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The role of extension in the Cuban Agricultural Knowledge and Information System: the case of Havana City Province

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The role of extension in the Cuban Agricultural Knowledge and Information System:
The case of Havana City Province

by

Eva Alejandrina Carrasco

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Agricultural Education (Agricultural Extension Education)

Major Professor: David Acker

Iowa State University

Ames, Iowa

2001

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Eva Alejandrina Carrasco
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TABLE OF CONTENTS

LIST OF FIGURES	vi
LIST OF TABLES	vii
ACKNOWLEDGEMENTS	viii
ABSTRACT	ix
CHAPTER I INTRODUCTION	
The Global Context	1
The Latin American Context	2
The Cuban Context	3
Havana City Province Context	6
The Problem	8
Purpose and Objectives	9
Need for the Study	10
Educational Importance	10
Limitations	11
Definition of Terms	11
List of Acronyms	13
CHAPTER II REVIEW OF LITERATURE	14
Introduction	14
Agricultural Knowledge and Information Systems	14
Extension Organization and Management	17
Role of Agricultural Education in the AKIS	21
Food Security	23
Summary	24
CHAPTER III METHODS AND PROCEDURES	25
Introduction	25
Organization of the Study	25
Qualitative Research	25
Case Study Methodology	26
Collaboration and Research	27
Validity	28
Triangulation	28
Member check	28
Interviews	29
Participant Observation	30
Document Review	30

CHAPTER IV RESULTS AND DISCUSSION OF FINDINGS	32
Introduction	32
Cuban Agricultural Context	32
The Structure of the Agricultural Production Sector	33
Havana City Province Agricultural Situation	36
AKIS Operators	36
The Policy Environment and National Structure	36
Agricultural Education	40
Daycare Centers (Círculos Infantiles) and Elementary Schools	43
Secondary Education	43
Polytechnic Agricultural and Livestock Institutes	44
Agrarian University of Havana “Fructuoso Rodríguez Pérez”	47
University Affiliated Research Centers and Research Institutes	48
Center for Sustainable Agriculture	48
Study Center for Agricultural and Livestock Higher Education	49
National Center for Agricultural and Livestock Health	49
Center for Agricultural and Livestock Mechanization	49
Animal Science Institute	49
National Institute for Agricultural Sciences	50
Extension Education at the University Level	50
Extension System	52
Background	52
Cuban Concept of Extension	55
Other Extension Structures of Support	58
Research Institutes	58
“Alejandro de Humboldt” Institute for Fundamental Research in Tropical Agriculture	58
National Group for Urban Agriculture	59
Irrigation and Drainage Research Institute	61
Soil Research Institute	62
Other Research Institutes	63
Non-Governmental Organizations	65
Cuban Non-Governmental Organizations	65
Council of Churches	65
Cuban Association for Agriculturists and Forestry Professionals	66
Group for Organic Agriculture	67
Center for Promotion and Development of Urban Agriculture	68

National Association for Small Farmers	68
Cuban Association for Livestock Production	68
International Non-Governmental Organizations	69
Farmers and Food Producers	69
Agricultural Stores	72
Agricultural and Livestock Markets	74
Discussion and Implications	74
Cuban AKIS	75
Prior to the Revolution	75
1959 - 1988	75
1989 - 1993	76
1994 - 2001	76
The Extension System in Cuba	77
Concept	77
Role of Providers of Extension Services in Cuba	77
Food Security in Cuba	81
CHAPTER V SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	84
Summary	84
Conclusions	86
Recommendations	89
For Other Countries Seeking Sustainable Food Security	89
For Cuban AKIS Operators	89
For Further Studies in Cuba	89
For Further AKIS Research in Other Countries	90
APPENDIX A: HUMAN SUBJECTS APPROVAL	91
APPENDIX B: LETTERS OF CONSENT	93
APPENDIX C: GUIDING QUESTIONS	96
REFERENCES	100

LIST OF FIGURES

Figure 1.	Map of Cuba	6
Figure 2.	Map of Havana City Province	7
Figure 3.	Swanson, et al. AKIS model	16
Figure 4.	Agricultural, Education and Training AKIS Model	17
Figure 5.	Linkages of the Government with AKIS operators	41
Figure 6.	Linkages among farmers and other AKIS operators	73
Figure 7.	The Cuban AKIS	80
Figure 8.	Generalized AKIS model	88

LIST OF TABLES

Table 1.	Indicators of Development in Cuba and LAC for 1999	4
Table 2.	Calorie and Protein Consumption in Cuba: 1970 – 1996	5
Table 3.	Organization of Cuban Agriculture	34
Table 4.	Research Institutes	38
Table 5.	Human Resources Working in Agriculture (1996)	42
Table 6.	Urban Agriculture Sub-programs	60
Table 7.	Land Tenure Structure	71
Table 8.	Similarities Between FAO Approaches and Cuban Extension Model	82

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ABSTRACT

The purpose of this study was to describe and interpret the Agricultural Knowledge and Information System (AKIS) of Havana City Province, Cuba, with particular reference to the role of extension programs in contributing to food security. Specific research objectives were to: 1) describe the AKIS in Havana City Province, 2) identify the role of extension in the AKIS, and 3) develop a model for analyzing the AKIS, which may have utility when studying the AKIS in other countries.

The study was designed using a qualitative research methodology. Specifically, a case study of Havana City Province was conducted. Interviews, participant observation and document review were used to collect data.

Regarding the first research objective, the Cuban AKIS is composed of the government, the Ministries of Agriculture, Science, Technology and Environment, Sugar, Public Health and Higher Education, agricultural stores, educational centers, research institutes, non-governmental organizations, an extension system, and farmers. These operators interact in an environment where the Communist Party as well as the culture and values provide support and influence direction.

Regarding the second research objective, the role of extension in the Cuban AKIS has a social action role to provide food security to the Cuban population. To varying degrees, this role is performed for all the operators listed above. The extension system has proven flexible in responding to challenging circumstances. It has opened opportunities for other operators to participate in and strengthen the AKIS. In regard to the third research objective, a generalized model is proposed by this research. This model may have utility when studying the AKIS in other countries utilizing a holistic approach.

The limitation of the study lies in the fact that this research was conducted in an urban agricultural setting, and the urban agricultural knowledge and information system has particular characteristics that differ from those in rural areas. Therefore, findings cannot be generalized to rural areas in Cuba.

CHAPTER I

INTRODUCTION

The Global Context

According to the United Nations (UN) (2001), the world's population is approximately 6.1 billion people and is expected to reach 9.3 billion by the year 2050. During this time, the population of the world's poorest countries is expected to triple in size. During the twentieth century, growth occurred in industrialized and developing countries; however, in the twenty-first century, almost all of the population increase will occur in developing countries, mainly in urban areas. For example, 9 of every 10 people will live in a developing country, 1 of 6 in India alone. Growth will be phenomenal in Latin America, Africa, and Asia. In addition, the Food and Agriculture Organization of the United Nations (FAO) (1998) stated that the population was more or less split equally between cities and rural areas, with the urban population expected to surpass the rural population by the year 2005. The 1998 United Nations World Population Report stated that 80% of the world's population resides in less developed nations and of the 78 million people annually added to the world, 95% live in these nations. In 1998, it was estimated that 828 million people living in these developing countries were chronically undernourished (UN, 1998).

In the 1999 World Bank Annual Report, an overall picture of the world was described as follows:

Poverty and inequality are on the rise, urban areas will account for a rising share of the poor, life expectancy gains are at risk, since 1990 life expectancy has declined in 33 countries, mostly related to AIDS. Two thirds of 33 million infected with the HIV virus live in Africa. Education is much worse for the poor; there are often enormous gaps within countries between the educational attainment of the rich and the poor. (14 -15)

Gasperini (2000) in her paper titled "From Agricultural Education to Education for Rural Development and Food Security: All for Education and Food for All" stated that

Poverty is a major cause of food insecurity and sustainable progress in poverty eradication is critical to improve access to food. World poverty can be significantly decreased by 2015 if developing and industrialized countries implement their

commitments to attack the roots of poverty. (1)

Gasperini suggested that a common vision needs to be implemented, and efforts need to be directed to achieving sustainable growth for the poor. Furthermore, more resources for health, education, gender equality, and environmental sustainability need to be provided worldwide. With the world under pressure from population expansion, resource constraints and health needs, it will be particularly challenging to pursue food security objectives on a global basis.

The United States Agency for International Development (USAID) defined food security in its 1999 U.S. International Food Assistance Report:

Food security exists when all people at all times have physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life. Food security has three dimensions: availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports; access by households and individuals to adequate resources to acquire appropriate foods for a nutritious diet; utilization of food through adequate diet, water, sanitation and health care. (4 - 5)

The Latin American Context

Latin America is going through the most dramatic changes of its post-colonial history. These changes (political, economic, technological and cultural) were accelerating at the end of the twentieth century. It is not an exaggeration to say that the Latin America of 2000-2010 will bear little resemblance to the Latin America of 1990. Despite some notable exceptions, Latin America gave rise to a stereotype of tropical republics mired in squalor, governed by self-serving autocrats and lagging decades if not centuries behind the economically advanced societies of Europe and North America (Buckman, 1998). According to USAID (1998), 152.5 million persons in Latin America live in poverty, with approximately 74.5 million living in extreme poverty. FAO in its report "The State of Food and Agriculture, 1998" states that 64 million persons are undernourished in Latin America.

The Inter-American Institute for Cooperation on Agriculture (IICA) in its report "Construyendo el Desarrollo Rural Sostenible de las Americas" (1999) stated that the

Americas, in particular Latin America and the Caribbean, is going through economic, social, political-institutional, and environmental problems. The models implemented during the last five decades have proved ineffective in solving the problems mentioned. While these models have stimulated economic growth, they have created greater social class differentiation and have damaged the environment. The economy in some Latin American countries has declined due to a variety of factors. These factors include the impact of natural disasters in the case of the Central American countries; political and embargo issues in the Cuban case; civil insecurity and unrest in Colombia and Peru; and drastic economic changes associated with a conversion to a dollar economy in Ecuador and El Salvador (Acker, personal communication, 2001).

The economic situation in Latin American and the Caribbean is inextricably linked to agriculture since their economies rely heavily on the agricultural sector. Most of the governments in Latin America have placed heavy emphasis on expansion of their agricultural and natural resource sectors as the preferred path for economic development. Although the solution for rural and agricultural problems is not the sole responsibility of the agricultural sector, a major contribution is expected from it (Macias, 1990). However, the type of agricultural practices utilized in these countries can often contribute to the degradation of the tropical soils, forests, and native species (French, 1993).

As pointed out by McMahon and Nielson from the Interamerican Development Bank (1998), most countries in Latin America recognize today that ensuring the flow of new knowledge to agriculture, a process in which extension is an important component, is critical if the agricultural sector is to play a role in the overall economic growth of the country. McCalla (1998) states that those countries that do not keep up to date in the information revolution will be left behind.

The Cuban Context

Due to its historical and political background, Cuba has evolved according to a model with unique development dimensions such as high levels of education, self-sufficiency, supply of basic needs, low input agricultural technology, and an increasing emphasis on urban agriculture. Its rapid development after the Revolution of 1959, its economic collapse

after the fall of the Soviet Union in 1991, and the nation's subsequent struggle to become more self-sufficient created a unique situation from which much can be learned. Cuba's development indicators compare very favorably with the average for the Latin American and Caribbean region. Cuba's rates of adult literacy, life expectancy at birth, and infant mortality are better than the average for the region. Table 1 displays three development indicators for Cuba and the region of Latin America and the Caribbean (LAC).

Table 1. Indicators of Development in Cuba and LAC for 1999

	Infant mortality rate (per 1,000 live births)	Literacy Rate (% of population age 15 years and older)	Life expectancy at birth
Cuba	7	97%	76
LAC	31	88%	70

Source: World Bank Country Report, 1999

According to Deer (1993), during the late 1980s, Cuba was importing from the Soviet Union 44-57% of its per capita caloric intake, 48% of its manufactured fertilizers, and 82% of its pesticides and herbicides. Food First, in its report entitled "Cultivating Havana: Urban Agriculture and Food Security in the Years of Crisis" (1999), stated that the collapse of the Soviet Union's economy in 1989 pushed Cuba into the worst economic crisis of its history. Cuba lost 85% of its trade, including both food and agricultural inputs. Cuba was faced with the dual challenge of doubling food production with half the previous inputs such as fertilizers, pesticides, and farming equipment. This period from 1989 to the present, is frequently referred to as the Special Period.

The first years of the Special Period, according to Moskow (1996), were extremely difficult. As food availability decreased, average daily per capita caloric intake dropped from 2,800¹ to 1,863 during the period of 1989 to 1993 (Plan Nacional de Acción para la Nutrición, 1994). In response to the Special Period, Cuba made significant changes in its

¹ The World Health Organization recommends a daily per capita consumption of 2658 calories and 79.8 grams of protein.

government policies, particularly those related to food security. As a result, in spite of having been economically challenged, Cubans have experienced an improvement in quality of life in terms of its caloric intake. However, protein consumption levels have not fully recovered. The government is trying to improve this situation through its Protein Program² and through support for urban agriculture. Table 2 shows calorie and protein consumption during the period 1970-1996.

Table 2. Calorie and Protein Consumption in Cuba: 1970 – 1996

Average daily per capita consumption	1970*	1989**	1993**	1996*
Calories	2619	2800	1873	2357
Protein (gr)	65	77	46	52.1

Source: * Human Development Indicators, UN, 1999

**Plan Nacional para la Nutrición. Cuba. 1994

The Food and Agriculture Organization (1999), in its report “The State of Food Insecurity in the World 1999.” said that in spite of its problems, Cuba remains prosperous and well fed compared to other countries in the Caribbean and Central America. More than half the country’s roads are paved and 93% of the population has access to safe water. These percentages are higher than those in Central America. For instance, in Honduras, only 20% of the roads are paved and 60% of the population has access to safe water (Chávez, personal communication, 2001). In Costa Rica, one of the region’s most developed countries, 75% of its population has access to safe water.

Food First (1999) adds to this discussion that urban agriculture has been a key part of Cuba’s effort to improve food security. According to the United Nations (1999) 80% of the Cuban population lives in urban areas. Thus, investment in urban agriculture has an impact on a large number of citizens. Growth of this type of agriculture has been stimulated by the

² This program encourages the raising of minor livestock by households.

government's support of aspiring urban farmers and other food producers by making unused urban and suburban land and other agricultural resources available to them. Placing food production close to consumption centers has also helped Cuba economize on fossil fuel use, a resource also in short supply. This development model has important implications for sustainable agriculture, and may be a lesson for other countries seeking to achieve sustainability through the planned and efficient use of both human and agricultural resources. Cuba is an interesting case for studying the role of extension education in food security (Lane, 1999).

Havana City Province Context

The Republic of Cuba covers an area of 110,860 km², and is composed of 15 geopolitical subdivisions or provinces. Figure 1 shows a map of the country.

One of the 15 provinces in Cuba is Havana City Province, which covers an area of 721 km², or 0.67% of the country's total area. Havana City Province has 2.2 million inhabitants, or approximately 19.8% of the country's total population. The population density

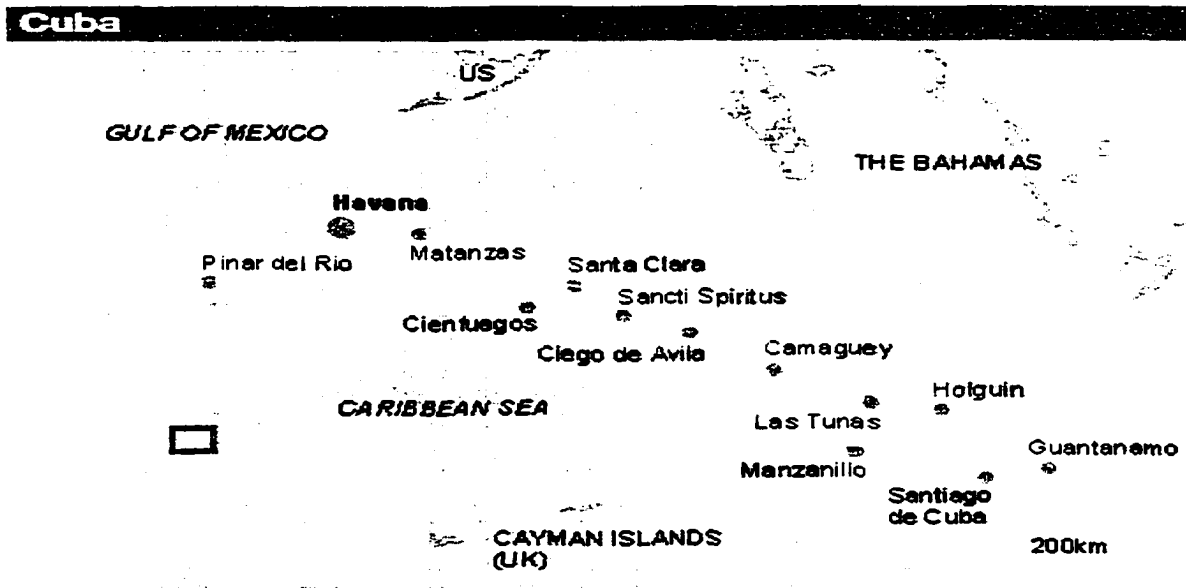


Figure 1. Map of Cuba
Source: Travel. (2001)

of this province is 3,014 inhabitants/km², and its population growth rate is 1.8% per year. The economically active population is about 1.5 million people.

Havana City Province has 15 municipalities: Playa, Plaza de la Revolución, Havana Center, Old Havana, Regla, East Havana, Guanabacoa, San Miguel del Padrón, 10 de Octubre, Cerro, Marianado, La Lisa, Boyeros, Arroyo Naranjo and Cotorro. All of them are considered to be urban (González and Murphy, 2000). Figure 2 displays a map of Havana City Province.

