive to ideas and interested in making and expect to make changes." The students expressed their frustration that farmers were not motivated to spend time on their "joint projects" but preferred to work on regular farm activities and "chores." If the innovations, referred to by the students as their *projects* were in fact meeting a real need of the farmer, why would the students have such a difficult time vying for time for the farmer to devote to the projects instead of on other farm activities? Again, this refers to the quality of the dialogue between the farmer and student. Mayoux (2001) identifies the exchange of information and the collaboration between the farmer and change agent as imperative to adapting an innovation to the contexts and needs of the farmer. If this is not done, the innovation will not have value to the farmer and will either be rejected or cause undesirable consequences (Chambers, 1997).

Process vs. Product

In the case of the WEM, the issue of process vs. product has a double implication. Students at EARTH University have ample opportunity to conduct experiments on the

campus' expanse of experimental farmland. They are frequently challenged to put their scientific knowledge to the test through hands-on courses (for which they are especially recognized), group projects, and individual projects they are expected to develop and complete in their third and fourth years. What the WEM offers that separates this module from all the other opportunities students have to work on is the unique, rich experience it allows the students to have with the farmers in the real world. Of greater priority than the implementation of innovations deemed impressive by scientific standards, should be the best utilization of the time that the students have with the farmers to learn how to interact with them, understand their values and rationale, assess *their* needs, and engage in joint problem solving with them. If the quality of interaction between the student and farmer is not enhanced, the very aspect that gives value to the WEM and sets it apart as such a unique and worthwhile opportunity for both the students and farmers will be lost. Steps should be taken to provide better training in needs-assessment and participatory methods for the students. While some workshops for the students may exist on these approaches, they need to be examined with a critical eye and improved to a level of effectiveness-where the students' main priority is to work with the farmers to identify their problems and then address them. The process through which the students interact with the farmers in the experience is extremely important.

On the other hand, because the WEM is intended to be a real-world experience, unlike many academic exercises that emphasize process over product for learning purposes, at the completion of the module, the farmer must have an end product. There is debate over this point, even among the faculty involved with the WEM, but requiring that

students present a finished product (except in extreme cases) will address and strengthen other weaknesses of the module.

For example students identified not having a focus and not knowing quite what to do on the farm once they arrived as major problems. Often times, this actually resulted in the student doing manual farm labor by default. As discussed in the previous section, when the student did have a clear idea of what they wanted to work on, they also often found it impossible to complete the project with the farmer.

In order to address this issue, students should not just limit the types of projects they are willing to do to ones involving innovations currently being developed and promoted by EARTH. If they are really committed to addressing the needs of the farmers, students must be flexible and responsive to them. In fact, student feedback to the faculty regarding farmers' interests should actually be used to guide future university research and development. The projects should be viewed as a tool through which students and farmers can engage in a mutually beneficial experience. If for example, after contemplation, a farmer replies that she has always wanted to make a book of pressed flowers, or use pressed flowers to decorate photo albums, the student should not toss that idea aside for a more impressive or elaborate one. This type of project can foster the combination of creativity and science as the farmer decides which flowers to grow and use, in the preparation of the flowers, and the artistic layout on each page. The economic return over time from the continued sale of these books and albums at local markets or beyond may be even higher than the farmer would receive from a more elaborative innovation. This type of activity may better meet the needs of the farmer

because she can work on the albums and sell them year round even in times of low cash flow.

Another scenario could be that a farmer is not sure how he can maximize the use of his land and resources. An end product that consists of a map of the farm and potential uses for each are would be very valid and useful. With this type of scenario and after consideration is given to constraints and resources the farmer might be interested in starting an IAS on his farm. The next student may think about conducting an ELP assessment (described in Chapter Two).

If the student is aware that he/she must generate an end product through their experience in the WEM, he/she would realize that the cooperation and interest of the farmer is imperative. It should be emphasized by professors that the way to ensure farmer cooperation is through the farmers' involvement in every step of the process. The result should be that the farmer looks forward to the day the student comes to the farm. The farmer should perceive it as one day closer to finishing their project and would consider it a lost opportunity to divert the students' time and attention from the project to farm chores. In conclusion, both the process and the product need to be given due attention.

Unbiased Selection of Farmers

Faculty, students, and farmers were unsure whether or not the WEM should help the farmers most in need of the community. According to their experiences in the 2004 WEM, *only* 13.8% of the students felt that they actually helped the poorest segment of farmers in the communities. This stands out as a "red flag" that cannot be overlooked. As Goss observed (1979, cited in Stephenson, 2003) in Latin America, the unequal spreading of innovations actually lead to a wider socioeconomic gap among the people.

Through farmer interviews, this study found that farmers disagreed that the module should send students to work with the poorest farmers in the community. The farmers were aware that: the responsibility of choosing the farms was not entirely EARTH's and that the farmers had to agree to participate; and that farmers recognized that if the farmer had no resources, they would be less likely to experiment or adopt innovations. One farmer stated, "The course can't always decide who it is going to help because it depends on which farmers want to participate. The course will help the most, farmers who take the information and follow through with it." It must be noted that the farmers from which responses were obtained were not considered the poorest of the communities. It might be speculated that they feared should EARTH focus on the poorest farmers, they may withdraw students from their farms. If farmers were paid a stipend in exchange for providing a learning environment for the students (rather than a free handout) perhaps the poorer farmers would have an interest in participating, have the means to participate, and the opportunity to engage in joint inquiry, exploration, capacity building, and learning with the student change agents. This would also address the students' complaints that "with the farmers that have had students for ten years, anything than *can* be done on their farm, already *has* been done."

Another instance of selection against certain segments of the population occurred because of natural phenomena. A significant number of farmers were unable to consider adopting many of the components of an IAS because the flooding of the nearby river made it impossible. A specific effort to identify ways to help this particular group of farmers is warranted.

Further attention must be paid to the issues of which farmers are targeted to participate in the WEM and the unbiased distribution of services to farmers. If these issues cannot be directly addressed through the farmers' participation in the WEM, EARTH should specifically target farmers with special needs for involvement in other extension education programs.

The Role of the Student

In terms of interpersonal characteristics such as sincerity, trust, honesty, and respect, the students can be considered role models for others in Extension. Farmers viewed the students in a very positive light in this regard and did not hesitate to compliment the personal character of the students. This set the foundation for the remarkable rapport that was evident between them. Often, farmers commented that by the time the students completed the module they were considered family. In many instances, students helped the farmers and their children to read and write. Students would read letters for illiterate farmers as well as tutor and assist children with schoolwork. The farmers and students placed much value on the social and cultural benefits they received from one another…especially conversations had over coffee. Most farmers never had the opportunity to travel and experience other cultures and they realized that the students were a way to bring the culture of other countries to them.

Rather than being perceived by the farmers as experts, farmers viewed the students as *access points* to information and specialists (faculty). Time and again, farmers praised the students' timeliness and thoroughness in retrieving information the farmers requested. Since most of the farmers had no formal education, they were appreciative of the students and took advantage of them to gain knowledge. The farmers often discussed the importance of combining theoretical and practical knowledge.

Farmers seemed to assess credibility of the change agents according to two criteria: 1) that have much information and knowledge and 2) that they have much experience. Because of the nature of the WEM, the lack of experience of the students will always be an issue. As was previously mentioned, farmers were often reluctant to adopt innovations without the endorsement or approval of the faculty. The ideal solution for this reason and to increase the influence of farmer feedback on directing the university's research and development, would be for faculty to spend more time on the farms with the farmers and students. Faculty should be encouraged to spend more time on the farms, but it would be difficult for EARTH faculty to devote as much time as the farmers would like to them due to the myriad of other responsibilities facing the faculty. Perhaps if the student prepared a short proposal/description of his recommendations for his/her respective host farm and received a signature from the supervising professor, this would instill in the farmer, a sense of confidence in the students' suggestions.

Tied with being a point of access as the most important role for the student was the role of the student as a motivator. Farmers literally admitted that if the students left, so did their motivation to try new things. While the students may not have enough credibility to convince a farmer to adopt higher risk innovations, they inspire farmers to learn new skills. It also appeared that the more a faculty member was involved with a farmer, the stronger the farmer's motivation was to experiment and adopt recommended practices and innovations. This is an intriguing point and warrants further investigation to understand why the EARTH students and faculty are such strong motivational factors for the farmers. EARTH students and faculty should be aware of the power of influence they have on the farmers, especially when making recommendations. The agro-

ecotourism initiative is a prime example where an examination of recommendations should be conducted. For instance, is it a viable and appropriate option for a farmer to transform half of his property into a soccer field for the enjoyment of tourists that might visit the farm a maximum of two times a year?