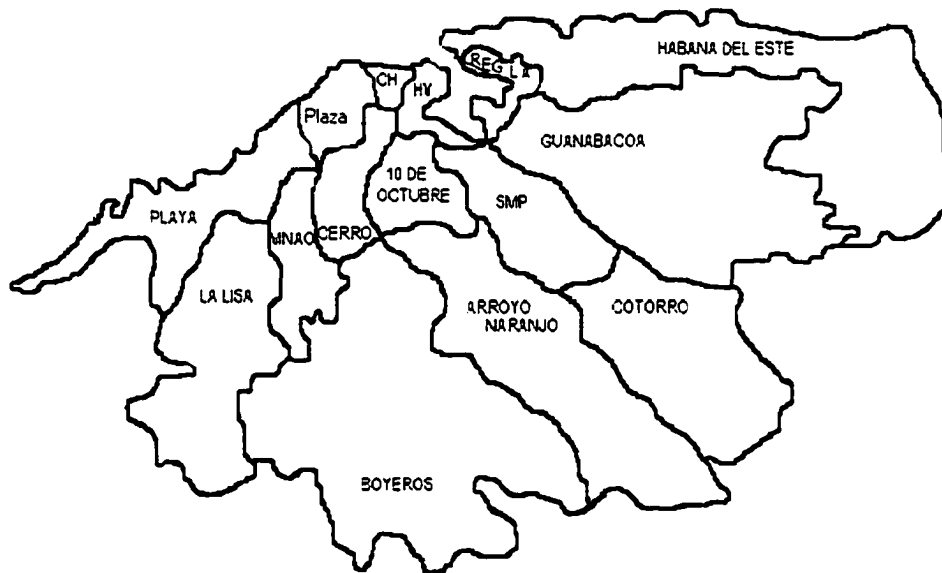


Figure 2. Map of Havana City Province

Source: Cuban Association for Agriculturists and Forestry Professionals (ACTAF, 2001)

According to Chaplowe (1996), the effects of the Special Period and subsequent food shortages have had great repercussions in Havana City Province. In addition to the nationwide decline in food production that previously served many of the needs of the urban areas, there is also a shortage of fossil fuel to transport, refrigerate, and store food available from the rural agricultural sector.

According to Torres as quoted by Moskow (1996) with the food shortage, calorie and protein consumption in the nation dropped by an estimated average of 20% and 27% respectively from 1989 to 1992. By 1993, drops in the median weight of males and females in all categories were generally observed. During this period, health personnel observed

malnutrition in pregnant women and elevated incidence of low-birth weight children. Vitamin deficiencies contributed to a higher incidence of the physiological disorder called neuritis. According to the American Association for World Health³ (1997), this disorder affected over 50,000 men and women.

Given its large population and non-agricultural tradition, it is not surprising that Havana City Province has been designated as a priority in the National Food Program. This program was created in 1991 to ensure that the population would have access to the required amounts of nutritious foods. As a response to the crisis, the government strategically supported and encouraged urban agricultural activities by giving state land to farmers and non-farmers in usufruct, so urban neighborhoods could produce enough quality food to meet their nutritional requirements. Vega de León (personal communication, 2000) stated that currently in Cuba, 74% of the land is private⁴ and 26% is managed directly by the State. In 1994, the Agricultural and Livestock Group was constituted in Havana City Province to support the growing set of urban agricultural activities. Currently, many agricultural activities are being carried out in Havana City Province, including the production of fresh vegetables, rabbits, poultry, goats, sheep, and pork. There is also a forestry program called "*Mi Programa Verde*" (My Green Program) that is in charge of planting trees (ACTAF, personal communication, 2000).

The Problem

Globally, the current situation and outlook for economic and social conditions in many developing countries is not positive. Many development models tried in the past have proven to be unsuccessful. Food security in many of these nations is in jeopardy. This research project was undertaken to understand an evolving system in which food security gains have been achieved against a backdrop of very pressing economic problems. That societal well-being depends, among other factors, on food security has been solidly established in the literature (International Food Policy Research Institute, 1996). However, food security is affected by many factors. One key factor in enhancing food security is an

³ The American Association for World Health is a private health education group based in Washington, D.C. USA.

⁴ Assigned for private usufruct.

effective Agricultural Knowledge and Information System (AKIS). At its core, an AKIS is composed of research and education and relies on a successful exchange of knowledge and information. This study examined the role of extension in the AKIS in an economically challenged country using a unique model of development to provide for citizens' basic needs. The significance of this study lies in not only the innovative nature and size of the AKIS in Havana City Province but also in potential application of lessons learned by Cuba in shaping development policies in other economically challenged countries.

Purpose and Objectives

The purpose of this study was to describe and interpret the Agricultural Knowledge and Information System of Havana City Province, Cuba, with particular reference to the role of extension programs in providing food security therein. Specific research objectives were to: 1) describe the AKIS in Havana City Province; 2) identify and analyze the role of extension in the AKIS; 3) develop a model for analyzing the AKIS, which may have utility when studying the AKIS in other countries.

Cuba was selected as an important case to examine because:

1. Cuba has pioneered a unique, people-centered development model to deal with obstacles of economic scarcity. It should be noted that little research has been published on the status of this model.
2. Cuba compares favorably with other Latin America and Caribbean countries. Paradoxically, in spite of severe economic problems, Cuba has shown comparatively strong performance in the categories of life expectancy, health care, infant mortality, and literacy.
3. The Cuban approach to extension has undergone a rapid and radical change to adjust to an external shock, and its current efforts to fine-tune its approach have not been documented.
4. The World Bank, FAO, IICA and the International Service for National Agricultural Research have all expressed strong interest in recent efforts to reform the Cuban AKIS and encouraged the researcher to pursue research in this area.

The rationale for focusing this study on Havana City Province was based on two

reasons. First, with nearly 20% of the Cuban population living in a largely urban province, Havana City in the Special Period was most vulnerable to food insecurity and, thus, became a focus for AKIS reform and innovation. This province has fundamentally redefined its role in food security by transforming itself from a consumer province to a producer of much of its own food, a province of “*autoconsumo*” as it is known in Cuba. Second, Cuban authorities are interested in assessing the activities of the different AKIS entities or operators working within the province. They are interested in detecting areas where improvement can be made, and where successful approaches can be noted for replication elsewhere in Cuba.

Need for the Study

In 1996, the World Summit on Food Security established a target of halving the number of malnourished people in the world by 2015. With over 800 million hungry people in the world and the generally bleak prospects for developing nations, there is a need to identify innovative approaches for achieving food security. In the information age, the role of extension education within the framework of the AKIS is one area of critical importance as we work to understand how best to address food security constraints in economically challenged countries.

In developing countries, as will be pointed out in the next chapter, it has been observed that AKIS operators do not always work in a systematic way to serve stakeholders. A framework needs to be designed to provide a better understanding of how operators could work together effectively to ensure food security in developing nations.

In Cuba, Government officers are interested in providing efficient services to citizens. In particular, they are interested in learning what areas of the Havana City Province’s AKIS could be supplemented to strengthen the system and provide food security to its citizens.

Educational Importance

The challenges faced by the global society force us to rethink the ways we pursue food security. As described in the next chapter, one important way to combat the causes of food insecurity is through the strengthening and coordination of the relationships among AKIS operators to increase efficiency and effectiveness of the AKIS. This study applied a

holistic approach to understand the array of AKIS operators and how they work interactively as a system. This approach helped to create a framework where ways of supplementing and strengthening the AKIS can be detected. This study attempted to show that the AKIS has played a major support role in the transformation of an urban consumer society into a highly intertwined production and consumption system. Extension education has been the key ingredient to bring AKIS operators together. Operators work systematically to meet farmers' needs. The process of transformation in Havana City Province highlights many issues that can be solved only through collaborative work among the operators. The study provided a rich experience to learn how an urban province with limited resources can transform itself to provide food security to its inhabitants. This experience can serve as a model to other urban areas in other countries. AKIS models should be used as tools to teach students to think systematically about serving farmers.

Limitations

This research was conducted in an urban agricultural setting. The urban agricultural knowledge and information system has particular characteristics that differ from those in rural areas. For instance, farmers in urban areas are food producers who did not have a strong background in agricultural production prior to the Special Period. Some agricultural conditions such as soil fertility and availability of water are very particular to an area where agricultural production has not been practiced until very recently. Since the research was conducted in this area, the findings should not be generalized to non-urban agricultural areas.

Definition of Terms

A list of terms is provided in this section with the purpose of acquainting the readers with terminology utilized in this study. Some terms are specific to the Cuban context.

Delegate of Agriculture - Representative of the Ministry of Agriculture at the Municipal and Popular Council level.

Diplomado System - Courses offered to farmers and former university graduates to update their knowledge on sustainable and organic farming.

Farmers - In Havana City, this name is given to all types of food producers, most without an agricultural background prior the Special Period.

Information - Knowledge obtained from investigation, study, or instruction.

Knowledge - Product of processing information.

Municipality - Group of communities and Popular Councils where the largest administration division of the Cuban Government is located, similar to a county in United States.

Operator - Active institution, element or component of the Agricultural Knowledge and Information System.

Organopónico - Plot where agricultural production is implemented using only organic material as a source of nutrients for the crops.

Popular Council (*Consejo Popular*) - Group of citizens organized at neighborhood and community levels with the objective of giving their opinions, problems, and suggestions to governmental authorities. Issues such as prices and availability of products, agricultural production limitations, training needs, health care services, and other topics are discussed.

Province - Administrative division of the country composed of municipalities.

Urban categories - Population centers composed of 2,000 or more inhabitants are considered urban. However, if an area has a population of 500 – 1.999 inhabitants, and the area has four of the following characteristic: public electricity (required characteristic), paved roads, safe water system, medical assistance, and an educational center, then this area is also considered urban. A metropolis is composed of 500,000 or more inhabitants, for example Havana City. Cities are composed of 20,000 – 499,000 inhabitants, whereas towns are composed of 2,000 – 19,999 inhabitants.

Usufruct - Form of land tenure, where the land is assigned to a person without fee under certain conditions. For instance, land will be assigned to a person or family committed to developing agricultural activities. Land can also be passed on to subsequent generations in the same family. If the government needs the land to conduct another activity that will generate common well-being, this land will be taken back from that person or family.

List of Acronyms

AET	Agricultural Education and Training
ACTAF	Cuban Association for Agriculturalists and Forestry Professionals
ANAP	National Association for Small Farmers
AKIS	Agricultural Knowledge and Information System
BANFAI	Agricultural Bank
CCS	Cooperatives of Credit and Services
CDR	Committee for the Defense of the Revolution
CEAS	Center for Sustainable Agriculture
CEESA	Study Center for Agricultural and Livestock Higher Education
CEMA	Center for Agricultural and Livestock Mechanization
CENSA	National Center for Agricultural and Livestock Health
CITMA	Ministry of Science, Technology and Environment
COMECON	Council for Mutual Economic Assistance
CPA	Cooperatives of Agricultural Production
DECAP	Department for Project Coordination and Assistance
FAO	Food and Agriculture Organization of the United Nations
FMC	Cuban Women's Front
GAO	Group for Organic Agriculture
IPM	Integrated Pest Management
ICA	Animal Science Institute
IICA	Inter-American Institute for Cooperation on Agriculture
INCA	National Institute for Agricultural Sciences
INIFAT	Institute for Fundamental Research in Tropical Agriculture
INISAV	Plant Protection Research Institute
INRA	National Agrarian Reform Institute
LAC	Latin American and the Caribbean
MINAG	Ministry of Agriculture
NGO	Non-Governmental Organization
SEA	Agricultural Extension System
SINCITA	National System of Science and Agricultural Technology and Innovation
UBPC	Basic Unit of Cooperative Production
UN	United Nations
UNAH	Agrarian University of Havana
USAID	United States Agency for International Development

CHAPTER II

REVIEW OF LITERATURE

Introduction

This chapter is divided into four sections, beginning with a description of Agricultural Knowledge and Information Systems (AKIS), followed by a discussion on extension organization and management and its different approaches. The third section examines some issues related to the role of agricultural and extension education in the AKIS. The chapter concludes with a section on food security.

Agricultural Knowledge and Information Systems

In this section, literature is reviewed in the areas of systems inquiry and AKIS. Specific AKIS models used by researchers are also analyzed.

According to Senge and Lannon (1991), systems thinking is a discipline for seeing wholes, recognizing patterns and interrelationships, and learning how to structure them in ways that are more efficient. Engel (1997) defines systems thinking as "an approach to studying the world, and intervening in it, probing and dealing with complex situations" (24). Bawden, et al. (1998) observed that a systems approach permits observers an opportunity to obtain a real representation of the world. Engel (1997) stated that a knowledge systems approach provides a practical and useful tool for reviewing stakeholders' interactions according to established objectives to formulate an effective path of communication and collaboration. The goal of systems inquiry is to help develop a rich picture of a complex situation and to use this in-depth understanding to develop proposals for action.

In the context of agriculture, Rölöing and Engel (1990) introduce and describe the importance of the recognition of the AKIS as a means of understanding and improving the development and transfer of technology and information to be used by agriculturists. The phrase Agricultural Knowledge and Information System was defined by Rölöing in 1992 as:

The articulated set of actors, networks, and/or organizations expected or managed to work synergistically to support knowledge processes which improve the correspondence between knowledge and environment, and/or the control

provided through technology use in a given domain of human activity. (31)

The World Bank (2000) describes the function and role of AKIS as follows:

An Agricultural Knowledge and Information System brings people and organizations together to promote mutual learning and generate, share and utilize agricultural technology, knowledge and information from diverse sources for better farming and improved livelihoods. The system has three main subsystems: agricultural education, agricultural research, and agricultural extension. Farmers' needs and opportunities influence and determine agricultural education and extension programs. Farmers provide direct input and feedback into design, funding, priority setting, implementation, and evaluation. (1)

Engel (1997) suggests that to understand the social organization of innovation in agriculture, researchers can look at the division of labor among the system's operators. Some researchers have studied AKIS to understand how knowledge flows within the system. For example, Röling and Engel (1990) and other experts suggest an examination of knowledge as the key ingredient within the system. For instance, Havelock (1986) and Swanson, et al. (1986) have used AKIS to learn how innovation and technology are generated, diffused, and utilized. In this case, indicators of performance are utilized to measure and assess the functions of agricultural technology systems (Röling and Engel, 1990). These indicators provide a means to focus on linkages, functions, and inputs between and within subsystems. The system is composed of policy, technology development (research), technology transfer (extension), and technology utilization. Figure 3 shows an application of the AKIS model suggested by Swanson, et al. (1986). In this figure, a crop breeding innovation is traced in a linear fashion from its origins in research to its adoption by farmers in Malawi.

Kaimowitz, et al. (1990) suggest that the main functions of an AKIS are technology production, delivery, monitoring, and evaluation. The FAO and the World Bank (2000) state that in some areas an AKIS is utilized not only to obtain information on agricultural technology advice but also on issues related to nutrition, health, community organization, and

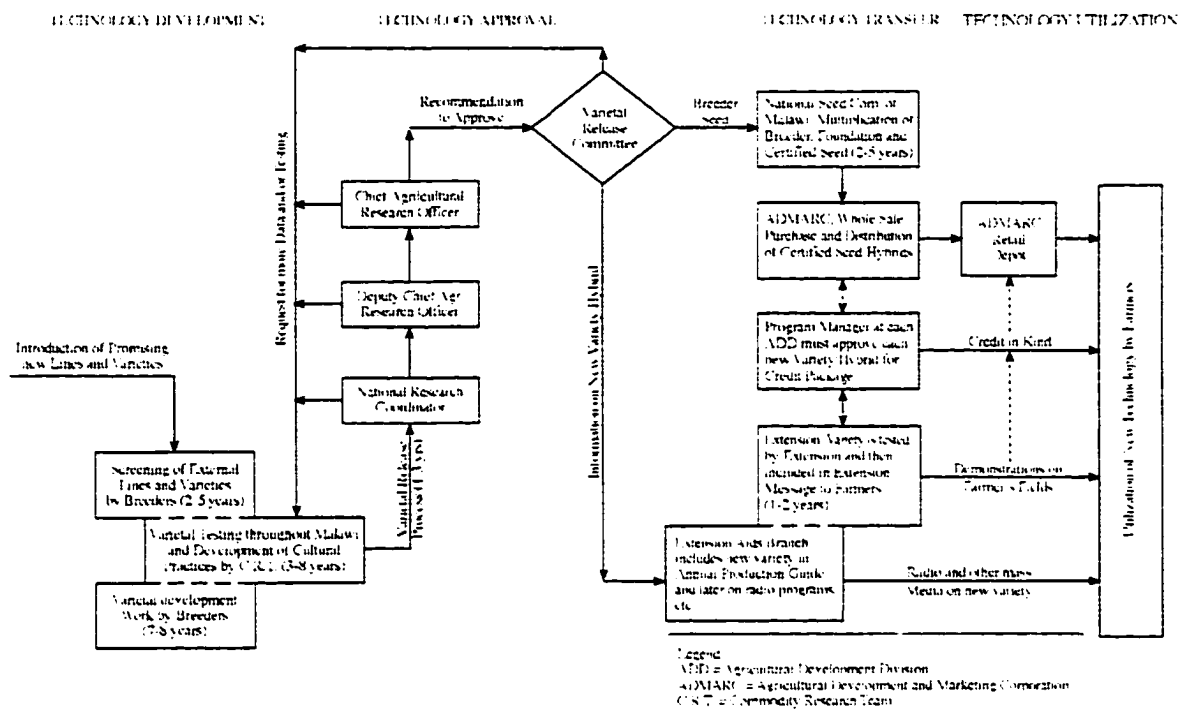


Figure 3. Swanson, et al. AKIS Model

others. The ability of AKIS operators to approach these needs depends on their scope and partnership with specialized organizations. For instance, Bawden (1998) offers another AKIS model to explain how the agricultural education and training (AET) system fits into the rural development system and how both systems are influenced by the environment that surrounds them. Figure 4 shows the condensed AKIS diagram. The AET system includes the clientele, organizations and institutions in both the private and public sectors, and both non-government (NGO) and community-based organizations (CBO) (Maguire, 2000).

As observed in the previous models, there are many ways to define the roles of the operators in agricultural innovation settings. Each choice represents a specific model for defining the process of managing agricultural innovation, therefore, each model has particular implications for systems analysis (Engel, 1997).

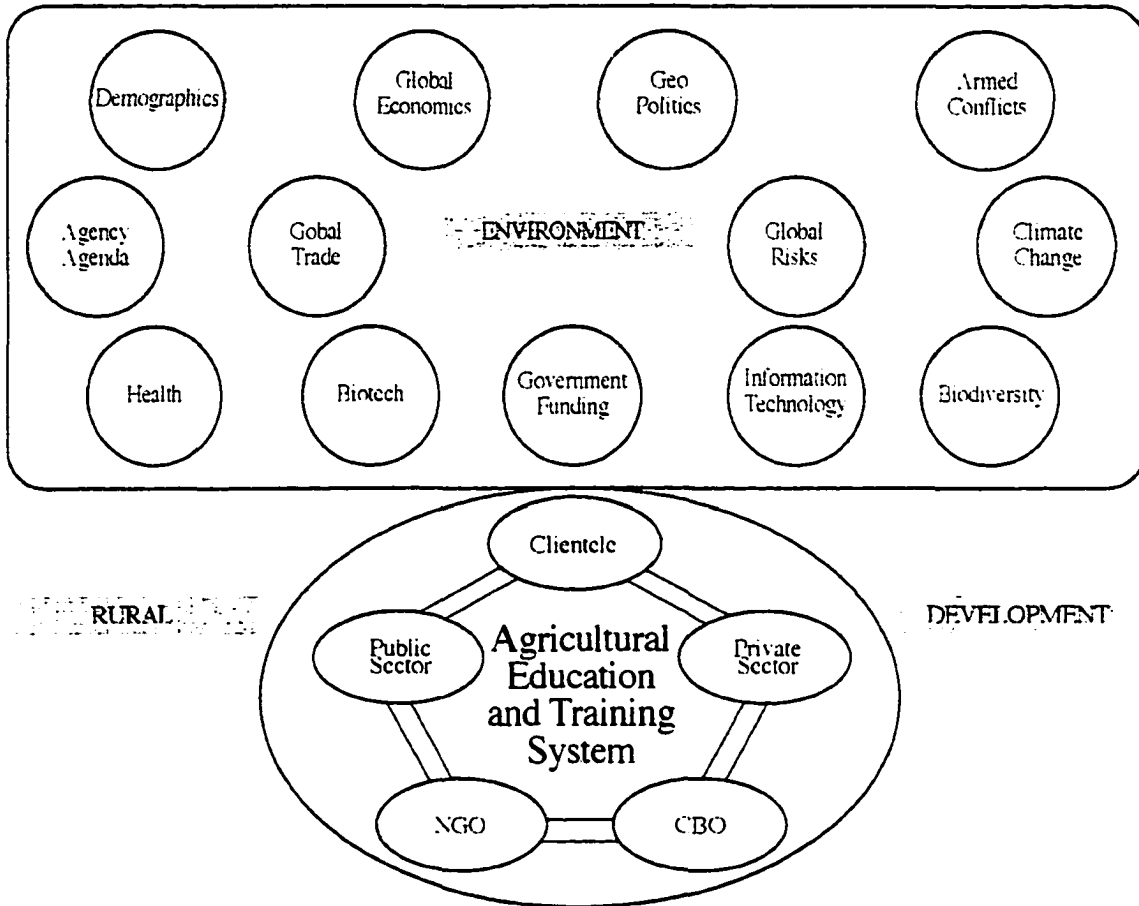


Figure 4. Agricultural, Education and Training AKIS Model

Extension Organization and Management

According to Röling (1990), the extension education concept has different definitions depending on the context and culture where it is applied. This makes its definition and usage imprecise. For instance, in the United Kingdom, Germany, and Scandinavia, the focus of extension is on “advisory work”, i.e., on solving specific problems. In the United States, extension traditionally has used an educational approach to teach people to solve problems by extending information. In The Netherlands, the term *voorlichting* is used in extension. It means to keep the light in front of someone to allow him or her to find the way. In France, the term *vulgarisation* is utilized to indicate that extension simplifies information so that it can be understood by the “vulgus” or ordinary people. Reactions against the “top down”

implication of this definition have led to many debates such as those introduced by Freire (1973) when he discussed terms such as “mobilization⁵” and “conscientization⁶.”

As pointed out by Röling (1990), differences in terminology are not the only source of confusion. Political and other traditions have made a considerable contribution. Extension is expected to achieve different purposes depending on the policy tradition under which it functions. Informative extension, for instance, is used in a conservative tradition context. In this form, extension is seen as an instrument for helping people make informed choices among alternatives provided by extension so the farmers may make optimal decisions with respect to achieving their own goals. People are free to use or not to use the extension service.

On the other hand, as stated by Röling (1990), in the socialist and Christian tradition, extension is seen as an instrument of emancipation, to uplift the poor. Freire (1973) has called it emancipatory extension, or “a pedagogy of the oppressed”. In this paradigm, extension is utilized for achievement of societal objectives and for correcting structural problems. In both traditions, there is a considerable emphasis on the use of extension for the development of the human being. This could be called “formative” extension or “human resources development”. Governments have also used extension as a policy instrument (“persuasive” extension), to achieve societal objectives such as inducing preventive behaviors to alleviate problems related to the environment, health, and crime. In countries where persuasive extension is utilized, it often serves as an instrument to achieve policy and export goals, national food security, and can be used to ensure inexpensive food supplies for urban workers.

After analyzing these different approaches, Röling (1990) tries to integrate points or descriptions where these approaches coincide. He defines extension as “a professional intervention deployed by an institution to induce change in voluntary behaviors with a presumed public or collective utility” (49). Engel (2000) in his article “*Facilitando el Desarrollo Sostenible: Hacia una Extensión Moderna?*” also recognizes that extension has different interpretations depending on the audience and the geographical region. He states

⁵ Mobilization refers to the participation of citizens in actions for the common good of society.

⁶ Conscientization refers to learning to perceive social, political, and economic contradictions, and to take action against the oppressive elements of reality.

that in 1997, IICA defined the universe of technical services as "The Technological Transference, Technical Assistance and Agricultural Extension Complex", suggesting that there are many different connotations to the word "extension." Axinn (1988) also provides a description of eight different approaches to agricultural extension. Although these approaches are different, they share some characteristics. All approaches function through non-formal education, have content related to agriculture, use communication techniques and aids, and seek to improve the capabilities of rural people. Axinn's definitions of the various approaches to extension are described below.

The general agricultural extension approach is probably the most common in the world. It has been dominant during the last 80 years. Government organizations are responsible for agriculture in almost every country. In this approach the ministry of agriculture is in charge of carrying out extension activities. The basic assumption of this approach is that technology and information are available, but they are not being utilized by farmers. The approach is one of technology transfer from government to rural people. The purpose of this approach is to help farmers increase their production. It is assumed that if they increase their production, they will be better off and, consequently, the country will be better off.

The commodity specialized approach, introduced in 1962, tends to focus on a single export crop, such as coffee, sugar, tobacco, cotton, or rubber. Sometimes, this approach is used to focus on one aspect of farming, such as livestock, dairy, irrigation, or fertilizer. The assumption is that in order to increase productivity and production, services need to concentrate on a single crop. It is often assumed that grouping extension with functions such as research, input supply, output marketing, credit, and sometimes price control will make the entire system more effective.

The training and visit approach started in 1970, and assumes that extension field personnel are poorly trained, not up-to-date, and tend not to visit farmers, preferring to stay in their offices. Management and supervision are assumed inadequate. Therefore, it introduces a management discipline designed to solve these problems. It also assumes that a two-way flow of communication between extension staff and farmers can be achieved through this system. The World Bank has been promoting this approach since the mid-1970s.

In general, the training and visit approach has not proven to be financially sustainable after loan or donor funds are depleted.

The agricultural extension participatory approach started at the end of the 1970s . It is based on the observation that there is growing evidence that when rural people organize for their own benefit, much can be achieved. This approach takes advantage of this principle and emphasizes significant and active participation by those who are affected by the agricultural extension system. This approach takes into account the indigenous knowledge of the farmers and the knowledge of scientists to improve agricultural production.

The project approach has a heavy dependence on special outside funds. It was introduced in the 1980s. Usually the project is directed to a limited location, in a specified time frame, and, therefore, continuity is not anticipated. According to Moris (1986) there are two forms of the project approach. One is an extension component as part of a development project or program. The other "is an extension system in a specific geographical area" funded by an external donor.

The farming systems development approach started in the 1980s. It assumes that the technology that fits the needs of farmers, particularly limited resource farmers, is not available and needs to be generated at the local level utilizing farmer participation in research. The purpose is to provide extension personnel with research results tailored to meet the needs and interests of local farming system conditions. This is a holistic and participatory approach.

The cost sharing approach is the newest extension approach. It was introduced in 1914. This approach points out that non-formal educational programs (and some formal educational programs) are more likely to achieve their goals if those who benefit from them share some part of the cost. It has often been demonstrated that commitment of the intended program beneficiaries will be enhanced if they pay some part of the cost.

The education institution approach was first introduced in Denmark in 1844. It involves participation by agricultural schools, colleges and universities. However, in many countries agricultural extension is not typically part of the primary mission of agricultural education institutes. Agricultural extension is an adjunct role that enhances the quality and

relevance of their main mission. Agricultural education institutes also support agricultural extension work by training future extension employees.

Role of Agricultural and Extension Education in the AKIS

This section addresses several issues of critical importance to the foundations of AKIS and agriculture and extension education. Specifically, the section discusses constraints and challenges of agricultural and extension education at all levels. In addition, this section is utilized as a reference to analyze the agricultural and extension education system of Havana City Province.

According to FAO (1997) there are a number of factors affecting the teaching of agriculture at all levels. Among these factors is the need to revise the education of extension workers to make their knowledge, skills, and attitudes more relevant to current development needs. The FAO argues for schools of agriculture to incorporate extension education classes into the curricula of agricultural universities to support rural communities and their development. One problem arises when the curricula of schools of agriculture are not relevant to the actual needs of society. Acker (1989) makes the following observation:

Lack of educational relevance is not without cost to society. Professionals operating with skills of marginal utility are often frustrated by diminished personal performance and inadequate professional results. Furthermore, inappropriate agricultural education training may delay the progress of national development. (7)

The FAO (1997) points out that most of the students in agricultural universities come from urban areas, and it has been found difficult to create awareness of rural development since the majority of them do not have any background in the issues of rural systems. Falvey (1998) adds that among the constraints to university research is the lack of students from rural areas. Rural students often become good research staff because they are familiar with agriculture and are willing to work in rural areas. In addition, Maguire (2000) notes that usually the best students from secondary schools choose careers other than agriculture, and the demand for university graduates with agricultural degree majors is low. Furthermore, donor support for agricultural institutions may be too narrow to serve rural population.

Gasperini (2000) states that:

Agricultural education and training has taken responsibility only for a reduced clientele, including students of vocational education and training institutions, and of higher agricultural education, and has not addressed the needs of the vast majority of rural population. (1)

At a 1999 conference on higher agricultural education held in The Netherlands, a number of factors were identified as major issues in agricultural education in developing countries. These factors included the need to improve: 1) the development and review practices of curricula by focusing on participatory methods, 2) educational policy and planning with a focus on meeting the needs of students, 3) the teaching/learning process at the university level, and 4) the role and potential use of distance learning in agriculture (Lindley, 1999).

According to Bush (1992) universities are expected to play a relatively important role in ameliorating real problems and improving situations faced by rural communities. Contributions in this area can be made directly through their participation in research and extension, and/or indirectly through the development of human resources to serve as future research and extension staff. To examine the interaction between economic development, technological transformation, and higher education it is necessary to analyze the structure and functions of universities as social institutions (Castells, 1993). In 1995, the National Association of State Universities and Land Grant Colleges and the W. K. Kellogg Foundation created the Kellogg Commission on the Future of State and Land Grant Universities to examine the role and future of public higher education in the United States of America. According to the Kellogg Commission (1999), it is time to go beyond outreach and service to "engagement." This will require the redesign of teaching, research and extension programs at public universities. By using engagement, the Commission envisions true partnerships with communities. Universities can make the community's agenda part of their own in a number of ways. Some are administrative and managerial; others are academic and scholarly providing specialized technical assistance of one kind or another to a local community group. The FAO and The World Bank (2000) state that education and training should not be considered only as processes to transfer knowledge, they are also means to

make people become critical thinkers and problem solvers. Only through this empowerment process can people help themselves.

In this section a major issue in agricultural and extension education was identified, namely that agricultural curricula is often found lacking in relevance to the needs of society. To solve this problem universities need to be engaged with their communities, and they need to revise their curricula to make knowledge, skills, and abilities relevant to actual needs.

Food Security

In this section types of food security and main causes of food insecurity are described. This discussion is used as a foundation for placing Havana City Province's food insecurity situation in context.

The USAID (2000) states that, currently, there are sufficient food supplies to feed the world's population. The major problem is that food is unevenly distributed and poorer nations are not able to either produce sufficient food or to generate enough economic capacity to import adequate amounts of food. Food insecurity produces loss of human productivity, deficiency in learning, and a barrier to development (World Federation of Agriculture, Food, Hotel and Allied Workers, 2000). There are two types of food insecurity: transitory and chronic. Transitory food insecurity refers to the temporary incapacity to consume sufficient food. Chronic food insecurity exists when there is a long-term inappropriate or decreasing capacity to obtain sufficient food (Government of the United States, 1998).

The causes of food insecurity are diverse and complex. The causes include wars and civil strife, inappropriate national policies, inadequate development, barriers to trade, environmental degradation, poverty, population growth, gender inequality, low utilization of food, poor health, lack of education, and unwise investment of incomes (USAID, 2000). Other causes include rural de-population with inadequate employment opportunities for those that migrate to cities, replacement of food crops with cash crops for export, and inequitable access to advanced agricultural technologies (Brklacich and Leybourne, 1999).

The United Nations (1996) stated that since the causes are diverse, a number of mutually reinforcing approaches need to be applied to achieve food security. These

approaches include strengthening of agricultural education, creation of non-agricultural employment opportunities, training in food preparation and childcare, provision of safe water and health care services, conflict resolution, and increased participation of women. The USAID (2000) states that there is a need to strengthen agricultural markets, invest in agricultural research, remove trade barriers, and promote health and family planning.

Summary

In this chapter the importance of using a systems approach to obtain a more thorough and realistic picture of a situation was noted. The agricultural knowledge and information systems framework has been utilized in different settings with different objectives. The definition of extension education was seen as being different according to the setting where it is applied. Eight extension approaches were discussed.

In addition, the concept of food security and related issues were introduced. The causes of food insecurity were characterized as being varied and particular to each region. The implementation of integrated approaches where operators can work together to fully develop their potential were suggested by many organizations such as FAO, the World Bank and USAID as a path to achieving food security in developing nations.

CHAPTER III METHODS AND PROCEDURES

Introduction

Qualitative research methods were selected as most appropriate for this study. The purpose of this chapter is to describe the procedures the researcher used to collect and analyze data. The chapter also provides a rationale for the appropriateness of qualitative research methodology in examining the role of extension in Cuba's AKIS.

Organization of the Study

A total of the three research trips were made to Cuba. In May 2000, a site visit was made to Havana City Province with the purpose of collecting initial data on Cuba's AKIS, meeting Cuban partners that were able to participate in a collaborative study, and formulating the study objectives. Cuban authorities indicated that the area of greatest interest would be to study the AKIS and its role in urban food security in Havana City Province due to the high investment of efforts that many operators have placed on that system to improve agricultural production and food availability. Once the study was formulated, a collaborative research proposal was sent to Cuba to obtain authorization to carry out the study. In November 2000, the proposal was accepted by the Ministry of Agriculture of Cuba.

To ensure that all research objectives were addressed, open-ended questions were developed and used as a framework for guiding interviews. These questionnaires were customized for each group of operators. The questionnaire guidelines and letters to request permission from the informants to hold the interviews were submitted to the Iowa State University Human Subjects Committee for their review and approval.

Qualitative Research

Marshall and Rossman (1995), Creswell (1994), and Guba and Lincoln (1985), stated that qualitative research should be utilized when the researcher is involved, performs various roles (observer, participant, participant-observer, complete observer), is aware of the existence of multiple realities, seeks participants' perspectives and looks for understanding. It

should also be utilized when the study is exploratory or descriptive, values context and setting, and when all the relevant variables are not initially known (quoted in Duffelmeyer, 1999).

Specifically, a constructivist qualitative approach was used to build an understanding and to describe Havana City Province's AKIS. Furthermore, several mutually reinforcing qualitative methods were used to develop a rich picture of the case of the AKIS in Havana City Province. Constructivist qualitative inquiry, as stated by Guba and Lincoln (1998), looks for understanding and reconstructions of the constructions that people (including the researcher) initially hold, but is still open to new interpretations as information and sophistication improve. As mentioned by Carr and Kemmis (1986), the researcher has the role of participant and facilitator in this process. Some methods used in this study are case studies, interviews, focus groups, observations, participation in events, document reviews, and pilot studies.

Case Study Methodology

A case study methodology was utilized in this study. Case study approaches are used when the researcher is interested in insight, discovery, and interpretation rather than hypothesis testing. They are used when the researcher seeks answers to how or why questions. In addition, case studies are conducted when the researcher does not have control over the situation being studied such as in Cuba where the researcher did not seek to control the subject under study. Case studies are most successful when multiple sources of evidence are utilized and holistic description and explanation are sought (Yin, 1989). Case studies are particularistic in the sense that they focus on a specific situation or phenomenon. Case studies are descriptive. They are heuristic, meaning that they offer insight into the phenomenon under study, and they are inductive. Qualitative case studies rely heavily upon qualitative data obtained from interviews, observations, and documents (Merriam, 1988).

According to Stake (1995) the cases of interest in education and social service are people and programs. Each case is similar to other persons and programs in many ways and unique in many others. We are interested in them for both their uniqueness and commonality (Stake, 1995).

The Havana City Province's AKIS represents a largely under-explored case. Based on parameters of quality case studies it was determined that the best methodology to conduct the research on Cuba's AKIS was the case study methodology.

In the next sections methodologies used to conduct the study will be described: collaborative research approach, validation, triangulation, interviews, participant observation and document review.

Collaboration and Research

Because of justifiable concerns on the part of Cuban Government officials, a collaborative approach was adopted as the least threatening and most likely to yield in depth results. According to Berg (2001), collaborative linkages between the researcher and a practitioner from the setting where the investigation is being conducted is one resource utilized to establish a relationship of mutual aid that helps to build trust. To conduct the study the researcher made three trips to Cuba, building trust over time. This allowed the researcher to show genuine interest and commitment to the Cuban authorities.

Berg (2001) presented three types of collaborative research. These are called: 1) technical/scientific/collaborative approach, 2) practical/mutual collaborative/deliberate approach, and 3) emancipating/enhancing/critical. In the first case the researcher identifies issues after collaborating with the practitioner who helps the researcher to collect data and implement the project to solve these issues within the community. In the second case, the researcher and the practitioner identify problems of the community, and try to find their causes and solutions together. The communication flow begins with the researcher and facilitator working collaboratively and then flows from the facilitator to the stakeholders. In the third case, critical consciousness is promoted to encourage change. This approach has two goals: a) to bring together the problems encountered by practitioners with the theories to solve them, and b) to help practitioners to get acquainted with knowledge that will help them to understand fundamental problems by raising their collective consciousness (Schwandt, 1997).

The researcher was assigned by the Ministry of Agriculture to the Cuban Association for Agriculturists and Forestry Professionals (ACTAF). The researcher met the interviewees

through the ACTAF staff, who helped to facilitate scheduling of interviews. This allowed collaborative research with characteristics of a technical/scientific/collaborative approach and of an emancipating/enhancing/critical approach (Berg, 2001). Findings will be shared with Cuban authorities for improving the agricultural system of Havana City Province.

Validity

To assure that the researcher's findings and interpretations accurately represent the situation under study, different methods were utilized. Ratcliff (1995) suggests the following procedures to ensure validity in qualitative research: 1) divergence from initial expectations, 2) convergence with other sources of data through use of triangulation techniques, 3) extensive quotations, 4) other research data (archival data and recordings), 5) multiple researchers, and 6) member check, meaning that the researcher goes back to those researched and asks them for feedback on the accuracy of the information gathered. To assure validity in the Cuban study, the researcher relied primarily on two techniques: triangulation and member check.