A Possible Alternative Design for the WEM

Based on the results, it may be inferred that focusing on group formation efforts and complimenting needs assessment with identifying and utilizing community assets would empower the community to learn from one another rather than depend so heavily on outside specialists. Using students to promote reciprocal farm visits between producers dedicated to a common activity (all producing yucca, ornamentals, or cattle, etc.) in order to share experiences and develop best management practices would also give the students an activity to center their experience around. It might also serve to: breakdown potential social barriers and mobilize members of the community to work together; build relationships and contribute to creating a sustainable social structure that would exist after the student leaves; improve agricultural practices contributing to sustainable management and a more uniform, quality product; and allow farmers to receive a higher price for their products.

Responsive to Farmers Needs

This study found that farmers benefit from their participation in the WEM in a number of ways but they also give of their time and resources to host the students on their farms. It is of utmost importance that the module is designed according to the convenience of the farmers. Farmer feedback included in this study should be valued and addressed by faculty and students at EARTH University. For example, farmers voiced

their preference that workshops begin around 4 pm instead of 2 pm in the afternoon. The WEM chairs should make it a priority to change the time without hesitation.

Students identified their poorest utilization of time while on the farms to be in the afternoon because after lunch the farmers took a break and it often rained. Students emphasized how much more productive they were in the mornings. Perhaps students could go to the farms twice a week every week or alternate weeks just until after lunch with the farmers and then return to EARTH for afternoon classes. Any potential modification must be subject to the review of the farmers.

As discussed previously, farmers also expressed a desire to have more of a feedback and monitoring role regarding the progress of the students during the WEM. They have also felt neglected in terms of receiving results of studies they have participated in. When working with the farmers, it is a priority to always give them proper consideration and to inconvenience them as little as possible. They are being very generous when they agree to participate at all.

Recommendations for Future Research

The researcher was limited in terms of time and other resources but successfully conducted this baseline study in order to identify areas suitable and appropriate for future research. As results provided further insights into the issues of farmers adoption of innovations and their relationship with change agents from EARTH's Work Experience Module, opportunities for further investigation became evident. Consequently, based on the findings and conclusions of this study, the following recommendations for further research were made.

1. This study found that the poorest farmers of the communities may not have participated in the WEM. An analysis of the farm households in each of the communities would have provided a deeper understanding of the farm livelihood

systems and facilitated the comparison of farmer characteristics of the farmers who participated in the WEM and those that did not. This could then be used to reveal potential biases and encourage unbiased farmer participation in the module to ensure that EARTH's efforts are not contributing to a widening of the socioeconomic gap.

2. This study found that a significant number of farmers were not able to adopt certain innovations because of the nearby flooding rivers. A study should collect data on their particular situation that would allow specialists to tailor innovations to these farmers' particular circumstance.

3. This study found that the farmers expenditure of time, labor, and resources in agro-ecotourism preparations were not generating favorable economic returns. A study should examine and identify other agro-ecotourism initiatives in the area to determine if enough interest, support and adequate infrastructure exist to make this endeavor worthwhile.

4. This study found that student and faculty change agents in the WEM functioned as very significant motivational factors regarding the farmers' decisions to adopt innovations and experiment. Results show that frequently, when the students would finish their term working on the farm, the farmer was no longer motivated to adopt new innovations and even discontinued the use of previously adopted practices and technologies. This study also found that farmers that were more in contact with faculty adopted more innovations. A study should be conducted to understand why student and faculty change agents have such a powerful motivating effect on the farmers and if and why they felt compelled or obligated to try the suggestions of the change agents.

5. Observation of educational processes utilized by change agents of the WEM. This study found evidence that would suggest that a true two-way exchange of knowledge was not always present between the farmers and change agents. Based on this study, it can be inferred that the needs of the farmers were not often identified or understood. Direct observation of the change agents' interactions with the farmers would assess the degree that participatory methods are employed and whether or not innovations are being adapted to the particular contexts in which the farmer would use them.

6. Examination of the maintenance of technologies. This study documented instances where the farmer needed maintenance on previously adopted innovations but did not receive assistance from EARTH. A study should be conducted to determine how much emphasis is placed on the maintenance of technologies already implemented and to determine if EARTH change agents solicit feedback from farmers periodically, after the innovation has been adopted.

7. Through this study, an interest was found in the WEM functioning as a component in a broader integrated extension system consisting of other entities involved in extension efforts in the humid tropic region. A study should explore the possible

opportunities for collaboration and cooperation, particularly with entities involved in promoting and developing innovations similar to those of those being promoted by EARTH.

8. This study revealed that the farmers perceived strong social barriers and resistance to working collectively, but the majority expressed a desire to overcome these obstacles to work together effectively. Further research should be conducted in this area, particularly to understand the farmers' reasoning behind both their perceived negatives and positives associated with working collectively in order to strengthen the self-organizational capacities of the communities if appropriate.

Limitations of the Study

This formative evaluation of the EARTH University Work Experience Module revealed many interesting and valuable findings. Nevertheless, there are some areas of the study that could be improved upon to provide more comprehensive results through a more participatory process. Most of these suggested improvements would require greater amounts of time and resources than were available.

An examination of the issues of importance to each of the groups of participants (farmers, faculty and students) through participatory research before creating the primary data collection instrument for this study would have allowed the researcher to ensure the incorporation of these issues into the study from the onset.

An analysis of the farm households in each of the communities would have provided a deeper understanding of the farm livelihood systems and facilitated the comparison of farmer characteristics of the farmers who participated in the WEM and those that did not. This could then be used to reveal potential biases and encourage unbiased farmer participation in the module.

More focus groups would have allowed for greater participation, more representation, and more data. Uniting farmers, faculty, and students in various combinations in forums to discuss perceptions of the WEM in the presence of other

groups would ensure that each group provided and received direct feedback to and from the other groups.

In order to more accurately assess the achievements of the 2004 WEM, an examination of only the innovations adopted within that year would have provided more relevant information.

Summary

This chapter provided the conclusions and recommendations related to the perceptions of farmers, students, and faculty regarding university-based extension through EARTH University. The research centered on the Work Experience Module (WEM), through which students and faculty from the university served as agents of change, helping local farmers solve problems and implement integrated agricultural systems (IAS) on their farms.

This chapter addressed implications and conclusions pertaining to each of the five research objectives. There were significant positive findings regarding the module as well as opportunities for improvement. A number of recommendations were provided to assist EARTH University in making their extension efforts as effect as possible.

The intent of this study was to serve as an evaluation for the WEM and to identify areas suitable for future research. This was accomplished and several recommendations for further research were presented based upon the findings of this study.

Lastly, the recommendations made throughout this chapter were offered to provide direction for improving EARTH's Work Experience Module and efforts made by other entities offering extension services of this type.