Triangulation

This procedure is used to crosscheck the accuracy of data gathered. It consists of using different data collection techniques. Glaser and Strauss (1967) note that triangulation avoids accepting too readily the validity of first impressions. It enhances the scope, density and clarity of constructs developed during the investigation process. Triangulation helps to correct biases that occur when the researcher is the only observer of the topic being researched (LeCompte and Preissle, 1993). Schwandt (1997) adds that triangulation also helps in drawing inferences from data, claiming that a particular set of data supports a definition, theme or claim. In this study, triangulation was established using three data collection procedures: interviews, participant observation, and document review. It was also established through multiple, reinforcing interviews.

Member check

Discussions were held in Cuba with those familiar with the AKIS to check their impressions of the interviewee responses. Drafts of the dissertation were shared with Cuban

authorities and counterpart for checking accuracy of data. Communication through email was employed to conduct this activity.

Interviews

An interview is a conversation with a purpose. The role of the researcher is to guide the process of discovering the participant's points of views without re-framing or changing the structure of responses. Interviews are combined with observation to help the researcher understand the meaning that people hold for their daily activities (Marshall and Rossman, 1999).

To acquire an understanding of the research context, key informants need to be interviewed. These are persons who possess special knowledge, experience, status and they are open to share these with the researcher. In some cases, the researcher and key informants develop a close scholarly relationship and research can be conducted collaboratively (LeCompte and Preissle, 1993). Key informants or "elite individuals", as Marshall and Rossman (1999) have called them, can provide an overview of an institution and its relationship with other institutes. Elites are able to mention policies, past histories, and future plans of the operator he/she represents.

For the study, the researcher interviewed representatives of each of Havana City Province's AKIS operators with the purpose of understanding and describing the agricultural system and the role of the AKIS in that system. The researcher was introduced to them through the intervention of the researcher's Cuban counterpart organization.

Forty-six people were interviewed between the dates of November 13 and January 28. Most of the interviews were audio-tape-recorded and transcribed. Interviews were conducted in Spanish and lasted approximately 90 minutes. In order to organize and analyze information, data were coded using different categories for each AKIS operator category. Different levels of the organizational structure within each operator were determined and analyzed separately. Also, data were coded taking into consideration the types of questions that the researcher wanted to answer. Furthermore, to ensure that data details were being understood and well interpreted by the researcher, member checking was conducted with

Cuban partners. After data were analyzed, tapes, transcriptions and diskettes were stored in a secure area.

Participant Observation

Participant observation is a procedure that helps to understand the life of others (Schwandt, 1997). It allows the researcher to verify that people do what they say they do. Researchers become learners. This method of collecting data is usually combined with other methods such as interviews, document collection, and surveys (LeCompte and Preissle, 1993). According to Schwandt (1997) the researcher utilizing this method becomes socialized into the group under study. It is recommended that the participant observer cultivate empathy, rapport and familiarity. However, a respectful distance needs to be maintained to create an objective perspective on the situation's analysis.

In the case of this research project, the researcher attended meetings on extension, visited farms, participated in demonstrations, toured research stations, worked in the offices of an AKIS operator and met formally and informally with AKIS operators. These activities allowed the researcher to participate and observe how the system works and establish communication among different AKIS operators.

Document Review

The review of documents such as minutes of meetings, formal policy statements, letters and research journals about the topic under study supplements participant observations, interviews and observations. The use of documents requires an approach called content analysis. This method is used to describe and interpret the artifacts of a society or social group. It is unobtrusive and non-reactive; this means that the setting is not disturbed by the researcher (Marshall and Rossman, 1999). With the research objectives in mind, documents found in US and Cuban collections written by Cubans and about Cuba were reviewed. Extension activities and organizational meetings were attended and group-interviews with Cuban authorities, non-governmental organizations, research institutes, former students, and one-on-one interviews with professors, farmers and people working in agricultural entities were conducted. In addition, the researcher searched for documents on

Cuba related to the research topic. This searching was done in libraries and online in both English and Spanish. Relevant information written in Spanish was translated into English. The searching was also done through different people who have an interest in Cuba, and had conducted research in that country as well as through entities working in Cuba.

CHAPTER IV

RESULTS AND DISCUSSION OF FINDINGS

Introduction

This chapter is divided into three sections. First, a general description of the Cuban agricultural context is provided. Second, all major operators of the AKIS of Havana City Province are described following the organization used in the AKIS model developed by Swanson, et al. (1986), including those involved with the policy environment, education, research, production, non-governmental organizations and markets. In this section the inter-relationships among the AKIS operators are described. The third section is a discussion of the findings and their implications.

Cuban Agricultural Context

Cuba is an agricultural island endowed with adequate rainfall and relatively good soils. However, beginning with its discovery in 1492, there have been growing pressures on its natural resource base. When the Spanish arrived in the 15th century, 95% of the country was covered by forests. By 1900, the forested area had been reduced to 54%. By 1959, the forested area had been further reduced to 14%. This deforestation process caused a serious loss of biological diversity. During the same period, industrial activity was limited, with the exception of sugarcane processing. Little attention was paid to natural resources and the environment.

According to the Ministry of Agriculture of Cuba (1999) before the revolution, the health care system and social services were inadequate. Since the revolution of 1959, social and economic transformations have been achieved creating a remarkable improvement in the well-being of the population and the protection of natural resources. However, Cuba did not escape from some of the negative trends frequently attributed to the Green Revolution (García, 2000). The 1970s and 1980s were characterized by agricultural intensification, with heavy reliance on imported seed, fertilizers, pesticides, and machinery. With this form of input intensive agriculture, the highest yields in the history of Cuba were obtained in almost all cultivated crops.

Sugar was Cuba's main export product, and from 1984 – 1989, it accounted for 77% of Cuba's exports. During this period, Cuba's main trade activity was with the Soviet trade organization called Council for Mutual Economic Assistance (COMECON). In 1984, Cuba and the Soviet Union signed a long-term trade pact. The treaty identified Cuba as the supplier of sugar, nickel, and citrus within COMECON (Roca, 1993). In exchange for its exports, Cuba acquired fuel, and several food products such as canned meat, canned vegetables, wheat, fertilizers, pesticides, and other products from the Soviet bloc. When the Soviet Union collapsed, the Cuban economy suffered a strong contraction that also effected all of its agriculture. In the 1990s, with the disintegration of the Soviet Union, Cuba lost almost all of its entire commercial and trade links (Pastor, Jr., and Zimbalist, 1997).

The Structure of the Agricultural Production Sector

The agricultural sector of Cuba has one agricultural corporation, three agro-industrial groups, 434 State Farms, 153 independent farms, 10,400 private producers, and 4,702 cooperatives. Of the 4,702 cooperatives, there are 1,601 basic units of agricultural production (UBPC) and 761 livestock production cooperatives (CPA), and individual producers, of which 2,340 are cooperatives of credit and services (CCS). Table 3 shows the organization of Cuban agriculture. The table is organized according to the type and location of agricultural units and its description, land tenure, number of people involved, and main products.

The total agricultural area is about 6,614,664 hectares, of which 1,969,400 hectares are State owned and managed lands. The forestry area is 2,832,000 (Oficina Nacional de Estadística, 1997). The main permanent crops are coffee, cacao, sisal, and citrus. The main annual crops are rice, roots and tubers, tobacco, and vegetables. More than 700,000 people work in agricultural activities; 53% work for the state, in jobs such as administrators, field workers, and others - only 21% are women. Cooperatives as well as individual farmers are important components of the agricultural production sector. Approximately 32,800 producers (cooperative members and individual farmers) cultivate an area of 300,000 hectares.

According to the mechanization office of the Ministry of Agriculture (1997), there are 35,142 tractors in the different agricultural production organizations; 301,372 oxen; and 284,345 agricultural implements for animal traction. Around 1,581 garages repair engines

Table 3. Organization of Cuban Agriculture

Type and location of agricultural units	Description	Land tenure/ No. of people involved	Main Products
State Farms. Found in peri-urban and rural areas.	There are three agricultural State Farms (Mixed Crop enterprise, Metropolitan Vegetable enterprise, and Animal Production enterprise).	State owned.	Food is distributed using the state system. Some land is dedicated to fruit, meat, and dairy for the tourist industry. Sugar and cacao are produced by State Farms.
Basic Units of Cooperative Production (UBPC). Found in rural and urban areas.	These cooperatives are the result of State Farms. There is a heavy reliance on governmental agenda for cultivation planning and financial support	Collective usufruct, 5-10 members.	Vegetables, ornamental plants, minor animals, livestock production
Agricultural and livestock cooperative production (CPA's). Mainly found in rural areas.	This type of cooperative was initiated in 1977. Small farmers gave their lands to be used in a collective way. The production and profits are divided among the members.	Collective/private ownership.	Sugarcane, tobacco, and coffee production for self-consumption and export.
Cooperatives of Credit and Services (CCS's). Found in urban and rural areas.	The cooperatives are formed to utilize equipment, request credit, and to receive technical assistance in a collective way. However, each individual has his/her own production plot.	Individual usufruct, 50-80 members.	All types of vegetables, minor livestock.

Table3. (continued)

Type and location of agricultural units	Description	Land tenure/ No. of people involved	Main Products
Gardeners (<i>Parceleros</i>). Found in urban areas.	Most popular form of urban agriculture in Havana. Gardens were developed in response to the Special Period. Production is for self-consumption; in some cases, <i>parceleros</i> make donations to elementary schools and daycare centers. People cultivate their yards, balconies, and patios. Surplus is sold to neighbors. Producers either have permanent jobs elsewhere, or they are retired. Many women are involved in this activity.	Adjacent to private homes. When the area available for cultivation is too small, gardeners have requested additional land; this is given in <i>usufruct</i> . There are about 20,000 organic gardens. Each plot is 1200 m ² on average.	Vegetables and condiments. In some cases some minor livestock.
Institutional/ State plots (self-provisional gardens). Found in urban and rural areas.	These plots are areas assigned to offices where food is produced to provide lunch to their employees; the surplus is sold to the employees.	Production areas are assigned at State offices.	Mostly vegetables.
Individual farmers (<i>Campeños particulares</i>). Found in rural areas.	These are small farmers with an agricultural tradition.	<i>Usufruct</i> . The common farm size is about 13 ha.	Mostly milk and flowers. Milk is distributed through the State distribution system.

and all types of farm equipment. Also, the Ministry of Agriculture has 964 industrial production centers where foods such as soy protein and canned food are processed.

Havana City Province Agricultural Situation

Havana City Province has 2.2 million inhabitants, 19.8% of the national population. Many agricultural programs are being carried out to improve food production and environmental conservation. Among the main programs are production of fresh vegetables, rabbits, sheep, and pork as well as My Green Program. The government selected this particular name with a purpose:

When you say “My Green Program”, you feel a sense of ownership. When things belong to you, you care more, so we name it this way, because this program belongs to everyone. We want to encourage people to really get involved developing an awareness of the need for a better and cleaner environment.

Due to the Special Period, Havana City Province has been transforming its role from consumer to food producer. Many AKIS operators are involved in this task, as explained in the following section.

AKIS Operators

In this section AKIS operators will be described under categories patterned after Swanson, et al. (1986) namely, policy environment, education system, extension services, research institutes, non-governmental organization, agricultural stores, and agricultural markets. The description of their organization and interactions will help to elucidate how the system operates as a whole to promote food security in Havana City Province.

The Policy Environment and National Structure

The Cuban Communist Party is in charge of providing vision, policy guidance and direction to the nation ensuring that policies are covering the basic needs of the Cuban population:

...the lines of the Communist Party are clear: we need to obtain more productivity and give more food to the people, establishing strong links among the research institutes

themselves to achieve these goals.

In addition, the Party has representatives at all levels that help to keep the goals of the revolution. However, the Government is in charge of the administration of the country. Today, the biggest challenges of Cuban agriculture are to: 1) produce enough food to satisfy the increasing food demand of both the Cuban population and the growing tourist industry, 2) increase the gross national product to improve financial autonomy, and 3) solve the main environmental problems, so a sustainable form of development can be pursued. So far, the Cuban government has taken different actions to solve the challenges cited above. Some of these actions are: 1) establishment of a National Food Program, 2) the creation of the Ministry of Science, Technology and Environment, and the National System of Science and Agricultural Technology Innovation (SINCITA)⁷, 3) the approval of an environmental law, 4) the implementation of the Environmental National Strategy, and 5) the elaboration of National Environmental Program (Ministry of Agriculture, 1999).

The Ministry of Agriculture has an important function at the national level. It is the regulator of the use and preservation of natural resources including forests, vegetation, animal resources, soils, crops, and others. To carry out its functions related to the AKIS the Ministry has 17 different national research centers as shown in Table 4.

As explained by one of the interviewees these research institutes are key to Cuba's agricultural production:

The research institutes are all responsible to increase production. The Ministry of Agriculture knows their work, goals and projections. Their results are introduced to the country's agricultural production.

In addition, the Ministry of Agriculture has three different levels of extension organization in the country as explained by one of the interviewees:

The Office of Development and Technical Services, which is part of the Direction of Science and Technology of the Ministry of Agriculture, is in charge for extension at the central level (national level). The Vice-Minister directs this function, and there is a person responsible of organizing activities at this

⁷ SINCITA organizes all types of research programs conducted under the Ministry of Agriculture's domain.

Table 4. Research Institutes

No.	Research Center	Location
1.	Soil Institute	Havana City Province
2.	Plant Protection Research Institute	Havana City Province
3.	Irrigation Research Institute	Havana City Province
4.	Center for Agricultural and Livestock Mechanization	Havana City Province
5.	Animal Science Institute	Havana City Province
6.	“Alejandro de Humboldt” Institute for Fundamental Research in Tropical Agriculture	Havana City Province
7.	Experimental Station for Bee Production	Havana City Province
8.	Pork Research Institute	Havana City Province
9.	Poultry Research Institute	Havana City Province
10.	Citrus and Fruit Research Institute	Havana City Province
11.	Forestry Research Institute	Havana City Province
12.	“Liliana Dimitrova” Horticulture Research Institute	Havana Province
13.	Rice Research Institute	Havana Province
14.	Tobacco Research Institute	Havana Province
15.	Pastures and Forages Research Institute	Havana Province
16.	Plantain, Roots and Tubers Research Institute	Villa Clara
17.	Central Station for Coffee and Cacao	Santiago de Cuba

Source: Mato, et al. (1999)

level. Also, there is representation at the provincial level, in the case of Havana City Province, where agricultural production differs from the rest of the country, the extension structure is different. However, extension also belongs to the Office of Development and Technical Service, specifically to the Section of Science and Technology, right now we are looking for a person to be in charge of Science and Technology, and the current person that has a dual role (in charge of Science and Technology and Extension) will be in charge of the extension part only... There is no a defined extension organization at the municipal level, many people do extension at this level; however, the Ministry’s delegates for the Popular Councils implement extension activities, they transfer technology, train producers...

It is important to point out that due to the Special Period, the State promoted reform of the agricultural production system. The main policies follow:

- Distribution of land and changes of land tenure: State farmlands were redistributed and became Basic Units of Cooperative Production (UBPC) (law No. 142 issued in

September 1993). With this redistribution, a more rational and efficient use of the land is expected. According to Azicri (2000), the new structure sought to use agriculture more effectively. To function efficiently, the UBPCs were granted:

The right to use the land freely (user rights only). The right to own their own production (not the land). The right to sell their production to the state through their own enterprises. The right to have their own bank accounts. The right to elect their own leadership (like other cooperatives). Their responsibilities included: The duties to provide their own technical/material resources and to contribute to the national fiscal expenses. (44)

- Decentralization of land use and reduction of underutilized lands through the creation of small State Farms, and distribution of small plots to individuals producing food primarily for home consumption, as well as the redistribution of farms to produce tobacco, coffee, and cacao.
- Establishment of the National Group for Organic Agriculture to supply vegetables, condiments, and medicinal plants to cities, through the introduction of organic (*organopónicos*) and popular gardens (gardens cultivated by households), and more recently, the introduction of fruit and forestry trees to improve and protect the environment.
- Establishment of commercial reforms including the creation of agricultural markets.
- Development of sources of renewable energy. One of the main agricultural problems is dependency on oil to carry out agricultural tasks. So far, the Ministry of Agriculture has reduced its fossil fuel consumption by 53% during the Special Period. However, it is expected to reduce this percentage even more. Yearly, more trees are being planted. There are 4918 windmills, 535 electrical irrigation pumps and 73 bio-digesters.
- Use of animal traction.
- Creation of an integrated plant management plan, including the rational use of synthetic pesticides, use of biological pesticides and fertilizers, use of biological control, introduction of the nutritional integrated management concept, and crop rotation.
- Promotion of an efficient and rational use of watersheds.
- Generation, transference, and promotion of technologies to support sustainable

agricultural development, reducing environmental risks and increasing the quality of agricultural products.

- Training of staff and producers at all agricultural production levels.

In the implementation of the Environmental National Strategy, five main problems have been identified. Four of them are related either directly or indirectly to agricultural, livestock, and forestry activities. On the other hand, diversification of the organization of agricultural production, decentralization of agricultural production, the increasing role of agricultural markets, and the opening of foreign investment opportunities, among other factors, required the incorporation of an environmental component to the Ministerial actions. Recently established Law 81 (Environmental Law) mandates that the Ministry of Agriculture will establish sustainable agriculture national strategies.

Figure 5 shows the linkages that the government has established with different AKIS operators. The main purpose of these relationships is to regulate and administrate the operators' performance. The government provides support to all operators with the purpose of achieving national goals. The Ministry of Agriculture has strong links with many other Ministries such as CITMA, Public Health, Sugar, and Fishery, which are also aware of the research centers' agenda and have projects with agricultural education institutes. The Ministry of Agriculture also regulates the markets' operations. In the case of non-governmental organizations, the government verifies that their goals, and objectives match the government's plan of development, and also guides the scope of their activities.

Agricultural Education

Fidel Castro (1997), in his report "*República de Cuba, 1994*" submitted to FAO and to the World Health Organization, stated that without the educational work that has been developed in Cuba since 1959, it would have been impossible to survive the Special Period and continue Cuba's development. During this period, the reduction of imports by 30%, and the reduction of food consumption on an average of 60% show the magnitude of the problem it was necessary to face (García, 2000).