APPENDIX A
FARMERS' REPRESENTATION OF EARTH-FARM RELATIONSHIP

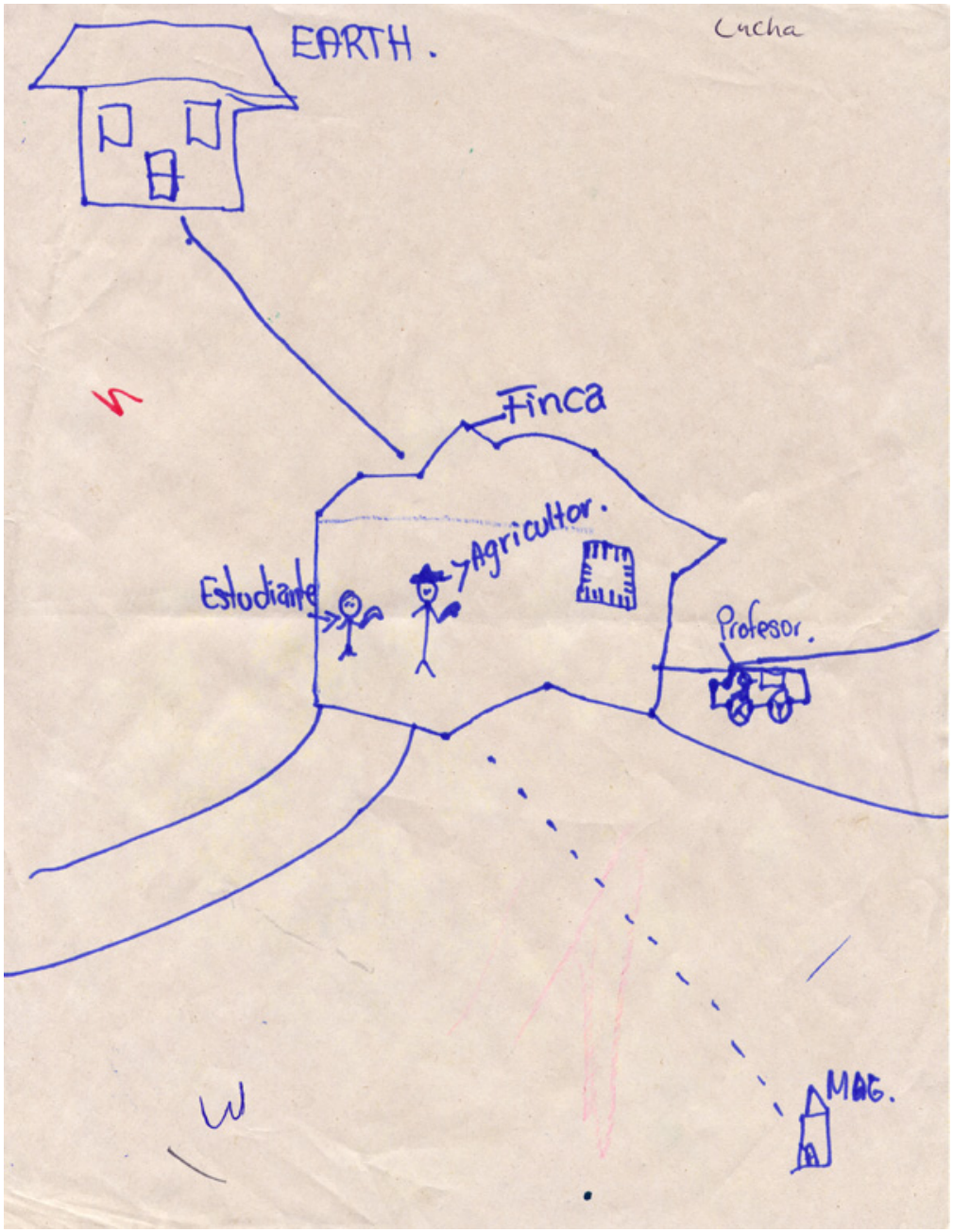


Figure A-1. Female Farmers' Representation of EARTH-Farm Relationship

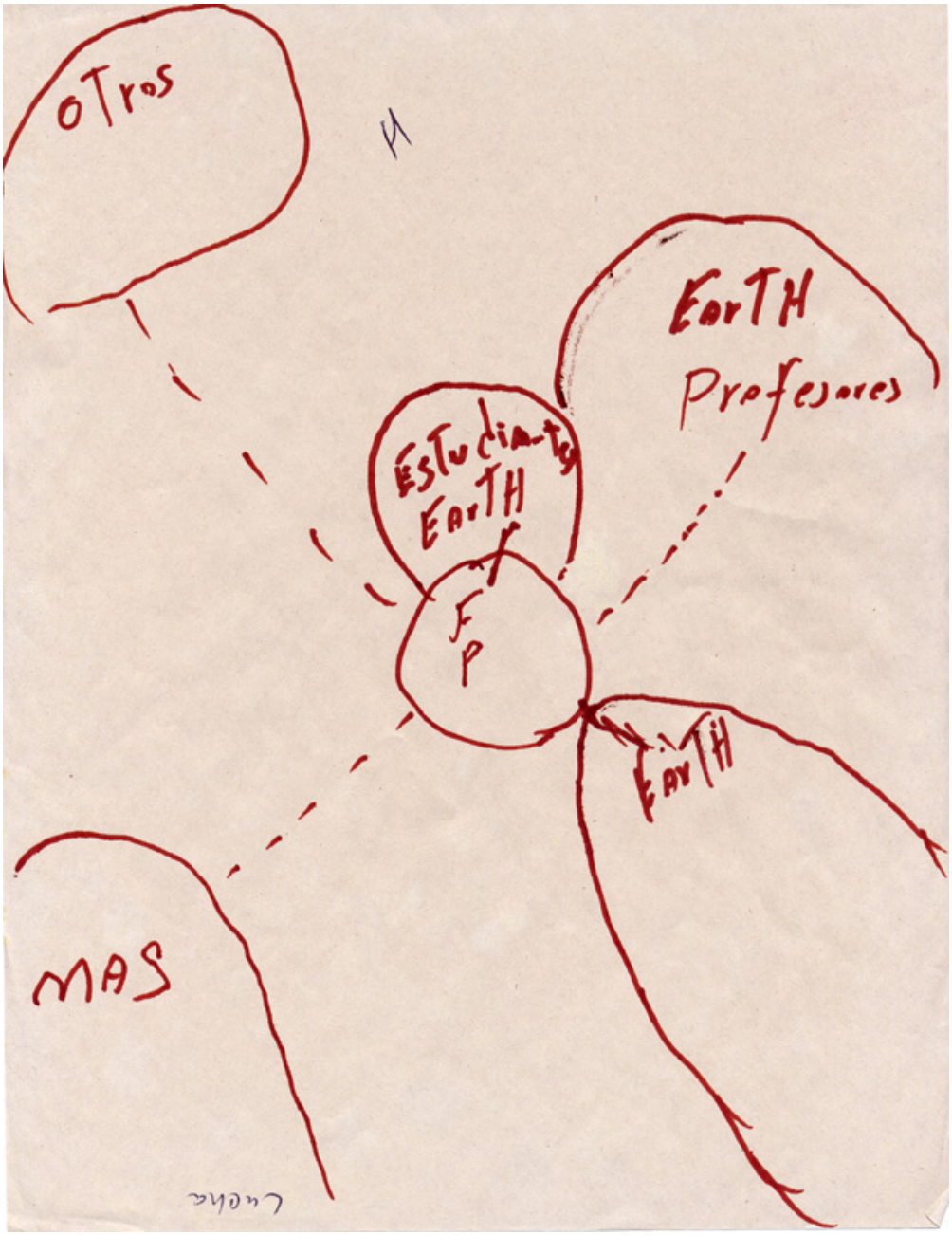


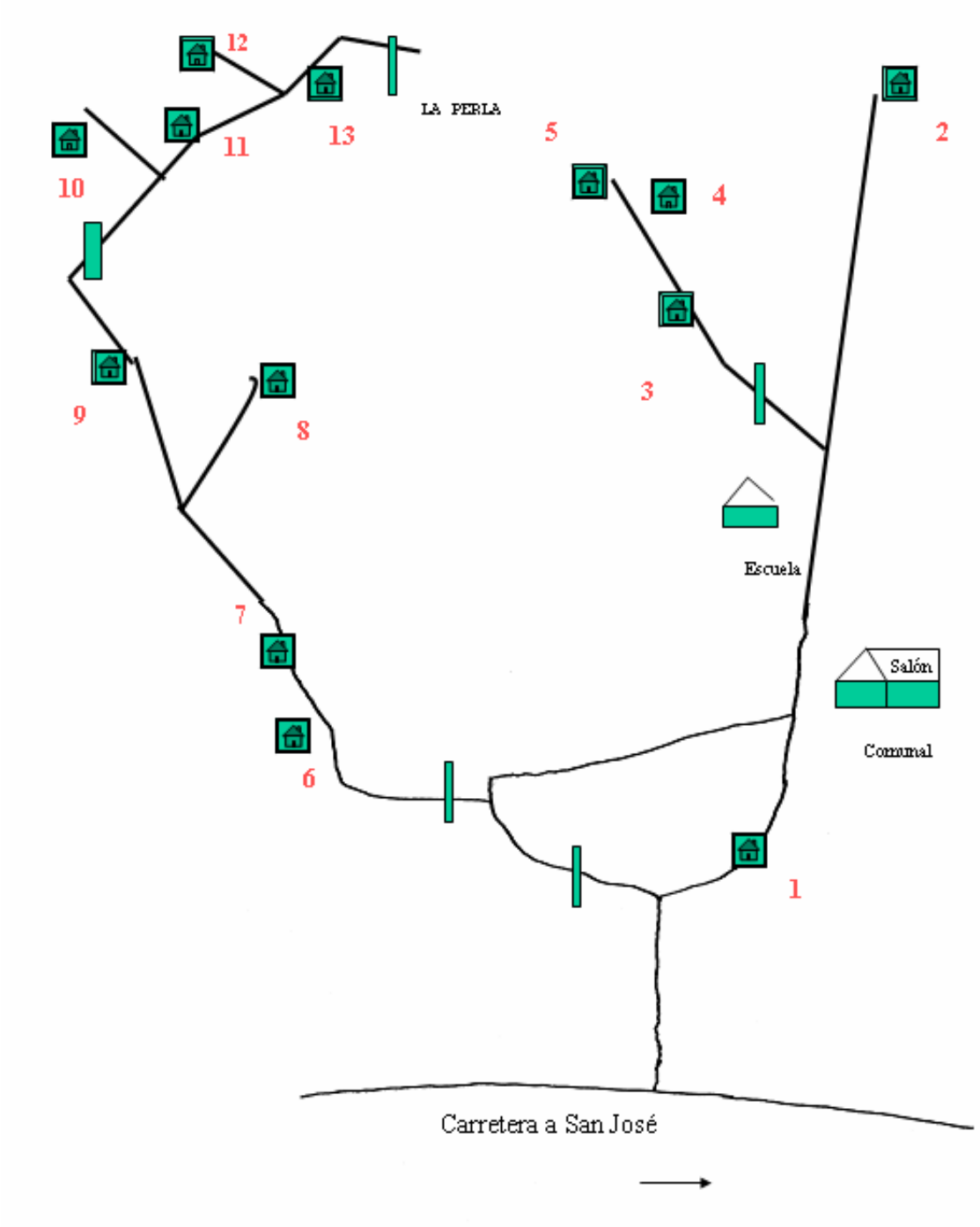
Figure B-1. Male Farmers' Representation of EARTH-Farm relationship

APPENDIX B
ADOPTION PRACTICES BY COMMUNITY

Table B-1. Adoption Practices by Community

Participant	Biodigester	N.B.	Compost	Fish Ponds	Lagoons	Med. Plants	Trees	Ecotourism	E.M.
1						×	×		
2						×	×		
3			×	×		×	×		×
4	×			×			×		×
5							×		
6	×					×	×		
7					×	×			
8							×		×
9						×	×		
10					×	×	×		
11			×			×	×		
12	×	×				×	×		×
13	×								
14	×	×	×				×		×
15			×	×		×	×	×	×
16			×			×	×	×	
17						×	×		
18	×					×	×		×
19	×		×	×	×	×	×	×	×
20							×	×	
21			×			×	×	×	
22	×	×	×	×		×	×	×	×
23						×	×	×	
24			×			×	×		
25				×		×	×	×	
26				×		×	×		
27	×	×	×	×		×	×	×	×
28				×		×	×	×	
29	×			×		×	×		
30	×					×	×		

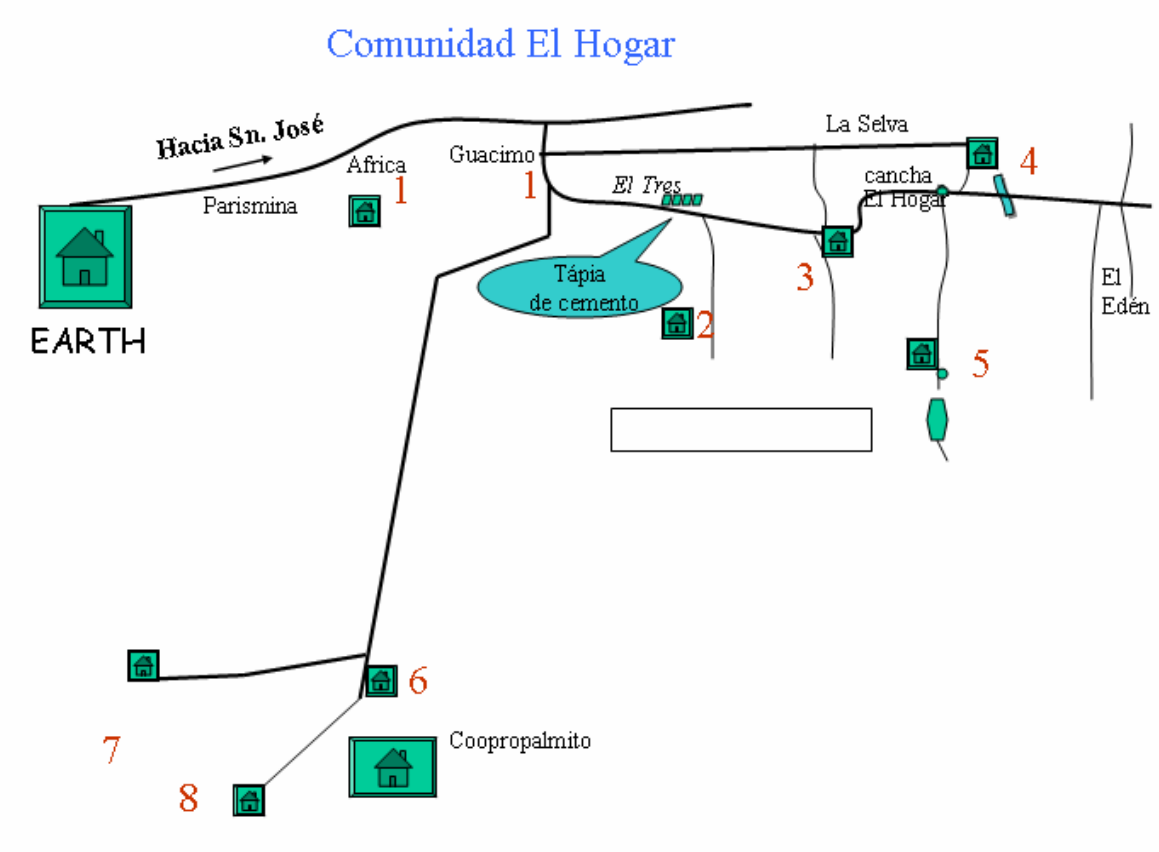
APPENDIX C
MAP OF ARGENTINA



APPENDIX D
LUCHA COMMUNITY MAP


Comunidad La Lucha
San Luis
Salón comunal
pulpería
Puesto policía
Irlanda
1
2
3
4
5
6
7
8
9
10
11

APPENDIX E
HOGAR COMMUNITY MAP



APPENDIX F
IRB APPROVAL OF PROTOCOL MEMORANDUM

UNIVERSITY OF FLORIDA

Institutional Review Board

98A Psychology Bldg.
PO Box 112250
Gainesville, FL 32611-2250
Phone: (352) 392-0433
Fax: (352) 392-9234
E-mail: irb2@ufl.edu
http://irb.ufl.edu/irb02

DATE: April 27, 2004

TO: Steffany L. Dragon
408 Rolfs Hall
Campus

FROM: Ira S. Fischler, PhD, Chair IF/TF
University of Florida
Institutional Review Board 02

SUBJECT: **Approval of Protocol #2004-U-346**

TITLE: Perceptions of Farmers, Change Agents and Faculty Regarding University-based Extension; a Case Study from EARTH University, Costa Rica

SPONSOR: EARTH University and the Curtis Wilgus Grant

I am pleased to advise you that the University of Florida Institutional Review Board has recommended approval of this protocol. Based on its review, the UFIRB determined that this research presents no more than minimal risk to participants. Given your protocol, it is essential that you obtain signed documentation of informed consent from each participant. Enclosed is the dated, IRB-approved informed consent to be used when recruiting participants for the research.

> In cases that require signature, it is essential that each of your participants sign a copy of your approved informed consent that bears the IRB stamp and expiration date.

If you wish to make any changes to this protocol, including the need to increase the number of participants authorized, you must disclose your plans before you implement them so that the Board can assess their impact on your protocol. In addition, you must report to the Board any unexpected complications that affect your participants.

If you have not completed this protocol by April 19, 2005, please telephone our office (392-0433), and we will discuss the renewal process with you. It is important that you keep your Department Chair informed about the status of this research protocol.