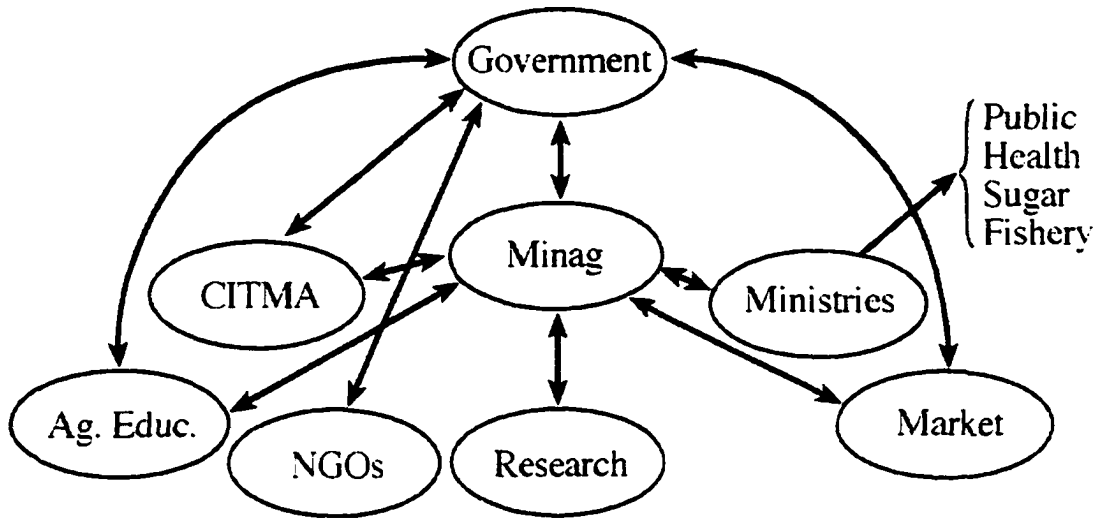


Figure 5. Linkages of the Government with AKIS operators

Cubans believe that the mobilization of the Cuban people during the Special Period has been especially successful due to the high level of organization and education achieved by the Cuban society. Education in Cuba became free and mandatory in 1959, and receives strong support from the State. In 1959, the illiteracy rate was 24%. The economically active population's minimum educational level went from 2nd grade in 1959 to 9th grade in the 1980s. By 1994, Cuba had the following professional ratios: 1 technician for every 8 workers, 1 bachelor degree professional for every 15 inhabitants, and 1 PhD for every 900 inhabitants (República de Cuba, 1994, as quoted by García, 2000). An inventory on human resources involved in agricultural activities is shown in Table 5.

García (2000) in his article titled "Agro-ecological education and training of human resources" states that in the classical model of agriculture, universities, and extension services helped to increase the worldwide availability of food by 18% during the Green Revolution. At the same time, rural poverty also increased. According to García, technology was developed for large agricultural enterprises requiring a nationwide food distribution system that did not always distribute food equally. In addition, in some cases, this input intensive means of production had negative impacts on natural resources. Its high cost had a

Table 5. Human Resources Working in Agriculture (1996)

Category	Number of People
Professionals (university degree)	19,390
Technicians	56,505
CCS farmers	121,070
CPA farmers	34,898
UBPC farmers	115,522
State workers	414,220
Others	14,796
Total	768,401

Source: García (2000)

strong socio-economic impact. García states that this is, perhaps, the most immediate cause of its non-sustainability.

Altieri (1996) stated that there is a need to change to a new model of agricultural production. This model needs to be both economically and ecologically sustainable. The urgency of this change justifies the high investment in agro-ecological training and education in Cuba.

Educational centers at all levels have adapted their agricultural curricula to find ways to solve the economic and environmental situation of Cuba. However, in spite of the fact that Cuba has prepared a considerable number of professionals in sustainable and organic agriculture, in 1991, it was determined that some farmers did not have the required skills needed to produce under the country's new conditions. As a response, Cuban universities have developed courses and other training activities to familiarize graduates and farmers with new technologies. The universities have realized that agricultural education has to reach every single person in the country. For instance, consumers need to learn how to reorient their role, getting involved in both rural sustainable development and urban agriculture.

According to Sanchez (2001, personal communication) there is a need to prepare the new generation in their earliest years on topics related to agriculture and ecology. It is better to educate correctly than to have to re-educate. For this reason, agricultural education has been introduced to all levels of education from daycare to university as shown in the following descriptions.

Daycare Centers (*Círculos Infantiles*) and Elementary Schools

The Ministry of Education has stipulated the inclusion of agricultural and livestock topics in the curricula of daycare centers and elementary schools to expose children to agricultural production and to ensure they have a healthy diet. The Ministry of Agriculture provides assistance to these centers. Usually, in the case of daycare centers, there are two types of garden plots. One is designated to intensively produce vegetables and medicinal plants for the center. This plot is cultivated by a farmer, who receives technical and material support from the Ministry of Agriculture and other organizations such as the Cuban Association for Agriculturists and Forestry Professionals (ACTAF). The other plot is cultivated by children and is utilized only for educational purposes. Children in their early years (4 to 6 year old children) participate in agricultural activities. They are actively involved in growing different types of vegetables and raising some minor livestock such as rabbits and poultry. The products harvested from the plots are part of the daily diet of the children and staff of these institutions. The personnel interviewed at a daycare center indicated that children enjoy working on the plots. This work has become one of their favorite recreational and educational activities. This observation is supported by the following excerpt:

Children really enjoy working in the field. This has become their favorite activity, you know kids, they like to play with soil, plants... It is easy to bring them to work on the plots... It is difficult to bring them back to the rooms.

Children attending elementary school also visit cooperatives to get involved working for a few hours in the fields. These cooperatives provide vegetables monthly to the schools' kitchens. Teachers and students receive snacks and one meal daily without cost.

Secondary Education

Secondary education is taught in boarding schools located in the countryside. These schools function simultaneously as experimental dairies, citrus groves, or ordinary farms (Kozol, 1978). The purpose of this system is to provide students from both urban and rural backgrounds with theoretical knowledge but also to give students the experience of working in the fields, so they can develop a sense of appreciation and respect for natural resources and

hard work. While the main goal of these schools is a quality education, the underlying goal is to bring rural and urban people together. This system also attempts to create an interest in agricultural activities. Through this approach, students may become motivated to pursue a career in agriculture and natural sciences. However, as stated by one of the informants, many students do not like to work in the fields. Students feel obligated to carry out agricultural activities, and instead of loving agriculture, they end up disliking it. A student's parent shared the following comment:

I like agriculture. I like to plant, but my son does not, he is not planning on becoming an agriculturalist. He has to work in the field for one or two hours daily as a part of his school activities. He does not like it at all. He is planning on studying Computer Sciences. He does not really like agriculture.

According to Kozol (1978), the agricultural goods produced pay for the building and maintenance of the schools. As mentioned before, education in Cuba is free, and in this case, includes lodging and board. These schools were based upon José Martí's⁸ philosophy: "Ideally, we should not speak of schools at all, but rather we should speak of schools as workshops for real life. In the morning, the pen – but, in the afternoon, the plow."

Polytechnic Agricultural and Livestock Institutes (IPAs)

In Cuba there are 143 polytechnic institutes, of which 111 are dedicated to agricultural education, 17 to livestock education, and 15 to agricultural mechanization education. In total, there is an enrollment of 41,300 students. These students are prepared to become qualified technicians. One hundred institutes have been opened since 1990 (Ministry of Education, 1996). After 9th grade, students interested in pursuing a technical agricultural career can enroll in these institutes. Preparation lasts for three and a half years. Three years are dedicated to acquiring practical and theoretical knowledge, and six months to working closely with farmers, State Farms, and communities. This work is supervised by professors from the institute. Their objectives are to prepare professionals able to innovate, adapt, and apply technologies that can achieve a balance between productivity and environmental

⁸ National hero during the Cuban war of independence from Spain. Assassinated by Spanish soldiers.

stability of the agricultural systems, which is the essence of alternative agriculture's principles (Santa Cruz and Mayari, 1997, as quoted by García, 2000). Furthermore, as stated by a director of one of these institutes, the idea is to attract farmers' children, so when they have graduated, they can go back to their communities and transfer what they have learned to their families and community. The interviewee shared that the monthly cost of each student is around 195 pesos⁹.

From the years 1991 – 97, advances in the curricula at these institutes were made. Establishment of biological control methods, production and use of biofertilizers, implementation of *organopónicos* using community resources and marginal non-productive areas, and other organic production techniques were incorporated into the study programs. In Havana City Province there are three polytechnic institutes. There is a Veterinarian Institute situated in Boyeros, and the other two are agricultural institutes located in the municipalities of El Cotorro and La Lisa.

Due to the Special Period two major changes were made to the IPA system:

- 1) The number and availability of these institutes were increased. Before the crisis, not all the provinces had polytechnic institutes. However, with the advent of fuel shortages and new agricultural needs, the State decided to create polytechnic institutions in all fifteen provinces, so students could attend school in their own provinces and learn specifics about their communities.
- 2) Modifications in the curricula were made to adjust the program to current needs of the Cuban agricultural system. Classes about integrated plant management, soil conservation, agricultural organization and land tenure, animal traction, biological control, composting, and other topics related to organic production were introduced to the study program. Professors try to integrate classes so students can develop a holistic understanding of agricultural processes.

The institute visited by the researcher was an agricultural polytechnic institute. This particular IPA was created in 1960 by the Government. During Batista's administration, the facility was a private recreational place. This institution has links with state agricultural farms, allowing advanced students to participate in the different urban agricultural sub-

⁹ 1 US dollar is equivalent to 21 Cuban pesos.

programs of the Ministry of Agriculture. In addition, and as a part of their community outreach activities, students work with farmers monitoring plots, and providing assistance to elementary schools that have plots designated for agricultural production. These close linkages with State Farms, farmers and the rest of the community allow students to learn about the current situation of Cuban agriculture. The institute also has scientific and cultural exchanges with German and French institutions.

As explained by an interviewee, the plan of study also includes courses outside of the traditional areas of agriculture:

Ethics and Values, Scholarship, History of Cuba, Theater, Traditional Cuban Dances, and Painting are taught in our institutions. Topics related to globalization, neo-liberal policies, nationalism and citizenship are also discussed. We want them to defend our country against neo-liberal policies... The objective of teaching these classes and having these types of discussions is to educate students broadly, we want to form their values.

Courses under this system are also offered through distance education (correspondence). In some cases, State Farms allow their employees to enroll in courses providing them a salary while they are away. One of the many advantages of these institutes is that 100% of their graduates receive a job offer before they obtain their diploma. Graduates have many options. They can become State Farm employees, they can form their own cooperative or become private producers, or they can pursue an undergraduate education. According to the informant, 21% of the graduates continue in a bachelor's program.

In spite of the important achievements that IPAs are having within the system, Lotti (2000) in her article "*¿A dónde van los graduados de los IPA? (Where are IPA graduates going?)*", expressed that in some provinces, only 30% of IPA graduates work in agriculture. While no claim was made about the generalizability of this finding to all provinces, she recommended that this situation needs to be evaluated to find efficient ways to encourage graduates to join the agricultural system. IPAs are a very important source of technology and information for the AKIS. Also, its graduates become food producers at different levels (individual producers, cooperative member, State Farm employees) or administrators of agricultural programs within the system.

According to Azicri (2000), in spite of the government's efforts, Cuba's educational system needs more economic support to purchase books, supplies, and equipment. "The economy is preventing the government from upgrading materials and equipment at the country's education institutions and universities." (93)

Agrarian University of Havana "Fructuoso Rodríguez Pérez"¹⁰ (UNAH)

UNAH was founded in 1976. It is under the administration of the Ministry of Higher Education of Cuba. The university is composed of the following four colleges: Veterinary Medicine, Agronomy, Agricultural and Livestock Mechanization, and Sports. It includes four research centers: the Center for Sustainable Agriculture (CEAS), the Study Center for Agricultural and Livestock Higher Education (CEESA), National Center for Agricultural and Livestock Health (CENSA), the Agricultural and Livestock Mechanization Center (CEMA), and two research institutes: the Animal Science Institute (ICA) and the National Institute for Agricultural Sciences (INCA). All these research centers and institutes are staffed with university professors. They will be described later in this chapter.

UNAH's main objectives are: 1) training of agricultural and sport professionals with a broad profile, 2) development of research that responds to current agricultural needs and problems, and 3) the support of graduates working in production, teaching and other fields through its post-graduate programs. UNAH has 800 professionals working in teaching and research activities with 29% holding doctoral degrees. The UNAH has 2,000 hectares of land where livestock facilities operate, and where multiple crops of economic importance are planted. These facilities allow students to be exposed to production, research, and teaching activities. In addition, the university has direct linkages with national production through its network of teaching units located in the main western agricultural and livestock State Farms. Fourth and fifth year students perform their pre-professional practice in these off-campus teaching units. They are requested to conduct a study in the communities aimed at improving the agricultural conditions of the area. This study has to be conducted with local farmers, so students can perform participatory diagnostics and assessment along with members of the

¹⁰ National hero of the Revolution who was assassinated by Batista's army.

community. These practices allow students to gain an enriched experience in both teaching and extension activities. So far, UNAH has graduated about 12,400 professionals, of which 1,300 have been foreign students from 61 countries.

Scientists at UNAH have obtained important achievements in the areas of health and animal nutrition, utilization of tropical crops, biotechnology, agricultural machinery, sustainable agriculture, and other results that have been published in extension technical-scientific magazines. UNAH offers Bachelor, Master and PhD degrees.

University Affiliated Research Centers and Research Institutes

In this section research institutes and research centers under UNAH's administration will be described. These operators provide research-based information to the system. They are not only in charge of conducting research but also of training farmers, former graduates, and current students of the university. Staff of these centers and institutes teach at graduate levels, and train farmers and former graduates through distance education under the *diplomado* system. These are courses offered to farmers and former university graduates to update their knowledge on sustainable and organic farming. In addition, they provide support to students working on their theses and dissertations. They also conduct extension activities in the teaching units and assist farmers that request their services. CEMA and ICA are also accountable to the Ministry of Agriculture.

Center for Sustainable Agriculture (CEAS)

CEAS was founded in 1995. Its objectives are to: 1) coalesce material and human resources to develop a sustainable agriculture system and 2) encourage the efficient utilization of those resources to rapidly promote production, research and teaching projects. This Center performs an important role in urban and organic agriculture by offering intensive courses to farmers, technicians, and graduates. The CEAS also coordinates the master's degree in Agroecology and Sustainable Agriculture. This graduate degree was structured with the collaboration of Miguel Altieri¹¹ and Peter Rosset¹². So far, CEAS has graduated

¹¹ Professor at the University of California, Berkeley, USA.

¹² Director of Food First (Institute for Food and Development Policy), USA.

more than 1,000 professionals and has branches in 12 provinces to assist farmers and students. Additionally, CEAS conducts research with a focus on sustainable development in the mountains, the production of food using sustainable methods, and feeding of livestock using ecological and sustainable methods (García, personal communication, 2001).

Study Center for Agricultural and Livestock Higher Education (CEESA)

The mission of CEESA is to study agricultural higher education issues to improve graduates' quality, university administration, and the promotion and development of academic programs. The objectives of the Center are to: 1) promote the development of investigations on both didactic and university administration and 2) promote programs of academic preparation, development of assessment and training programs for professors and administrators (UNAH, 2000).

National Center for Agricultural and Livestock Health (CENSA)

The CENSA was founded in 1969 with the objective of conducting research in the fields of health, genetics, animal reproduction, and plant protection. It develops and produces biological media and biological products, medicine for human beings, and milk preservatives. It has also obtained important results in disease diagnostic methods for both animals and crops (UNAH, 2000).

Center for Agricultural and Livestock Mechanization (CEMA)

The CEMA was founded in 1968. Its main activities are teaching, training, and conducting research on topics related with the mechanization of agriculture in crops related to sugarcane, citrus and other fruits, coffee, plantain, potato, yucca, sweet potato, vegetables, and other tropical crops (UNAH, 2000).

Animal Science Institute (ICA)

The ICA was created in October 1965. Its main objectives are to conduct research and develop efficient methods for animal production based on natural resources. It carries out

different livestock projects such as sheep, cattle, pig, and rabbit production. It has developed important products for animal consumption derived from sugarcane (UNAH, 2000)

National Institute for Agricultural Sciences (INCA)

The INCA was founded in 1970. Its main objective is to conduct research in genetics, nutrition, and technology of crops of economic importance. It has obtained important achievements in the following fields: soil improvement and fertilization to produce sugarcane, bio-fertilizer development, structure of different varieties of crops such as citrus, coffee, rice and soybean, genetic improvement and production of potato seeds, and application of plant biotechnology (UNAH, 2000)

Extension Education at the University Level

With the creation of new production structures and urban agriculture, technical assistance, technology transfer, and training activities have increased in Cuba during the last ten years. Research institutions, universities, polytechnic institutes, NGOs and other organizations all provide extension services to the Cuban population. Extension education has not been formally taught in any institution, so people providing these types of services have learned to carry out extension activities through additional training. The Ministry of Agriculture is aware of this opportunity to improve agricultural and extension education, and three years ago requested that the UNAH authorities add an extension course to the curriculum so that students can learn more about extension education, its philosophy, practices and methods. Since the university did not have professionals specialized in extension education, the staff prepared a special two-year program to train students to become professors of a class that will be added to the curriculum.

To obtain more information about this experience, the researcher interviewed two of the first extension professionals that the university has graduated so far. One interviewee shared the following information:

The university administrators convened students that had fulfilled some requirements (outstanding grade point average, leadership skills, high motivation for learning, etc.) to participate in an informational meeting to learn about the new specialization that was going to be tried for first time at the university. Eleven students attended this meeting. The meeting was very interesting, however, only three out of the eleven students decided to take the challenge and be part of the "experiment." The other students, had already decided on their future specialization, and did not change their minds. They did not want to be guinea pigs.

The reason one of the informants gave for pursuing this career in extension can be found in the following excerpt:

I like to work with farmers... I like to have direct contact with farmers to try to find solutions to their problems. I found the program exciting and very interesting.

Some of the subject topics offered were teamwork, participatory diagnostic assessment surveys, project evaluation and follow up, rural sociology, rural extension education, and psychology, among others. Additionally, workshops on agro-ecological production, extension education and leadership were part of the study program. For their thesis work¹³, each of the students conducted a participatory diagnostic assessment in two different rural communities. They assessed the agricultural needs of a UBPC and a CCS.

Currently, the two professionals are being prepared to become university professors, a process expected to last for two years. They will teach the new extension course that is going to be under the Agronomy Department administration. During this two-year preparation, they will be pursuing their master's degrees in Agroecology and Sustainable Agriculture.

¹³ It is a requirement in Latin American universities to write a thesis to obtain a bachelors degree.

Extension System

In this section the multifaceted extension system will be described. The section is divided into several categories including the background of the extension system in Cuba, its definition and mission as conceived by Cubans, key governmental and non-governmental extension institutions and their relationship to other AKIS operators.

Background

As explained by an interviewee, the approaches to extension have changed during the last 40 years as a response to new needs and demands.

Extension in Cuba has existed since the 1950's; it followed the United States model. It was directed by people who used to sell machinery, was utilized to promote the utilization of pesticides and fertilizers, it was a commercial type of extension... In 1977, the agricultural structure was changed and new actors appeared (State Farms and Cooperatives of Credit and Service). The agriculture of those years was characterized by a strong specialization; Cuba did not escape from the green revolution. There was an introduction of improved varieties, big amounts of fertilizers were utilized, and there was a high reliance on machinery and pesticides. At the same time, research institutes were created to support these highly-specialized activities... Extension gave the impression that it was an institution offering results. However, real demands were not being satisfied. In 1993, new agricultural figures came out and the production mechanisms to produce were not efficient enough. A collective reappraisal was made to adjust the extension methodology. Concepts and ideas related to participatory diagnostic, social, economic, and social terms were introduced, the need to know more about different varieties came along; at the end, two years ago, a national system for agricultural extension was formed.