ISF:dl/tf

APPENDIX G
FARMER INSTRUMENT

Objetivo 1: Percepciones del rol de los agentes del cambio (estudiantes), productores, y el Programa de Experiencia de Trabajo

I. En la columna I están los posibles (reglas) roles de los agentes de cambio. En la columna II: Basado en su experiencia del programa de Experiencia de Trabajo (**en 2003**), por favor indique el nivel con el que usted esta de acuerdo o en desacuerdo con el rol del estudiante (agente de cambio) debería incluir la descripción en la columna I. En la columna III: Basado en su experiencia del programa de Experiencia de Trabajo, por favor indique el nivel con el que usted esta de acuerdo o en desacuerdo con el que actualmente (fue) es el rol del estudiante (agente de cambio) incluye la descripción en la columna I. (Para ser completada por los estudiantes, la facultad y los productores).

Cuantos estudiantes: 1 o 2

Genero: H M H H M
M H M

Columna I ***Posibles Roles de Agente de Cambio (El Estudiante)***	*Columna II* ***Debería HACER / SER:***	*Columna III.* ***Actualmente FUE / HIZO:***
1. Debería tener / tuvo conocimiento técnico en el área de interés	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
2. Debería aprender / aprendió del productor	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
3. Debería trabajar / trabajó bien en el desarrollo e implementación de nuevas ideas con el productor	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
4. Debería realizar / realizó experimentos con el productor	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
5. Debería estimular / estimuló al productor a conducir sus propios experimentos	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
6. Debería enseñar / enseñó nuevas habilidades al productor	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
7. Debería valorar / valorió el conocimiento tradicional/local de la gente	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
8. Debería valorar y respetar / valoró y respeto opiniones e ideas diferentes a las suyas	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO

9. (Propone nuevas ideas) Cuando hay problemas, debería pensar / pensó en nuevas ideas junto al productor	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
10. Debería proporcionar / proporcionó información actualizada	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
11. Debería consultar / consultó información de otros recursos, y especialistas cuando es necesario	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
12. Debería ser trabajador / fue trabajador	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
13. Debería ser / fue disciplinado y responsable	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
14. Debería tener / tuvo nuevas ideas, es creativo	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
15. Debería ser / fue atento durante discusiones	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
16. Debería comportarse / se comportó como un profesional ante los agricultores	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
17. Debería ser sincero / fue sincero	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
18. Debería honesto / fue honesto	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
19. Debería tener / tuvo confianza en Usted	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
20. Debería ser / fue motivado	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO

21. Debería ser / fue respetuoso	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
22. Debería ser / fue confiable	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
23. Debería percibir / percibió correctamente como se siente (emocionalmente)	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
24. Debería tener / tuvo interesa en sus ideas, opiniones, y sentimientos	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
25. Debería comunicar / comunicó bien	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
26. Debería aprender y trabajar / aprendió y trabajó conjuntamente con Ud.	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
27. Debería identificar / identificó problemas, necesidades e ideales de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
28. Debería ayudar / ayudó a los esfuerzos de agricultura sostenible	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
29. Debería ser / fue comprometido en mejorar la calidad de vida de la comunidad local	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
30. Debería ser / fue preocupado y comprometido con el ecosistema (medio ambiente; naturaleza,	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO

arboles, tierra, animales) de la región		
31. Debería cumplir / cumpló con un rol del informante / concientizador (presentando información)	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
32. Debería cumplir / cumplió con el rol de fomentar la capacidad del productor para analizar y evaluar situaciones	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
33. Debería ayudar / ayudó en el desarrollo de estrategias para resolver problemas	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
34. Debería ayudar / ayudó los agricultores a hacer cambios en el comportamiento y en las practicas en la finca	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
35. Debería ser / fue una modelo de inspiración y educación	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
36. Debería ayudar / ayudó a la gente a ayudarse a si misma	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
37. Debería poseer / poseó buenas conexiones	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
38. Debería ayudar / ayudó a los grupos más necesitados de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO
39. Debería transferir / transfirió información basada en investigación	SI / TAL VEZ / NO	SI / TAL VEZ / NO SI / TAL VEZ / NO

Objetivo 1: Percepciones del rol de los agentes del cambio (estudiantes), productores, y el Programa de Experiencia de Trabajo

II. En la columna I están los posibles (reglas) roles de los agentes de cambio. En la columna II: Basado en su experiencia del programa de Experiencia de Trabajo, por favor indique el nivel con el que usted esta de acuerdo o en desacuerdo con el rol del estudiante (agente de cambio) debería incluir la descripción en la columna I. En la columna III: Basado en su experiencia de programa de Experiencia de Trabajo, por favor indique el nivel con el que usted esta de acuerdo o en desacuerdo con el que actualmente (fue) es el rol del estudiante (agente de cambio) incluye la descripción en la columna I. (Para ser completada por los estudiantes, la facultad y los productores).

Columna I ***Posibles Roles de Los Productores***	*Columna II* ***Debería HACER / SER:***	*Columna II* ***FUI / HICE:***
1. Debería aprender / aprendió del estudiante	SI / TAL VEZ / NO	SI / TAL VEZ / NO
2. Debería trabajar / trabajó bien en el desarrollo e implementación de nuevas ideas con el estudiante	SI / TAL VEZ / NO	SI / TAL VEZ / NO
3. Debería realizar / realizó experimentos con el estudiante	SI / TAL VEZ / NO	SI / TAL VEZ / NO
4. Debería enseñar / enseñó nuevas habilidades al estudiante	SI / TAL VEZ / NO	SI / TAL VEZ / NO
5. Debería valorar / valoró el conocimiento tradicional/local de la gente	SI / TAL VEZ / NO	SI / TAL VEZ / NO
6. Debería valorar y respetar / valoró y respeto opiniones e ideas diferentes a las suyas	SI / TAL VEZ / NO	SI / TAL VEZ / NO
7. (Propone nuevas ideas) Cuando hay problemas, debería pensar / pensó en nuevas ideas junto al estudiante	SI / TAL VEZ / NO	SI / TAL VEZ / NO
8. Debería identificar / identificó	SI / TAL VEZ / NO	SI / TAL VEZ / NO

problemas, necesidades e ideales de la comunidad		
9. Debería ayudar / ayudó a los esfuerzos de la agricultura sostenible	SI / TAL VEZ / NO	SI / TAL VEZ / NO
10. Debería ser / fue preocupado y comprometido con el ecosistema de la región	SI / TAL VEZ / NO	SI / TAL VEZ / NO
11. Debería cumplir / cumpló con un rol del informante / concientizador a amigos y vecinos (presentando información)	SI / TAL VEZ / NO	SI / TAL VEZ / NO
12. Deber ser / fue una modela de inspiración y educación por los estudiantes	SI / TAL VEZ / NO	SI / TAL VEZ / NO
13. Debería proveer / proveó experiencias educativas por los estudiantes	SI / TAL VEZ / NO	SI / TAL VEZ / NO

Objetivo 3. Uso de Sistemas Agrícolas Alternativos

I. Las siguientes preguntas están enfocadas en obtener información acerca de prácticas utilizadas por cada productor con especial énfasis en los componentes de un Sistema Integral Agrícola (IAS). Para cada aspecto conteste si o no, basado en si está o no está en la finca. En las otras 4 columnas, indique con la letra de los cuadros posteriores, las opciones que aplican en cada ocasión. (Para ser completada por los productores).

ASPECTO	Esta Usando S / N		Lo Ha Usado S / N		Fuente de información	Porque no lo implementó	Porque dejó de usarlo	Consejo en mantenimiento / preparación
1. Biodigestor								
2. Bloques Nutricionales								
3. Compostaje Tradicional								
4. Compostaje de Lombriz								
5. Bokashi con E.M.								
6. Lagunas Peces								
7. Sistema de Descontaminación con Lagunas								
8. Plantas Medicinales								
9. Especies Forestales								
10. Preparativos Agro-ecoturismo								
11. E.M.								

* variable/ dependiente de la respuesta en las primeras 3 columnas

PERCEPTIONS OF UNIVERSITY-BASED EXTENSION

EARTH University TCD University of Florida Steffany Dragon 2004

Fuente de información sobre cada área / aspecto

a. MAG-Ministerio de Agricultura (Extensión Gubernamental)
b. Vecino
c. Otro productor
d. Facultad/Profesor/Investigador de EARTH
e. Estudiante de EARTH
f. Técnicos tailandeses
g. ICE (Instituto Costarricense de Electricidad)
h. Representante de Ventas
i. Consultor
j. Veterinario
k. Material publicado, donde leyó?_____
t. Otro_____

Razones para no implementar la innovación

j. Demasiado caro
k. Demasiado trabajo
l. Demasiado tiempo
m. No tengo los recursos necesarios en la finca
[m1: tamaño de la finca, m2: mano de obra masculina, m3: mano de obra femenina, m4: dinero para el costo inicial; m5: difícil mantener / reparar; m6: topografía]
n. no entiendo como usarlo
o. no entiendo el propósito
p. no calza en el sistema (no va con las necesidades de la finca)
q. Otras tecnologías no han funcionado
r. No estoy convencido que trabaja adecuadamente
s. No interés
t. Otro_____

Razones para descontinuar

a. Demasiado caro
b. Demasiado trabajo
c. Demasiado tiempo
d. No tengo los recursos necesarios en la finca
[d1: tamaño de la finca, d2: mano de obra masculina, d3: mano de obra femenina, d4: dinero para el costo inicial; d5: difícil mantener / reparar; m6: topografía]
e. no entiendo como usarlo
f. no entiendo el propósito
g. no calza en el sistema (no va con las necesidades de la finca)
h. no sirve
t. Otro_____

Consejo para darle mantenimiento y reparación

j. Extensionista del MAG
k. Otro productor
l. Vecino
m. Facultad/Profesor/Investigador de EARTH
n. Estudiante de EARTH
o. Miembro de familia
p. Representante de Ventas
q. Consultor
r. Veterinario
s. Copile (Recopile) mi propia información [s1: computadora, s2: radio, s3: publicación]
u. Nadia
t. Otro_____

12. ¿Ha escuchado Ud. El termino "Sistema Agrícola Integral"? S / N
Si su respuesta es afirmativa, donde? (y continuar con pregunta 12)

13. ¿El estudiante que trabajó en su finca entendió y promovió un manejo integral de la finca donde todas las actividades / componentes dependen uno del otro?

14. ¿Considera que su finca es un sistema agrícola integral? S / N

15. ¿En el ultimo año, ha entrenado / comunicado a otros productores sobre nuevas prácticas o información? S / N

Si, si:

a. ¿Que practicas o información?

b. ¿Aproximadamente, cuantos productores ha entrenado / comunicado?

c. ¿Quienes?

d. ¿Han usado la información o la han practicado? S / N

e. ¿Continúan utilizándola?

Objetivo 3. Uso de Sistemas Agrícolas Alternativos

II. Las siguientes preguntas están enfocadas en obtener información acerca de prácticas utilizadas por cada productor con especial énfasis en los componentes de un Sistema Integral Agrícola (IAS). Para cada aspecto conteste si está o no está en la finca y para que propósito. (Para ser completada por los productores).

	si está en la finca e indicar el propósito								
1 **Animales**	Ganado	Búfalo	Cabras	Pollo	Cerdos	Patos	Caballos	Abejas	Otros

	Tipo						
2 **Cultivos**	Granos	Vegetales	Frutas	Pastura	Ornamentales	Medicinales	Otro

	Tipo			**propósito**						
3 **Especies Forestales**				Produce frutas	madera	leña	Protección del sol	lluvia	viento	otro

	propósito					
4 **Especies Forestales**	Aumenta (materia) materia orgánica del suelo	Fijar - N	↓ erosión	Conservación de flora y fauna	Control natural de plagas	Alimentar los animales

	propósito				**Alimentación para Peces**			
5 **Lagunas Peces**	Peces y tipos	Plantas Acuáticas	Desechar desechos animales	Desechar basura cultivos	Plantas Acuáticas	Nutrientes de los desechos animales	Concentrado	Otro

	propósito				
6 **Lagunas**	Plantas Acuáticas	Desechar desechos animales	Desechar basura cultivos	Producir fertilizante liquido para irrigar los cultivos	Otro

		S / N Cuanto		propósito					
7 **Biodigestor**	Bajo protección	Efluente a lagunas #	Efluente a lagunas con peces #	Para producir gas-cocinar (energía)	Calefacción	↓moscas	↓ olores	Prod. fertilizante	Otro

	Ingredientes					Beneficios		
8 **Bloques Nutricionales**	cal	sal	melaza	Aceite vegetal	urea	↑becerros/ vaca/año? (más animales)	↑ producción de leche / carne?	Otro

	Tipo			
9 **Compostaje**	Tradicional	Con Lombrices	Bokashi con E.M.	Otro

PERCEPTIONS OF UNIVERSITY-BASED EXTENSION

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Objetivo 1: Percepciones del rol de los agentes del cambio (estudiantes y facultad), productores, y el Programa de Experiencia de Trabajo

III. En la columna I están las posibles reglas del Programa de Experiencia de Trabajo. En la columna II: Basado en su experiencia de programa de Experiencia Trabajo, por favor indique el nivel con el que usted esta de acuerdo o en desacuerdo con el rol del Experiencia de Trabajo debería incluir la descripción en la columna I. En la columna III: (Para ser completada por los estudiantes, la facultad y los productores). Basado en su experiencia de programa de Experiencia Trabajo, por favor indique el nivel con el que usted esta de acuerdo o en desacuerdo con que actualmente es el rol del Programa de Experiencia de Trabajo incluye la descripción en la columna I. Revisar según el primero

Columna I ***Posibles Roles del Programa de Experiencia de Trabajo***	*Columna II* ***DEBERIA SER:***	*Columna III.* ***FUE / HIZO:***
1. Debería funcionar / funcionó como punto de intercambio educativo entre estudiantes, profesores, y productores locales.	SI / TAL VEZ / NO	SI / TAL VEZ / NO
2. Debería ayudar / ayudó los agricultores a hacer cambios en comportamiento y de prácticas en la finca	SI / TAL VEZ / NO	SI / TAL VEZ / NO
3. Debería ayudar / ayudó a los esfuerzos de la agricultura sostenible	SI / TAL VEZ / NO	SI / TAL VEZ / NO
4. Debería ayudar / ayudó a los grupos más necesitados de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
5. Debería complementar / complementó el servicio de extensión del gobierno	SI / TAL VEZ / NO	SI / TAL VEZ / NO
6. Debería mejorar / mejoró la calidad de vida de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
7. Debería identificar / identificó aspectos donde la universidad debería enfocar sus investigaciones	SI / TAL VEZ / NO	SI / TAL VEZ / NO
8. Debería ser / fue el puente comunicativo entre la investigación y los productores	SI / TAL VEZ / NO	SI / TAL VEZ / NO
9. Debería promover / promovió las prioridades nacionales en agricultura	SI / TAL VEZ / NO	SI / TAL VEZ / NO

10. Debería transferir / transfirió información que es basada en investigación	SI / TAL VEZ / NO	SI / TAL VEZ / NO
11. Debería servir / servió para usar los estudiantes como una conexión entre la tecnología, el conocimiento, y los servicios de otras instituciones que trabajan en la región tropical húmeda y los productores	SI / TAL VEZ / NO	SI / TAL VEZ / NO
12. Debería servir / servió como un componente de un sistema integrado de extensión que consistiría en la EARTH, el MAG, y otras entidades que están involucradas en esfuerzos de extensión	SI / TAL VEZ / NO	SI / TAL VEZ / NO
13. Debería ser / fue una manera de informar (enseñar) a productores sobre sucesos globales (ej. NAFTA y CAFTA) que efectúan mercados agrícolas	SI / TAL VEZ / NO	SI / TAL VEZ / NO
14. Debería ayudar / ayudó a los productores con proyectos individuales solamente, en vez de proyectos comunales	SI / TAL VEZ / NO	SI / TAL VEZ / NO
15. Debería animar y apoyar / animó y apoyó más los proyectos de estudiantes que reflejan los problemas más urgentes, y las necesidades de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
16. Debería ayudar / ayudó a los productores a trabajar en grupos y juntar sus recursos, productos e ingresos	SI / TAL VEZ / NO	SI / TAL VEZ / NO

PERCEPTIONS OF UNIVERSITY-BASED EXTENSION

EARTH University TCD University of Florida Steffany Dragon 2004

Horario por Entrevistas con Productores

Entrevista # _____ Fecha y Hora: _____

Entrevistadora: Observante:

_____ _____

Información Básica

1. Género del entrevistado: Hombre Mujer

2. Edad y nivel de educación de productor:

A. Edad (años)			B. Nivel de educación
<30	31-49	>50	

3a. Cuantas personas viven en la finca mayores de 6 meses por año? _____
3b. De esos, clasifíquelos de acuerdo a edad:

Genero	**Edad (años)**			
	menos de 10	11-20	21-50	más que 50
Hombre	i.	ii.	iii.	iv.
Mujer	v.	vi.	vii.	viii.