Additionally, Salguero (2000) in her master's thesis, titled *Quivicán's Rural Diagnostic: A Case Study*, provides a deeper background on extension services of Cuba. Salguero states that the first extension activities in Cuba were carried out by the Agricultural Bank (BANFAI), which was created on December 20, 1950, with the objective of providing financial means to develop and diversify agricultural production with the purpose of improving the Cuban population's quality of life. Loans were provided to rural associations

to acquire machinery and supplies such as fertilizers and seeds. Moreover, loans were given to establish direct or sponsor services designed to conduct research, and experiments related to agricultural production. In 1959, BANFAI provided loans to construct houses and fences, and to buy machinery, equipment, livestock, and other items as a way to contribute to the first agrarian reform.

In 1959, the National Agrarian Reform Institute (INRA) was founded to mandate agricultural policies in the country. In 1976, as a consequence of the institutionalization process, INRA was transformed into the Ministry of Agriculture. Two years later the Directorate of Science and Technology office was created under the Ministry of Agriculture.

The main objective of the Directorate of Science and Technology is to promote and apply technical-scientific advances to the agricultural production sector. Along these same lines, research centers, research institutes, and educational centers have been developed and supported with the objective of strengthening the agriculture system. The Directorate tried to assume the role of an extension system (holding workshops, training courses, presenting videos, etc.). Its main focus was on technology transfer. However, the scientific and technical potential of the Cuban AKIS was not efficiently utilized. The transfer of technology was from the top to the bottom, in this case, from the research institutions to farmers. As a result of this extension approach, little feedback was obtained, and real constraints were not solved. During the period 1986 -1990, multidisciplinary groups were formed. They were in charge of meeting determined goals of the Ministry of Agriculture (Caballero, 1997, as quoted by Salguero, 2000).

In 1993, a Cuban-French project on extension education was established in Holguin in partnership with the Directorate of Science and Technology office of the Ministry of Agriculture. Its objective was to develop methodologies that will integrate holistic approaches to solve agricultural production problems. This project lasted for three years, and its results have had important impacts on the current extension services provided in Cuba. For instance, in 1996, a new extension approach that considers farmers' needs was defined. Meeting farmers' felt needs is now a key objective for all AKIS operators. The Cuban-French project will have a follow-up phase in Holguin. Also, this experience will be disseminated to Havana Province and Camaguey. These provinces were selected, because

they have an enormous agricultural potential that needs to be exploited.

During the Special Period (1989 to present), the main goal of the extension system has been to increase agricultural production to provide food security to the Cuban population. To achieve this goal, the interaction of AKIS operators has been considered fundamental. In addition, the role of the extension system is to provide information and training to all citizens involved in the agricultural production system. They learn how to produce organic products utilizing low input methods and adapted varieties.

In November 2000, the researcher attended a meeting at the Delegation of Agriculture of Havana City Province. In this meeting the National Commission for Extension (*Comisión Nacional para la Extensión*) was officially initiated. The Commission integrates several institutions and organizations:

The Commission is composed of the eleven research institutes located in the Province, ACTAF, ACPA, ANAP, some IPAs, many representatives of the Ministry of Agriculture, and some communication media.

The Commission established a new framework in which greater interaction and coordination among those providing extension services are expected and in which the Commission serves as a regulator of the whole system. However, as stated by one of the interviewees, Cuba has had many extension models before, and these models need to be considered:

In Cuba we have had many extension models. The organizers of this new system should consider these previous experiences. They are many worthy experiences that we need to rescue from the previous models to create a better extension system. We need to discuss more; they should not be imposing their ideas...

As observed by the researcher, the meeting was held without the participation of some operators that conduct extension activities. For instance, some NGOs, farmers' representatives, and universities did not attend the meeting where the Commission was inaugurated.

Cuban Concept of Extension

In defining the word extension, interviewees stated that there are a number of terms that refer to this concept:

In Cuba, extension receives many names. Some of these are technical assistance, training, extension plan, extension of results, and introduction of achievements. The semantics are not important because the meaning, the essence and the function are the same: Feed the entire Cuban population.

In addition, Salguero (2000) quotes an extension education definition that was formulated during a workshop titled "Learning Extension Education":

Extension education is an interactive educational process whose purpose is to develop the capabilities and actions of the rural population, so this population can identify its problems and make decisions that will allow them to increase productivity and improve quality of life.

Extension services in Cuba are provided by research centers, educational centers (agrarian universities and polytechnic institutes), Ministry of Agriculture, and non-governmental organizations:

Extension activities are conducted by many people. Everybody is involved in these tasks, we all share information, even the Vet Clinics and Greenhouses... Agriculture in the City was developed and implemented through extension.

However, the Ministry of Agriculture organizes, regulates, and systematizes this system through its Directorate of Science and Technology office. People and entities working in extension attend meetings together to discuss agricultural problems to find ways to solve them. In addition, they meet with the Minister of Agriculture to plan and to define both targets and production priorities. This approach is relatively new, and was born out of the necessity to provide a planned service to producers, and avoid misunderstandings concerning technical advice and decision-making. An extension officer from the Directorate of Science and Technology office offered the following:

Our role is to organize the service; all the actors are interested in improving production. A research center can come to the producer with a new variety, later another center comes with another variety,

and then we have problems. The farmer is confused; he asks himself, "Should I use this or the other variety?" We have to make the concept more open. Extension is not only technology transfer, it is more, it is training, and it is a broader concept.

In relation to competencies, interviewees expressed a very clear understanding of the type of qualifications that an extension worker needs to have to help to improve agricultural production. They are expected to be generalists, so they can understand the majority of the technical problems and give solutions to farmers. Some other competencies as described by the informants can be seen in the following excerpts:

An extension worker has to have vocation, general knowledge, has to be able to deal with different diagnostic tools, and has to know about typology of farmers. He or she is able to identify the environment, and its socio-economical elements, also has to have good relations with the farmers.

On the other hand, another interviewee stated that in order for the Cuban extension system to be successful, people, especially those with extension responsibilities, need to relearn extension methodologies:

If we want our extension system to succeed, people involved in extension need to forget what they have previously learned about extension education methodologies, and then relearn taking into consideration farmers as the center of the entire extension process. Farmers need to be approached as the objects, not as subjects of the agricultural system. Though this is a very difficult task, it is vital to consider farmers' needs and indigenous knowledge to improve agricultural production in Cuba.

Training is provided at all levels of agricultural production (UBPC, individual farmers, CCS, State Farms) and to all the actors/players involved in this activity. Other services such as credit and technical assistance are also provided to all the different categories of farmers.

As manifested during the interview, the success of the extension work is due to the high level of commitment that the system's employees possess. Leadership is provided to and

requested from those conducting extension activities. Because of their political and economic background, Cubans do not fear change:

Things in Cuba change continually. Our experience has taught us that change is good. Things that you see in Cuba today might be very different tomorrow, because we are trying to improve people's status. After all the things that have happened to us, we do not fear anything. We are always informed about possible changes and how to face them.

In addition, the level of conscientization and awareness that they possess about their role to fulfill society's needs is impressive. Changes are sought and utilized to improve the economic status of the nation.

The embargo imposed by the United States on Cuba and the collapse of the Soviet Union have been the biggest challenges that Cuba has faced during the last 40 years. These events have had a detrimental effect on the economic/agricultural system of Cuba. Likewise, these situations have challenged Cubans to become more creative and efficient with the scarce resources upon which they rely. Human resources have been the main contribution to Cuba's well-being as stated by the interviewees. According to the World Bank, the Cuban government allocates 6.7% of gross national income into public education, twice the average of other Latin American and Caribbean countries. Education in Cuba is in tune with the developed world (Ritchie, 2001).

Moreover, transparency and full citizen participation and government commitment are claimed to be the key ingredients in the success of Cuba's extension system. Cubans have developed a holistic understanding of their problems, and it is in that way that they are trying to search for solutions (applying an interdisciplinary approach to both the analysis of problems and to the decision making process). Cubans have been able to determine and assess their resources, potential, and limitations. From that point, they have developed a plan of development, which involves and requires full participation of Cuba's citizens.

Furthermore, officers working for the Ministry of Agriculture have recognized the need to supplement the curricula of the agrarian universities to better prepare future agriculturists and extension workers; as expressed by one interviewee "universities play a protagonistic role in the agricultural improvement of the country." Other centers of non-

formal education also perform an important role training and updating the current agricultural professionals and farmers with the purpose of meeting the needs of society.

Other Extension Structures of Support

Other structures offer support to the extension activities being carried out by the Government and other institutions. The Committee for the Defense of the Revolution (CDR) supports and supervises agricultural activities at the municipal level. It also helps to administer land distribution along with the Popular Councils of each municipality. Women farmers belong to the Cuban Women's Front (FMC). This association supports the integration of women into the agricultural system. It offers training and advice to its members.

Research Institutes

In this section a general description of institutions conducting research in Havana City Province and Havana Province will be presented. The institutions located in Havana Province provide strong support to urban agriculture activities that are being carried out in adjacent Havana City Province. Research institutions in both provinces are important pieces of the AKIS that serves the 11 million people living in Cuba.

"Alejandro de Humboldt" Institute for Fundamental Research in Tropical Agriculture, (INIFAT)

INIFAT was founded in 1904, and was the first agricultural research institute in Latin America and the Caribbean. Its staff is composed of 25 PhD professionals, and 125 bachelors and master's degree professionals. It has four experimental stations located in the provinces of Pinar del Rio, Havana Province, Sancti Spiritu, and Ciego de Avila. Their main task is to reproduce foundation seed and support the introduction of technology, and technology adjustments. INIFAT is divided into four main divisions: the technical-scientific division, the administrative division, the economic division, and the commercial division. The technical-scientific division is subdivided into six programs: Breeding, Plant Protection, Microbiology, Biophysics, Biotechnology, and Seed Sciences. The technical-scientific division is in charge of public and international relations, training services to conduct workshops and field days

for farmers, joint projects with the university and polytechnic institutes, and to give advice to students on their research projects, theses, and dissertations.

To determine their research agenda, a strong link has been established with the State enterprises. Additionally, the research unit directors along with representatives of the Communist Party, Ministry of Agriculture, and Government at the municipal level visit fields and countryside communities to get to know the needs, and to decide together what path and what level of support needs to be implemented. This approach helps to keep farmers informed and motivated, because their needs are considered in the process of setting up the research plan. Also, these visits are utilized to evaluate the results of State Farm production, and to provide incentives to State Farms that have achieved outstanding production results.

An average of 50% of INIFAT work is conducted with producers. All its projects are considered to be completed when new technologies are adopted by producers:

Extension activities represent an important priority for the institute. We believe that conducting extension activities help us to pursue our research agenda. We work close to farmers, and we are interested in obtaining their feedback in regard to the implementation of our research findings. Farmers' feedback guides our current and future research activities, ensuring greater relevance and efficiency of our work.

INIFAT also coordinates a new network of five seedling nurseries in Havana City Province. Products are sold at prices lower than seedlings available from other places. Six more seedling centers have been planned to start operating soon (Gonzalez and Murphy, 1999).

National Group for Urban Agriculture

One of the main programs that INIFAT coordinates is the National Group for Urban Agriculture. This program is composed of the Ministry of Agriculture, research institutions, universities, polytechnic institutes, NGOs, National Association for Small Farmers (ANAP), and farmer's representatives at all levels: provincial, municipal and community level (*Consejo Popular*), and others. It is in charge of bringing the latest technology on organic production to farmers.

According to one informant, the National Group for Urban Agriculture is an excellent example of extension education in Cuba. This program has achieved outstanding coordination among its members. Currently, the Group, with strong support from the Ministry of Agriculture, is promoting 26 sub-programs shown in Table 6.

In addition, INIFAT and the Ministry of Public Health are jointly conducting research to determine the nutritional composition of vegetables. The reason to conduct this study, as stated by a member of the National Group for Urban Agriculture, can be found in the following comment:

Table 6. Urban Agriculture Sub-programs

No.	Sub-program
1	Control, Use and Conservation of Land
2	Organic Material
3	Seeds
4	Irrigation and Drainage
5	Vegetables
6	Medicinal Plants
7	Fruits
8	Protected Crops
9	Rice
10	Forestry Program
11	Coffee and Cocoa
12	Ornamentals and Flowers
13	Oil Seeds
14	Bean Production
15	Livestock Feed
16	Apiculture
17	Poultry Production
18	Rabbit Production
19	Sheep and Goat Production
20	Pork Production
21	Beef Production
22	Fishing
23	Plantain, Roots, and Tubers
24	Commercialization
25	Small Industry
26	Science, Technology, Environment and Training

Source: Grupo Provincial de la Agricultura Urbana. (2000)

It is important to know the nutritional composition of vegetables, not only to say that human beings need to consume a determined amount of grams of vegetables per day, but also be able to tell what types of vegetables need to be consumed to fulfill daily requirements... Our relations with the Ministry of Public Health go beyond that, the project considers supply of vegetables to many units, such as general hospitals, maternity hospitals, daycare centers, and others.

When they finish this investigation, they will share their findings with the population through different channels, so the growth and consumption of these vegetables can be undertaken. Scientists are aware of the need to change some food habits among the population. For instance, 70% of the population is not in the habit of consuming broccoli, a vegetable with considerable nutritional value. In other provinces such as Santiago de Cuba, people do not like to consume vegetables. In other cases, the volume of vegetables being produced is not enough to satisfy the demands, as is the case of Havana City Province.

They plan to start with a national campaign to teach the population about the nutritional content of foods, how to plant healthy foods and methods to cook and preserve them. One interviewee mentioned that the link with the Ministry of Public Health will also help to improve eating habits. It has been noted by INIFAT that community doctors can be helpful in spreading the word and encouraging their neighborhoods regarding the need to consume more vegetables. Additionally, posters will be placed in each one of the agricultural stores, so consumers can learn as they buy their food. The National Group for Urban Agriculture is an example of how research organizations have developed an extension function within their organization to ensure that their research is relevant and to keep disseminating their findings.

Irrigation and Drainage Research Institute

In general terms, this institute is in charge of determining the amount of water needed to have efficient agricultural production without damaging the soil's fertility. In addition to its main objectives in research, it conducts outreach activities such as training technicians and professionals. Also its staff provides advice to undergraduate and graduate students' research

projects. The institution does not conduct extension activities as stated by one of the interviewees as follows:

Our institute does not carry out extension activities, we transfer technology and provide services, these two are extension components, but not really extension education. We don't do extension, everything we do is done from the top to the bottom, and that is not extension...

One interviewee also indicated that with the urban agricultural movement and practices, it is necessary to emphasize the application of the right amounts of water since the incorrect use of this resource could harm the soil. Another informant also shared that in his/her opinion food demand is not being completely satisfied yet. Prices are very high. The State has the heavy responsibility of providing food to numerous institutes such as daycare centers, hospitals, schools, and universities. The informant also said that there are other operators that contribute to food production, such as the Ministry of Interior and the Ministry of the Revolutionary Army.

Soil Research Institute

The Soil Research Institute is an institute for research and services. It has a national scope with representatives in all provinces except Havana City Province. This is due to the fact that before the Special Period, Havana City Province did not have an agricultural tradition. Now, the situation has changed, and urban agriculture is being practiced in the province. Staff at the institute believe that Havana City Province needs to implement a soil management plan to avoid soil degradation and water pollution.

The institute has important information to be shared with farmers, especially in topics related to organic material, worm-culture and soil conservation. However, it does not have enough personnel to provide adequate assistance. At this moment, there are only two technicians supporting activities in Havana City Province. The institute is trying to integrate a team of professionals to provide better care of the soil in the city, and encourage the production of crops appropriate to specific soil types, to achieve sustainable soil management. It is also an important component of the National Group for Urban Agriculture, and is specifically in charge of the Composting and Organic Material sub-program. It was

reported that Havana City Province does not have all of the information needed to implement a rational use of the soil. It lacks registers of soil fertility, descriptions of different types of soils, types of crops being cultivated, conservation management plans, and a plan to improve degraded soil.

However, the Soil Research Institute has strong linkages with the UNAH and its personnel teach and provide advice to students. Also, it has collaborative programs with the Autonomous University of Chapingo and the Post-Graduate University (*Colegio de Post-Graduados*) in Montecillos, Mexico. It also supplies bio-fertilizers (*Ryzobium sp.*, fosforine, and worm-humus) to the agricultural stores to be retailed to farmers and utilized in urban agricultural production.

Other Research Institutes

Among the several research institutions working in the province, the researcher visited the following: Forestry Research Institute, Pastures and Forages Research Institute, “Liliana Dimitrova” Horticulture Research Institute, and the Plant Protection Research Institute (INISAV). During a visit with a researcher from the Forestry Research Institute, it was stated that more than 69 species of trees are in danger of extinction. Most of the research is not conducted with the idea of meeting specific needs of the community. It is conducted to transfer the findings to the State Farms in charge of forestry utilization. There are 37 State Farms in the country. The informant stated that:

These farms have a lot of pressure to meet the production goals. They are a top priority for us. That is one of the reasons for not getting closer to the community.

Besides, the informant said that research with the community is very atypical in Forestry Sciences. However, they are conducting some community work trying to protect some watersheds. He/she also indicated that the institute would like to receive more training related to participatory approaches, detection of needs, diagnostic assessment and other topics to be able to work more closely with farmers and the rest of the community. The institute does not have a culture of conducting research and outreach activities in partnership with other institutes or organizations.

The Pastures and Forages Research Institute is in charge of conducting research to evaluate pasture species with the purpose of determining what species can produce better yields under Cuba's conditions. Moreover, they have identified 60 different livestock ecosystems in Cuba. The institution produces seeds to be spread mainly among the State Farms. The Pastures and Forages Research Institute conducts many projects and shares research findings with farmers. However, according to an interviewee, extension activities need to be strengthened:

Extension is an important component of the research system, but so far it has been the weakest link of the research net. To improve this situation we are trying to promote more contact between our productive areas and the Ministry of Agriculture.

The institute has representatives in all provinces, who work very closely with the community through its program of rural development called "Agronet." It has important linkages with UNAH. Together they conduct projects to support urban agriculture mainly in Havana City Province. Undergraduate and graduate students also work closely with the institute conducting their research projects.

The Horticulture Institute conducts similar research and outreach activities to those of INIFAT. Likewise, it manages important community work conducted in some provinces, for example in Pinar del Río, where an extension program was implemented in a polytechnic institute and the community. Its personnel are very interested in conducting similar activities in other provinces. They are convinced of the importance of determining their research agenda in consultation with the community to ensure that their findings are useful to the community. There is evidence that shows that this orientation has increased attention to farmers' problems, at the same time there is room for improvement. The system has physical barriers to travel out to farmers' sites with more frequency.

The Plant Protection Research Institute (INISAV) is one of the most important operators within the urban agricultural production system. It has developed many technologies appropriate for combating pests and diseases utilizing organic products. It runs 11 centers to reproduce insects and pathogens to be used in biological control (Centros de Reproducción de Entomófagos y Entomopatógenos). The institute has research programs in biological control and integrated pest management in crops such as potato, tobacco, green

pepper, plantain, banana, and coffee. Its main objective is to develop an integrated pest management (IPM) system for all crops being cultivated in Cuba. It also has a Toxicology Directorate in charge of dealing with environmental issues, such as chemical residues and how to avoid the use of methyl bromide.

INISAVs research agenda is set up utilizing direct feedback obtained from farmers, other research institutes and educational centers. It publishes educational materials to inform farmers about different pests and diseases, and products and doses to be used to combat them. Products are sold in the research facilities, as well as in stores located in the neighborhoods and communities.

Non-Governmental Organizations

Before the Special Period, few non-governmental organizations were working in agriculture in Cuba. The major reason for this is that the Government had remained fully in control of the agricultural sector due to its key role in the economy. With the crisis, many national and international organizations have entered the system, with the purpose of facilitating the provision of resources to farmers, educational, and research centers such as new technology, and agricultural equipment:

The participation of non-governmental organizations in the agricultural system is very important, but they do not define what is to be done. They are important because they provide many resources.

A description of the main non-governmental organizations operating in Havana City Province is provided below. This includes Cuban and international non-governmental organizations.

Cuban Non-Governmental Organizations

Council of Churches

The Council of Churches is composed of 29 churches and 14 religious groups. Its main responsibilities are to serve its member churches through the distribution of Christian literature, and to receive and distribute medical donations. The Council through its

Department for Project Coordination and Assistance (DECAP) conducts projects in agricultural production, biotic regulation, and alternative energy (stoves). It also provides assistance and training of stakeholders (religious leaders and farmers, and technicians to become facilitators), and it collaborates in development projects:

We run programs of dialog, exchange, and assistance in sustainable development. We have published many brochures and manuals to facilitate the understanding of physiological processes in agriculture and these publications are given to farmers at no cost. We have strong linkages with the Ministry of Higher Education, University of Camaguey, and the Ministry of Science, Technology and Environment. Funds are provided by German, Belgian, American, Spanish, and Canadian organizations. All our activities have a national scope, but priority has been given to the provinces of Matanzas, Holguin, and Havana City as suggested by the State.

An interviewee manifested that the Council is working acceptably, but he/she would like to see an improvement in the ecclesiastical structure, and to carry out more strategic planning to orient projects. He/she also commented that it was not easy for the State and the Cuban population to accept the intervention of the Council in social and agricultural activities, however, opportunities to work together were opened through mutual respect and collaboration.

Cuban Association for Agriculturists and Forestry Professionals (ACTAF)

This association was constituted in 1987 by staff of the Ministry of Agriculture. Since 1990, the membership has been open to individual farmers and cooperative members. It has representation units in almost all research institutes, educational centers, farms and cooperatives in the 15 provinces. ACTAF is an important component of the Cuban agricultural sector as manifested by a representative of the Ministry of Agriculture:

ACTAF plays an important role in providing information to farmers. ACTAF participates in the training of farmers, also publishes educational material such as magazines and brochures that help to strengthen agricultural activities.

ACTAF conducts projects with the goal of improving agricultural and livestock production, and making these activities profitable and more accessible to the Cuban population. So far, one of the major challenges faced by agricultural and livestock organizations is to increase the amount of protein available to the population, while reducing the costs of these products. ACTAF is currently implementing three main projects:

- 1) Promotion and establishment of gardens in psychiatric and nursing homes with the purpose of assuring that the patients and elderly consume a healthy diet. In the case of psychiatric patients it is expected that this activity will reduce required medication and will serve as occupational therapy. This project is conducted in conjunction with the Ministry of Public Health.
- 2) Training courses and workshops directed to farmers about organic agricultural practices and to professionals interested in learning more about extension education methodologies.
- 3) Collaborative projects with international non-governmental organizations. These projects are conducted to strengthen organic agricultural practices and to make technology and facilities accessible to farmers and cooperatives.

An interviewee also declared that they used to have a television program to transfer technology to farmers. Due to lack of resources and time management the program was cancelled.

Group for Organic Agriculture (GAO)

This group was consolidated in 1992 to support organic agriculture projects in the country. It is under the supervision of ACTAF, with the support of all the educational centers, the Ministry of Agriculture, and research institutions. The main tasks of this Group are to: 1) coordinate *Faros Agroecológicos*, which are demonstrative agricultural areas where concepts about and practices in organic agriculture are being implemented, and 2) publication of the magazine *Agricultura Orgánica*. It is important to point out that in 1999, GAO received the Right Livelihood Award, which is given to organizations working in agriculture. This award is known as the “Alternative Nobel Prize.” ACTAF also organizes international conferences on organic agriculture (García, et al., 1999 and Monzote, 1999).

Center for the Promotion and Development of Urban Agriculture

Among the most immediate projects that ACTAF and the Cuban Association for Livestock Production (ACPA) are coordinating together is the creation of a Center for the Promotion and Development of Urban Agriculture. Its main objective is to show and promote the best sustainable practices in livestock, forestry, and agricultural experiences. Also, workshops will be held at all levels to increase production.

It is intended that this center will have four different areas: teaching and research, collaboration and projects, information, and a demonstration plot to extend advanced technology following an integrated farm model. All these working areas will be operating to support the 26 urban agriculture sub-programs.

National Association for Small Farmers (ANAP)

This association represents the social and economic interests of Cuban farmers. It was founded in 1961 and has 260,000 members, of whom 25,000 are women. 1,155 are CPAs and 2,745 are CCS. In total (ANAP members and their families), the association serves one million people, who own 1,600,000 hectares. This represents 22% of the total agricultural land. The objectives of the ANAP are to: 1) promote the role of its members as producers of food and raw materials, 2) facilitate active discussion of social and economic issues in the country, and 3) reinforce the cultural identity of Cuban farmers. ANAP has its own facilities where training is given to members. In addition, it has several projects and programs conducted in partnership with international agencies. The areas included in these partnership activities are agricultural production, training, exchange of experiences, technology transfer, ecological agriculture, self-sustainable development, management of cooperatives, and environmental protection. ANAP also publishes educational materials that are given to farmers and technicians.

Cuban Association for Livestock Production (ACPA)

The ACPA conducts several extension activities in partnership with Cuban and international organizations. Though its main focus has been to improve livestock production, ACPA also provides assistance in crop production at the national level.

International Non-Governmental Organizations

In Cuba, collaborative linkages have been established with international NGOs. Cuba has opened its AKIS to these organizations, mainly due to the economic crisis and awareness of the opportunities that these linkages bring to Cuba. Some of the NGOs working in the country to support the AKIS are *la Asociación Navarra Nuevo Futuro (ANNF)* and *El Movimiento por la Paz, el Desarme y La Libertad (MPDL)* from Spain; and *The Comitato Internazionale per lo Sviluppo dei Popoli (CISP)* and *El Grupo de Voluntariado Civil (GVC)* from Italy. These four non-governmental organizations are promoting and supporting the introduction of gardens and plots in psychiatric, nursing homes and daycare centers. They have also carried out other types of social and economic activities to improve quality of life in Cuba. Lifecycles and OXFAM Canada from Canada, OIKOS from Portugal, and OXFAM America from the United States have organic agriculture projects. Their projects go through a process of evaluation by the government before implementation of any activity in Cuba.

Farmers and Food Producers

Farmers in the Cuban AKIS perform a fascinating role. In rural areas farmers have a strong background in agricultural production. In the urban areas' context most of the farmers are food producers that have not had any background in agricultural practices and production. Farmers in Havana City Province have limited "indigenous agricultural knowledge" and are not all full-time farmers in the traditional sense. Due to the Special Period, people, as well as the Cuban Government felt the need to change their role from consumers to producers of agricultural goods. They also felt the need to organize to acquire and exchange knowledge and inputs as explained in the following excerpt:

When the Special Period started horticultural clubs were organized by farmers themselves. Being organized helped farmers and their families to learn about agricultural production through training courses. Special emphasis was made to involve the whole family in these activities... We wanted also to develop more collaboration, and mutual help among ourselves, we exchanged seeds, varieties, and experiences. We achieved a sense and spirit of mutual help, solidarity and of course, we have *learned* about agricultural production.

Currently, farmers with agricultural backgrounds share their knowledge with new farmers through workshops, field days, and demonstrations, using a farmer-to-farmer methodology. In addition, farmers can take courses through distance education on topics related to agro-ecology and sustainable agriculture. These courses are taught by the university. Another way to obtain knowledge is through the assistance of governmental and non-governmental organizations that conduct specific projects with farmers. Through this assistance, farmers are able to provide feedback to organizations concerning their needs and the status of technology adoption. Farmers recognize and appreciate the role of the government as can be observed in the following excerpt:

The government's policies support agricultural production. I have visited other countries, and I can tell you that our government does not want to eliminate us, as is the case in other countries.

In addition, farmers associated with cooperatives have their own specialized team of professionals that provide extension services to members. Also, farmers receive technical assistance from stores where they buy their agricultural inputs. People providing assistance in these stores are agriculturists and veterinary doctors. Sometimes, farmers also rent equipment to facilitate agricultural activities.

As noted by Rodriguez (2000) in his paper titled "Cuban Agrarian Policies: Towards a Rural Sustainable Lifestyle", in 1959 a process of deep transformation in the agrarian sector occurred when 70% of the land became State property. The State production, organized in agricultural and livestock State enterprises, was characterized by strong centralization of planning and control. Agricultural communities linked to the State enterprises were subordinated and did not have any local initiative to achieve community benefit. In 1959, when the National Agrarian Reform Institute (INRA) was created, transformations were made to the agricultural organization, and new structures were created. State Farms were created to produce livestock, sugarcane, and rice.

In 1961, ANAP was founded to protect the interests of farmers. Different forms of cooperation were established among farmers; among these forms are: Farmer Associations, Brigades of Mutual Aid, CCSs, and Agricultural and Livestock Societies. In 1975, the CPAs were formed, eliminating private property.

The Special Period required a rethinking about efficiency and land tenure. The Government realized that current agricultural production structures would not be able to provide food security to the nation. New structures were born out of necessity. However, the Government attempted to provide minimum supplies and inputs necessary to produce. In summary, three major changes occurred: 1) development of the agricultural and livestock markets 2) creation of UBPCs, and 3) distribution of plots to individual farmers producing for their own consumption and agricultural production in general. Table 7 shows the change in land tenure during the past decade.

Table 7. Land Tenure Structure

Year	State Sector	Non- State Sector
1990*	75%	25%
1999*	33%	67%
2000**	26%	74%

Source: *Rodriguez (2000) "Cuban Agrarian Policies: Towards a Rural Sustainable Lifestyle"
 **Vega de León (personal communication, 2000).

According to Perez, et al. (1997), the agricultural and livestock cooperatives (CPAs) have demonstrated a better organizational capability and better administration skills than State Farms. When UBPCs came to the agricultural scene, farmers were able to make their own production decisions, and have more control over local resources; a more rational use of the lands and environment resulted (Rodriguez, 2000). However, a UBPC member told the researcher that they do not have complete control of their work. For instance, they cannot perform jobs that are not a hundred percent agriculturally related. The State justifies this limitation saying that UBPCs were created to conduct a social function, and must direct their efforts only to the production of food.

In addition, they lack access to a US dollar bank account, while many business transactions need to be made in dollars. For example, many supplies such as tools and equipment are retailed in dollars. On some occasions, hotels want to buy ornamentals and since hotels perform only dollar transactions, payments have to be made in dollars. Because farmers do not have dollar accounts, they cannot cash the checks. Consequently, UBPCs

profitability is low. According to one interviewee, more than 65% of these cooperatives are unprofitable and as a result, many cooperatives are being dissolved. This is a very serious issue that the government is aware of, and currently the Ministry of Agriculture is trying to find solutions to this problem. On the other hand, CCSs are very profitable. Farmers associated with these cooperatives showed very good administrative skills, and have more control over the management of their production.

Another issue, as stated by one of the farmers, is that many times authorization to retail some types of processed products such as sauces and vinegar are difficult to obtain. When the researcher mentioned this situation to a technician, he/she said that this delay is justified because the Ministry of Public Health cannot provide authorization until its staff is sure that the farmer is meeting all sanitary requirements, which usually takes time. Farmers need to obtain more information about certification requirements.

As a final comment, the researcher observed that in general, farmers whose farms are profitable enjoy a good standard of living within the Cuban context. For instance, their average salary is around 900 pesos per month, an amount that is almost three times the salary of an extension official working for the Ministry of Agriculture.

Figure 6 shows the different linkages established among farmers and other AKIS operators (research centers, ministries, markets, churches, stores, NGOs and educational institutes). Farmers provide their feedback to the different operators, so that these operators can determine and implement programs that better fit farmers' needs. The arrows with two ends in the figure signify that communication and feedback flow freely among the operators, in the case of stores, the arrow has only one end because these stores provide inputs to the agricultural system, and no feedback is requested.

Agricultural Stores

There are more than 30 agricultural stores in Havana City Province providing supplies such as seeds, bio-fertilizers, bio-pesticides, tools, and chicks, as well as technical assistance and other services to farmers. Publications such as brochures and magazines are also offered in these stores. According to Gonzalez and Murphy (1999), at first the stores were run by employees of the Ministry of Agriculture, but with decentralization, the

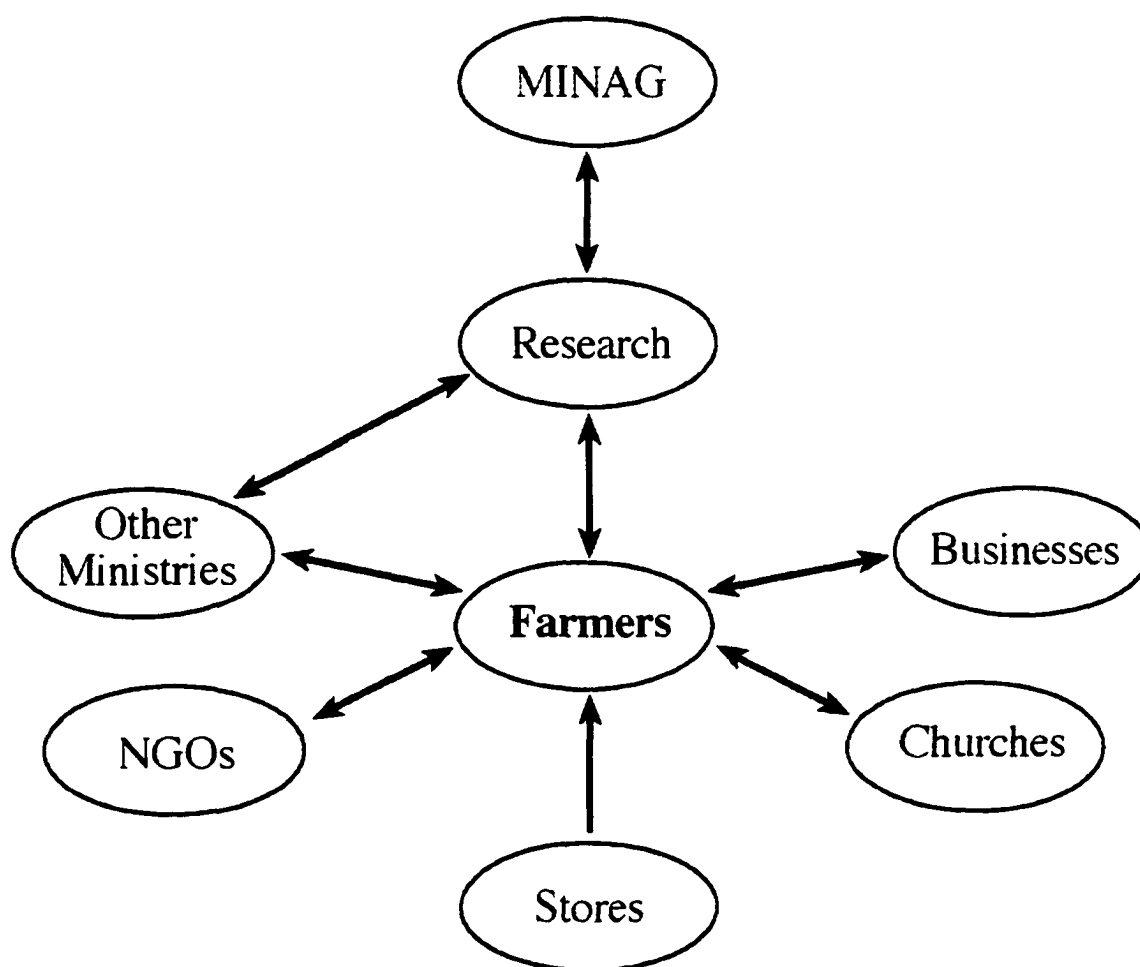


Figure 6. Linkages among farmers and other AKIS operators

employees became self-employed managers. At the same time, the stores continue having strong links with the Agricultural and Livestock Supplies Enterprise, which belong to the Ministry of Agriculture. These stores play a very important role providing extension advice to farmers. They are run by people with agricultural experience and agriculturists.

The stores provide a strong support to farmers. They provide advice to farmers, they teach farmers how to plant seeds, how to plant seedlings, how to take care of their minor livestock... They are close to the farmers...

In November 2000, the stores' staff had a symposium on extension. The stores' general director in the Havana City Province shared the following insight:

We are very interested in learning more about extension techniques, practices, methods... We need to know better ways to approach our clientele. Extension education is needed to improve the efficiency of our agricultural stores.

Agricultural and Livestock Markets

In 1962, Cuba developed a ration system to meet population food needs. Cubans enjoyed a diet high in nutritional quality at low cost. National and imported products were retailed in stores. Currently, and as a consequence of the Special Period, the ration system still exists, but does not meet the needs of households (Chaplowe, 1996).

One of the measures adopted by the government during the early 1990s to increase agricultural product availability was the reopening of local produce markets. These were closed in 1986 from government concern about the social inequality that these markets could create (Moskow, 1996).

The main objectives of these markets are to stimulate food production by providing an outlet for surplus produce to provide more options for the population to obtain food, and to eliminate black markets. There are two types of markets, those that are administered by the Ministry of Internal Commerce, and those that are under the administration of the Ministry of Agriculture. In the first case, most of the sellers are private producers. In the second, most are public (State sellers). The government provides incentives to farmers retailing products at these types of markets. Producers pay a lower tax than those retailing products on farm sites. Prices at the markets are higher in Havana City Province than in other provinces (some products more than twice the price found in other provinces) (Rodriguez, 2000).