4. Cuantas hectáreas de la tierra:
No dueño pero usa dueño y usa dueño pero no usa

---------- ---------- ----------

5. Tiene registro de propiedad de la finca donde vive? Si / No
6. Tiene otra fuente de ingreso fuera de la finca? Si / No

APPENDIX H
STUDENT INSTRUMENT (SPANISH)

Objetivo 1: Percepciones del rol de los estudiantes en el Curso de Experiencia de Trabajo

I. En la columna I están las posibles roles de los estudiantes. En la columna II: Basado en tu experiencia en el Curso de Experiencia de Trabajo, por favor indique el nivel con que tu estas de acuerdo o en desacuerdo que el estudiante deba asumir ese rol. En la columna III: Por favor indique el nivel con que tu estas acuerdo o en desacuerdo que actualmente fue tu rol como un estudiante en este curso. (¡OJO! Por favor, de completar **ambas** columnas: I y II).

Por ejemplo, para la primera pregunta:
Col. II: el estudiante debería tener conocimiento técnico en el área de interés
Si / Tal Vez/ No

Col III: tú tuviste conocimiento técnico en el área de interés
Mucho / Poco / Nada

Genero: H M

Columna I ***Posibles Roles de Los Estudiantes***	*Columna II* ***Debería HACER / SER:***	*Columna III.* ***FUI/HICE:***
1. Aportar conocimiento técnico relevante a las diferentes actividades de la finca	SI / TAL VEZ / NO	MUCHO / POCO / NADA
2. Aprender del productor	SI / TAL VEZ / NO	MUCHO / POCO / NADA
3. Desarrollar e implementar nuevas ideas en conjunto con el productor	SI / TAL VEZ / NO	MUCHO / POCO / NADA
4. Realizar experimentos agrícolas con los productores	SI / TAL VEZ / NO	MUCHO / POCO / NADA
5. Estimular al productor a conducir sus propios experimentos	SI / TAL VEZ / NO	MUCHO / POCO / NADA
6. Enseñar nuevas habilidades al productor	SI / TAL VEZ / NO	MUCHO / POCO / NADA
7. Valorar el conocimiento tradicional/local de la gente	SI / TAL VEZ / NO	MUCHO / POCO / NADA
8. Valorar y respetar opiniones e ideas diferentes a las suyas	SI / TAL VEZ / NO	MUCHO / POCO / NADA

9. (Propone nuevas ideas) encontrar soluciones viables en conjunto con el productor	SI / TAL VEZ / NO	MUCHO / POCO / NADA
10. Proporcionar información actualizada a los productores	SI / TAL VEZ / NO	MUCHO / POCO / NADA
11. Consultar información especialistas y otros recursos cuando sea necesario	SI / TAL VEZ / NO	MUCHO / POCO / NADA
12. Aportar nuevas ideas, ser creativo	SI / TAL VEZ / NO	MUCHO / POCO / NADA
13. Tener interés en las ideas, opiniones y sentimientos de los agricultores	SI / TAL VEZ / NO	MUCHO / POCO / NADA
14. Tener una buena comunicación con el productor	SI / TAL VEZ / NO	MUCHO / POCO / NADA
15. Aprender y trabajar conjuntamente con los agricultores	SI / TAL VEZ / NO	MUCHO / POCO / NADA
16. Identificar problemas, necesidades e ideales de la comunidad donde esta la finca	SI / TAL VEZ / NO	MUCHO / POCO / NADA
17. Fomentar los esfuerzos de agricultura sostenible (conservar el ambiente para asegurar así una mejor calidad de vida a las futuras generaciones)	SI / TAL VEZ / NO	MUCHO / POCO / NADA
18. Comprometerse a mejorar la calidad de vida de la comunidad local	SI / TAL VEZ / NO	MUCHO / POCO / NADA
19. Velar por el bienestar del ecosistema de la región	SI / TAL VEZ / NO	MUCHO / POCO / NADA

20. Ser informante / concientizador (presentando información) a los productores	SI / TAL VEZ / NO	MUCHO / POCO / NADA
21. Fomentar la capacidad del productor para analizar y evaluar situaciones	SI / TAL VEZ / NO	MUCHO / POCO / NADA
22. Ayudar en el desarrollo de estrategias para resolver problemas	SI / TAL VEZ / NO	MUCHO / POCO / NADA
23. Ayudar a los productores a hacer cambios tanto en su comportamiento como en las practicas en la finca	SI / TAL VEZ / NO	MUCHO / POCO / NADA
24. Ser un fuente de inspiración y educación para los agricultores	SI / TAL VEZ / NO	MUCHO / POCO / NADA
25. Ayudar a la gente a ayudarse a si misma	SI / TAL VEZ / NO	MUCHO / POCO / NADA
26. Facilitar contactos e información a través de conexiones personales	SI / TAL VEZ / NO	MUCHO / POCO / NADA
27. Ayudar a los grupos más necesitados de la comunidad	SI / TAL VEZ / NO	MUCHO / POCO / NADA
28. Transferir información basada en investigación	SI / TAL VEZ / NO	MUCHO / POCO / NADA

PERCEPTIONS OF UNIVERSITY-BASED EXTENSION

EARTH University TCD University of Florida Steffany Dragon 2004

Objetivo 1: Percepciones del rol de los productores en el Curso de Experiencia de Trabajo

II. En la columna I están las posibles roles de los productores. En la columna II: Basado en tu experiencia en el Curso de Experiencia de Trabajo, por favor indique el nivel con que tu estas de acuerdo o en desacuerdo que el productor deba asumir ese rol. En la columna III: Por favor indique el nivel con que tu estas acuerdo o en desacuerdo que actualmente fue el rol del productor en este curso.

Columna I ***Posibles Roles de Los Productores***	*Columna II* ***Debería HACER / SER:***	*Columna II* ***FUE / HIZO:***
1. Aprender del estudiante	SI / TAL VEZ / NO	MUCHO / POCO / NADA
2. Trabajar bien en el desarrollo e implementación de nuevas ideas con el estudiante	SI / TAL VEZ / NO	MUCHO / POCO / NADA
3. Realizar experimentos agrícolas con el estudiante	SI / TAL VEZ / NO	MUCHO / POCO / NADA
4. Enseñar nuevas habilidades al estudiante	SI / TAL VEZ / NO	MUCHO / POCO / NADA
5. Valorar el conocimiento tradicional/local de la gente	SI / TAL VEZ / NO	MUCHO / POCO / NADA
6. Valorar y respetar opiniones e ideas diferentes a las suyas	SI / TAL VEZ / NO	MUCHO / POCO / NADA
7. (Propone nuevas ideas) Cuando hay problemas, pensar en nuevas ideas junto al estudiante	SI / TAL VEZ / NO	MUCHO / POCO / NADA
8. Identificar problemas, necesidades e ideales de la comunidad	SI / TAL VEZ / NO	MUCHO / POCO / NADA
9. Fomentar los esfuerzos de agricultura sostenible (conservar el ambiente para asegurar así una mejor calidad de vida a las futuras generaciones)	SI / TAL VEZ / NO	MUCHO / POCO / NADA

10. Velar por el bienestar del ecosistema de la región	SI / TAL VEZ / NO	MUCHO / POCO / NADA
11. Ser informante / concientizador a amigos y vecinos (presentando información)	SI / TAL VEZ / NO	MUCHO / POCO / NADA
12. Ser una fuente de inspiración y educación para los estudiantes	SI / TAL VEZ / NO	MUCHO / POCO / NADA
13. Proveer experiencias educativas para los estudiantes	SI / TAL VEZ / NO	MUCHO / POCO / NADA

PERCEPTIONS OF UNIVERSITY-BASED EXTENSION

EARTH University TCD University of Florida Steffany Dragon 2004

Objetivo 1: Percepciones del rol del Curso de Experiencia de Trabajo en desarrollo comunitario

III. En la columna I están las posibles roles del Curso de Experiencia de Trabajo. En la columna II: Basado en tu experiencia en el Curso de Experiencia de Trabajo, por favor indique el nivel con que tu estas de acuerdo o en desacuerdo que el curso deba asumir ese rol. En la columna III: Por favor indique el nivel con que tu estas acuerdo o en desacuerdo que actualmente fue el rol del curso.

Columna I ***Posibles Roles del Programa de Experiencia de Trabajo***	*Columna II* ***DEBERIA SER:***	*Columna III.* ***FUE / HIZO:***
1. Funcionar como punto de intercambio educativo entre estudiantes, profesores, y productores locales	SI / TAL VEZ / NO	SI / TAL VEZ / NO
2. Ayudar a los agricultores a hacer cambios en comportamiento y de practicas en la finca	SI / TAL VEZ / NO	SI / TAL VEZ / NO
3. Ayudar los esfuerzos de agricultura sostenible (conservar el ambiente para asegurar así una mejor calidad de vida a las futuras generaciones)	SI / TAL VEZ / NO	SI / TAL VEZ / NO
4. Ayudar a los grupos mas necesitados de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
5. Complementar el servicio de extensión del gobierno	SI / TAL VEZ / NO	SI / TAL VEZ / NO
6. Mejorar la calidad de vida de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
7. Identificar aspectos donde la universidad debería enfocar sus investigaciones	SI / TAL VEZ / NO	SI / TAL VEZ / NO
8. Ser un puente comunicativo entre la investigación y los productores	SI / TAL VEZ / NO	SI / TAL VEZ / NO
9. Promover las prioridades nacionales en agricultura	SI / TAL VEZ / NO	SI / TAL VEZ / NO
10. Transferir información basada en un proceso de investigación	SI / TAL VEZ / NO	SI / TAL VEZ / NO

11. Lograr, a través de los estudiantes, una conexión entre de tecnología, conocimiento, y servicios de otras instituciones que trabajan en la región tropical húmeda y los productores	SI / TAL VEZ / NO	SI / TAL VEZ / NO
12. Servir como un componente de un sistema integrado de extensión que consistiría en la EARTH, el MAG, y otros entidades que están involucrados en esfuerzos de extensión	SI / TAL VEZ / NO	SI / TAL VEZ / NO
13. Enseñar a los productores acerca de los sucesos globales (ej. NAFTA y CAFTA) que efectúan mercados agrícolas	SI / TAL VEZ / NO	SI / TAL VEZ / NO
14. Ayudar a los productores con proyectos individuales solamente, en vez de proyectos comunales	SI / TAL VEZ / NO	SI / TAL VEZ / NO
15. Apoyar los proyectos que responden a los problemas más urgentes, y las necesidades de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
16. Ayudar a los productores a trabajar en grupos y juntar sus recursos, productos, e ingresos	SI / TAL VEZ / NO	SI / TAL VEZ / NO

Información Básica:

1. Genero del entrevistado:

2. País de Origen:

3. Edad del entrevistado:

4. Durante El Curso de Experiencia de Trabajo usted (por favor encierre una):

a. trabajó con **el productor** durante la primera fase (15 semanas)

O

b. trabajó con **la comunidad** durante la primera fase (15 semanas)

5. Durante el Curso de Experiencia de Trabajo, Ud. trabajó con **el productor** en (por favor encierre una):

a. La Lucha b. El Hogar c. La Argentina

Sus respuestas son importantes para nosotros; muchas gracias por su participación.

APPENDIX I
FACULTY INSTRUMENT

Objetivo 1: Percepciones del rol del Curso de Experiencia de Trabajo en desarrollo comunitario

III. En la columna I están las posibles roles del Curso de Experiencia de Trabajo. En la columna II: Basado en tu experiencia en el Curso de Experiencia de Trabajo, por favor indique el nivel con que tu estas de acuerdo o en desacuerdo que el curso deba asumir ese rol. En la columna III: Por favor indique el nivel con que tu estas acuerdo o en desacuerdo que actualmente fue el rol del curso. **Por favor, de completar **ambas** columnas: I y II.

Columna I ***Posibles Roles del Programa de Experiencia de Trabajo***	*Columna II* ***DEBERIA SER:***	*Columna III.* ***FUE / HIZO*:**
1. Funcionar como punto de intercambio educativo entre estudiantes, profesores, y productores locales.	SI / TAL VEZ / NO	SI / TAL VEZ / NO
2. Ayudar a los agricultores a hacer cambios en comportamiento y de practicas en la finca	SI / TAL VEZ / NO	SI / TAL VEZ / NO
3. Ayudar los esfuerzos de agricultura sostenible (conservar el ambiente para asegurar así una mejor calidad de vida a las futuras generaciones)	SI / TAL VEZ / NO	SI / TAL VEZ / NO
4. Ayudar a los grupos mas necesitados de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
5. Complementar el servicio de extensión del gobierno	SI / TAL VEZ / NO	SI / TAL VEZ / NO
6. Mejorar la calidad de vida de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
7. Identificar aspectos donde la universidad debería enfocar sus investigaciones	SI / TAL VEZ / NO	SI / TAL VEZ / NO
8. Ser un puente comunicativo entre la investigación y los productores	SI / TAL VEZ / NO	SI / TAL VEZ / NO
9. Promover las prioridades nacionales en agricultura	SI / TAL VEZ / NO	SI / TAL VEZ / NO
10. Transferir información basada en un proceso de investigación	SI / TAL VEZ / NO	SI / TAL VEZ / NO

11. Lograr, a través de los estudiantes, una conexión entre de tecnología, conocimiento, y servicios de otras instituciones que trabajan en la región tropical húmeda y los productores	SI / TAL VEZ / NO	SI / TAL VEZ / NO
12. Servir como un componente de un sistema integrado de extensión que consistiría en la EARTH, el MAG, y otros entidades que están involucrados en esfuerzos de extensión	SI / TAL VEZ / NO	SI / TAL VEZ / NO
13. Enseñar a los productores acerca de los sucesos globales (ej. NAFTA y CAFTA) que efectúan mercados agrícolas	SI / TAL VEZ / NO	SI / TAL VEZ / NO
14. Ayudar a los productores con proyectos individuales solamente, en vez de proyectos comunales	SI / TAL VEZ / NO	SI / TAL VEZ / NO
15. Apoyar los proyectos que responden a los problemas más urgentes, y las necesidades de la comunidad	SI / TAL VEZ / NO	SI / TAL VEZ / NO
16. Ayudar a los productores a trabajar en grupos y juntar sus recursos, productos, e ingresos	SI / TAL VEZ / NO	SI / TAL VEZ / NO

PERCEPTIONS OF UNIVERSITY-BASED EXTENSION

EARTH University TCD University of Florida Steffany Dragon 2004

Información Básica:

1. Género del entrevistado: Hombre Mujer

2. Por cuanto tiempo ha trabajado a la Universidad? Meses____ Anos____

3. Por cuanto tiempo ha estado involucrado en el Programa de Experiencia de Trabajo?

Meses____ Anos ____

4. Durante El Curso de Experiencia de Trabajo usted (por favor encierre una o los dos):

a. trabaja con el Curso de Experiencia de Trabajar durante **la primera** fase (15 semanas)

O

b. trabaja con el Curso de Experiencia de Trabajar durante **la segunda** fase (15 semanas)

5. Indique en cual(es) comunidad(es) Ud. ha tenido experiencia:

a. La Lucha b. El Hogar c. La Argentina

6. Edad de entrevistado:

7. Titulo de entrevistado (profesor, personel):

Sus respuestas son importantes para nosotros. Muchas gracias por su participación.

Si le gustaría realizar un comentario de alguna pregunta de la encuesta (para elaborar o explicar más su respuesta), por favor utilice este espacio. Gracias.

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BIOGRAPHICAL SKETCH

Steffany Lyn Dragon grew up in Florida, spending as much of her childhood as possible immersed in her true passion: horses. From her love of horses also came her introduction to agriculture, an area very dear to her heart. After high school, she attended Auburn University in Alabama and then the University of Florida where she studied Animal Science and became more familiar with the agricultural industry and the people who comprise it.

Through the years, she was blessed with opportunities to experience other cultures vicariously through her parents' stories about their four years living in Mexico before her birth and through visits to many islands of the Caribbean. After her second trip to the Dominican Republic, she became very interested in sustainable agricultural development in Latin America and the Caribbean. Committed to this pursuit, she returned once again to the University of Florida and began working on her Master's degree in International Agricultural Extension and Tropical Conservation and Development. She has conducted field work in Costa Rica during the past two years and has worked on a U.S. national initiative to internationalize extension by assisting with a training program, which consisted of short term emersion in Costa Rica, for county commissioners, graduate students and extension faculty.

Although she has international interests, Steffany's love of Florida, her family, horses and a simple life will always lead her back home. Steffany is also passionate about the U.S. Extension System and its mission of helping people improve their lives.

She plans to work in the area of agriculture and natural resources, assisting people manage animals, agriculture, and natural resources in a sustainable manner.