Discussion and Implications

The purpose of this study was to describe and interpret the Agricultural Knowledge and Information System of Havana City Province, Cuba, with particular reference to the role of extension programs therein. Specific research objectives were to: 1) describe the AKIS in

Havana City Province, 2) identify the role of extension in the AKIS, and 3) develop a model for analyzing the AKIS, which may have utility when studying the AKIS in other countries.

To conduct the study a qualitative research methodology was employed. Due to the uniqueness of the setting and because the researcher was looking for constructing and understanding the AKIS a case study methodology was selected as the most appropriate for this research.

In this section a discussion of the research findings will be presented. Specifically, the Cuban AKIS in four different phases: prior the Revolution, before the Special Period (1959-1988), during the Special Period (1989-93) and the current status of the AKIS (2001). Also the extension system in Cuba, its concept, role of the providers of these services, similarities and differences between FAO approaches and the Cuban extension model, and food security in Cuba are discussed.

Cuban AKIS

Prior to the Revolution

During this period, there was strong dependency on the American market. Land belonged to a small number of national and foreign owners. There was one main research institute in charge of the country's research agenda. Extension services started in the 1950s. Transnational companies, mostly from the United States were promoting machinery and chemical products. Research and extension were dedicated to increasing sugar and tobacco production. In regard to education, there were two main universities, Easter University founded in 1947 and University of Havana founded in 1728. The government provided some economic support to farmers through BANFAI (Agricultural Bank).

1959 – 1988

During this period several research institutes were created. Among these are ICA, INIVIT, INCA, CENSA and La Lilliana. Cuba, influenced by the Green revolution, used enormous amounts of pesticides and fertilizers to obtain high yields. Because of that, an increasing awareness about chemical abuse occurred. By 1982, research institutes started to conduct research on organic production. The Ministry of Science, Technology, and

Environment was created. This Ministry directed the function of universities and research centers, trying to integrate a system. Education became a key issue, so the State decided to create more educational centers. Seven new universities are inaugurated and Polytechnic Institutes were created. The National Institute for Agrarian Reform was created. INRA implemented the first agrarian reform. Ownership of large parcels of land was eliminated, and the State took the land to create State Farms. These farms were in charge of agricultural production; however, some independent producers remained on their lands. In 1962, the United States placed an embargo on Cuba. This embargo does not allow Cuba to have commercial relationship with US and some third parties. Cuba nationalized US companies and land holdings. Markets were shut down. New forms of organization appeared and farmers organized themselves in cooperatives. Later, INRA became the Ministry of Agriculture.

1989 – 1993

With the Soviet disintegration, Cuba lost its main trading partner. As a consequence, the markets and the economy contracted dramatically. Cuba suffered food and fuel shortages. To face this situation a new agricultural production system started. New technologies were introduced such as vermiculture and adapted varieties. Also, old ways of traction were re-introduced such as animal traction. In addition, national and international NGOs, and consultant stores became part of the system. Agricultural universities and IPAs updated their curricula. Attempts to meet the needs of farmers and achieve national goals did not completely succeed. However, the National Group for Urban Agriculture and other organic movements were integrated into the system to provide more information and techniques to farmers.

1994 – 2001

On the world stage, Cuba's international links improved little. Eastern Europe and the former Soviet Union were not able to reestablish trade and the US embargo continued.

During this period, the Cuban AKIS has implemented several modifications. Land tenure has been perhaps the most important structural modification. Land has been given

back to the population in usufruct. Most of the State Farms are broken down, and new structures of cooperatives, farmers, and food producers were integrated into the system. The Government realized that by itself, it would not be able to provide food security to its population. Cooperatives received more governmental support to improve their organizational and technical skills. There are modifications in the educational system, for example UNAH introduced a new masters program in Agroecology and Sustainable Agriculture and a program on Extension Education is under revision and implementation. Markets have been reopened to increase food availability. A Protein Program was introduced to help to increase daily protein consumption. Research centers and MINAG are trying to work more closely with farmers. The Agricultural Extension System was inaugurated to provide better services and meet needs of farmers. The main goal is to increase agricultural production. All AKIS operators were called on to join the campaign to provide service directly to farmers to improve food security.

The Extension System in Cuba

Concept

In Cuba, the extension system is described by different names, such as technology transfer, training, generalization plan, etc. All these terms are related to the methodologies that the extension system utilizes to fulfill its purpose. To Cubans terms for referring to processes or activities are not important as long as people work together to improve agricultural production.

Role and Providers of Extension Services in Cuba

The extension system in Cuba has many purposes. In Havana City Province, its main focus has been to provide information to farmers and aspiring food producers, so that national food security can be achieved. Also, it has distributed land and other inputs to producers, provided credit, and organized groups such as cooperatives and other representative units so farmers and agricultural research and educational institutions can become members of organizations such as ACTAF. In the case of State Farms, extension has been used to achieve export goals and to provide food for the tourist industry. Additionally,

extension has been used to link farmers with markets. Farmers receive technical assistance from technicians working in agricultural stores. According to the different extension roles defined by Rölöng (1990) in the literature review, the extension system in Cuba has a “persuasive” and “emancipatory” role. The AKIS operators use extension as a way to achieve policy and societal goals, and national food security. To achieve these goals campaigns to improve both agricultural production and eating habits are utilized.

Several operators such as agrarian universities, research centers, government entities, farmer organizations and non-governmental organizations offer extension services. Since the government also has a special interest in export commodity crops (tobacco and sugar cane), there are research centers and extension professionals specialized in these. However, there is no single institution that conducts all extension work. Most of the extension work conducted by different operators is supervised and organized by the Directorate of Science and Technology of the Ministry of Agriculture through the recently inaugurated Agricultural Extension System. This system was created to ensure that the information that goes to the farmers is consistent and clear. They have learned that they need to have a well-organized extension system and an efficiently functioning communication system to be able to improve economic well-being and food security of Cuban citizens.

In addition, each operator has responsibilities at different levels, for instance universities and polytechnic institutes operate at provincial levels. Each educational institute is accountable to the province where it is located. One important aspect that needs to be highlighted is that these institutes recognized that changes in their curricula needed to be made to help improve agricultural production during the Special Period. These changes were implemented through the creation of the *diplomado* system and offering a master’s degree in agro-ecology and sustainable agriculture.

Furthermore, the Ministry of Agriculture and UNAH became aware of the lack of extension knowledge and methodologies to effectively transfer technology within the agriculture sector. This awareness prompted the addition of an extension course in the UNAH curriculum.

Another important change made by the government was the decentralization of agricultural production and land tenure. With the decentralization of land tenure, the

government became primarily in charge of its State Farms; close attention has also been given to UBPC cooperatives. The government, upon request through Popular Councils and delegates of the Ministry of Agriculture, also serves other levels of farmer organizations.

ANAP and other farmer organizations play an important role within the AKIS. These organizations are in charge of bringing the voice of their members to the government. Policies that affect agricultural production are made through their active participation.

Ministries and other governmental institutes develop partnerships among themselves and with national and international NGOs. Research institutions have a broader scope, conducting research to solve agricultural problems in the entire nation. Currently, their main focus has been to develop and spread organic agriculture technology to the entire agricultural system. However, a situation observed by the researcher is that Cuba's isolation means, that in some cases, Cuban researchers are conducting research that was concluded years ago and reported in international journals. The research to determine the amount of nutrients of vegetables is one example. In other fields such as medicine, production of pharmaceuticals, and cigar making Cubans are ahead of the world. A recent push to bring a number of international conferences to Cuba will assist Cuban scientists to exchange research information with their counterparts from other countries.

Non-governmental organizations and international aid agencies work where specific attention is required and where the government has approved their involvement. In addition, collaboration and partnerships with international agencies and foreign universities are now increasing in Cuba. These partnerships provide an additional input of knowledge and material resources to the AKIS. Almost all operators publish technical material that circulate in the AKIS through different channels. Most of these publications are available to farmers at reasonable prices. Television has been used to transfer technology. However, the frequency of these programs and publications is affected by a lack of resources and time. Outside information gets to the country through donations made through churches and international non-governmental organizations. Access to the world-wide-web is limited, due to two constraints. First, Cubans must make internet connections using servers located in other countries, producing delays in the communication. Second, the number of computers is inadequate to satisfy the demand.

Figure 7 shows a diagram that represents the Cuban AKIS and the different interactions of its operators as described previously. The key elements of Figure 7 include the Government, which regulates agricultural and non-agricultural activities and the Ministry of Agriculture (MINAG) whose main function is to organize and systematize the agricultural system through policies and structural support to farmers. The MINAG has strong linkages with other ministries such as Public Health, Sugar, Fishery, and Science, Technology, and Environment (CITMA). These relationships help to strengthen the agricultural system. The system also includes research centers, educational centers, non-governmental organizations,

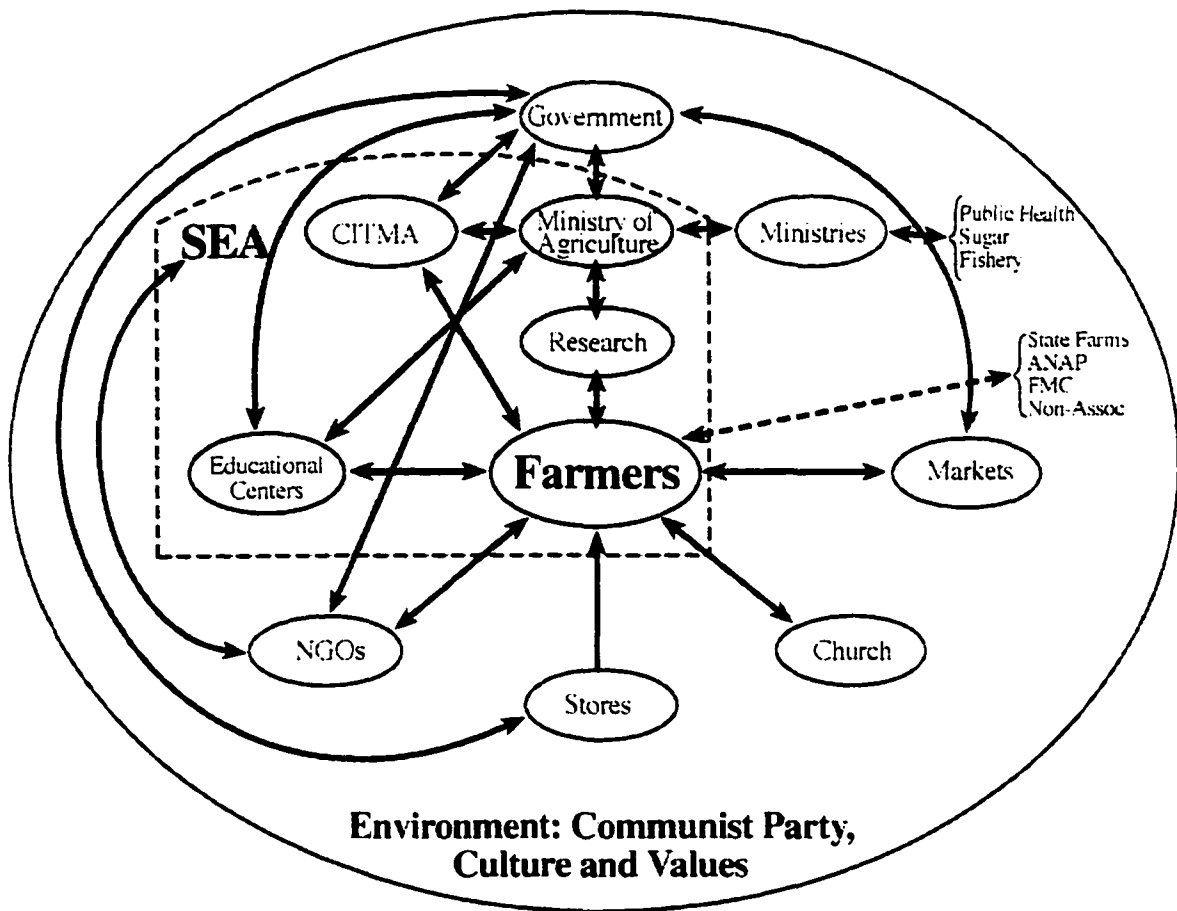


Figure 7. The Cuban AKIS

stores, churches, markets, and farmers. Operators work to establish a close relation with farmers. Farmers organized in different associations (ANAP and FMC) or individually provide feedback to operators. The Agricultural Extension System in Cuba (SEA) is composed of farmers, educational institutes, MINAG, CITMA, some IPAs and some national NGOs and research centers.

The environment in which these operators interact is influenced by the Communist Party, as well as Cuban culture and values. It is important to point out that in spite of the effort to create an extension system, the current SEA could be improved through the active participation of more operators that are already part of the Cuban AKIS. The researcher believes that communication can be improved among operators to establish a more participatory extension system. Also, the new extension system needs to open itself to full participation of the entire range of agricultural system operators.

A comparison of the previous findings with the eight extension approaches offered by Axinn (1988) in the literature review was performed and the observed similarities are shown in Table 8. The Cuban extension system does not fit any single extension approach suggested in the literature review. However, it builds on the agricultural extension participatory approach. Active participation of AKIS operators is expected. In addition, there is an attempt to improve communication among farmers and extension services' providers. Extension is pervasive throughout the AKIS. The Cuban AKIS could be called a centrally coordinated AKIS.

Food Security in Cuba

When the Soviet Union collapsed, Cuba's economic well-being and national security were seriously challenged. Interviewees shared recognition of difficulties during the Special Period. Food insecurity in Cuba has three dimensions. First, insufficient availability of food is a problem - specifically, protein sources and vitamin supplements. This is due to poor economic conditions precipitated by the collapse of the Soviet Union and exacerbated by the embargo imposed by the United States. Second, there are problems of food accessibility.

Table 8. Similarities Between FAO Approaches and Cuban Extension Model

FAO Extension Approaches	Cuban Extension Model Similarities
<i>General agricultural extension approach:</i> The Ministry of Agriculture is in charge of conducting extension activities.	The Ministry of Agriculture coordinates extension activities, assisted by the Ministries of Sugar, Science, Technology, Environment, and Higher Education.
<i>Commodity specialized approach:</i> Focuses on one export crop.	Separate focus on two export crops: sugar and tobacco.
<i>Agricultural extension participatory approach:</i> People organize for their own benefit and participate in the process of extension.	Farmers have organized themselves in cooperatives. Model is farmer centered.
<i>Project approach:</i> There is reliance on outside funds, confined to a limited location.	A Cuban-French project was conducted in Holguin. A second phase of this project will be carried out in Holguin, Havana and Camaguey.
<i>Farming System approach:</i> Technology developed to fit the needs of farmers.	Almost all institutes conduct research that meet the needs of farmers.
<i>Education institutes approach:</i> Agricultural schools, colleges and universities conduct extension activities, but it is not their only role.	Agrarian universities and polytechnic institutes have a strong component of extension in their curricula and outreach activities.

Cuba's previous focus on sugar and tobacco production as cash crops for export made the food system dependent on imports. This specialization placed Cuba's food security in a very fragile state. Past land tenure policies did not allow a strengthening of the agricultural system. Third, inadequate utilization of food results from food habits based on a diet lacking in variety.

To face the Special Period and quickly address food insecurity, the government along with all AKIS operators, directed and inspired by the Communist party, have played an important and decisive role acting together as an extension system. The system provides

information to food producers on appropriate technologies to be used under scarce resource conditions. To respond under these circumstances, the Cuban AKIS has become more flexible in aspects such as land tenure, new operators, new gardens, new information pathways, new crops, and introduction of new technology. In spite of these efforts, there are still many challenges to be solved. For instance protein levels need to be improved, so the population can consume the daily requirements of a healthy diet.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This research project was undertaken to understand an evolving system in which food security gains have been achieved against a backdrop of very pressing economic problems. That societal well-being depends among other factors on food security has been solidly established in the literature. However, food security is affected by many factors. One key factor in enhancing food security is an effective Agricultural Knowledge and Information System (AKIS). This study examined the role of extension in the AKIS in an economically challenged country using a unique model of development to provide for citizens' basic needs. The significance of this study lies not only in the importance and size of the AKIS in Havana City Province but also in potential application of lessons learned by Cuba in shaping development strategies in other economically challenged countries.

The purpose of this study was to describe and interpret the Agricultural Knowledge and Information System of Havana City Province, Cuba, with particular reference to the role of extension programs in contributing to food security. Specific research objectives were to: 1) describe the AKIS in Havana City Province, 2) identify the role of extension in the AKIS, and 3) develop a model for analyzing the AKIS, which may have utility when studying the AKIS in other countries.

The rationale for focusing this study on Havana City Province was based on two reasons. First, with nearly 20% of the Cuban population living in a largely urban province, Havana City in the Special Period was most vulnerable to food insecurity and thus became a focus for AKIS reform and innovation. This province has fundamentally redefined its role in food security. It has transformed itself from a consumer province to a producer of much of its own food, a province of "*autoconsumo*" as it is known in Cuba. Second, Cuban authorities are interested in assessing the activities of the different AKIS entities or operators working within the province. They are interested in detecting areas where improvement can be made, and where successful approaches can be noted for replication elsewhere.

The literature review presented concepts, approaches, and issues related to AKIS, extension organization and management, agricultural and extension education, and food security. This conceptual framework helped to create a better understanding of the extension system in the Cuban AKIS.

The study was designed using a qualitative research methodology - specifically, a case study of Havana City Province. Interviews, participant observation, and document review were used to collect data.

Regarding the first research objective, the Cuban AKIS is composed of the government, Ministry of Agriculture, Ministry of Science, Technology and Environment, Ministry Public Health, Ministry of Sugar and Ministry of Higher Education, educational centers, agricultural stores, research institutes, non-governmental organizations, extension system, and farmers. These operators interact in an environment where the Communist Party as well as Cuban culture and values provide support and influence direction.

Regarding the second research objective, extension in the Cuban AKIS has a social action role, which is to provide food security to the Cuban population. To varying degrees, this role is performed by all the operators cited previously. The extension system is horizontal, meaning that decisions are made taking into consideration farmers' feedback. Operators providing extension services are trying to improve the communication within the extension system to better serve farmers' needs and provide food security to the Cuban population. The extension system has proven flexible in responding to challenging circumstances. It has also opened opportunities to other operators to participate in and strengthen the AKIS.

Regarding the third research objective, a Cuban AKIS and a generalized model are provided by this research. The generalized model is introduced at the end of chapter five. For this model, the researcher built on the Cuban AKIS model and took into consideration previous models suggested by Swanson, et al. (1986) and Bawden (1998). In addition, the Cuban AKIS describes the existing holistic approach where operators work together to achieve sustainability and food security. The generalized AKIS model may have utility when studying the AKIS in other countries utilizing a holistic approach.

The limitation of the study lies in the fact that this research was conducted in an urban agricultural setting, and the urban agricultural knowledge and information system has particular characteristics that differ from those in rural areas. For instance, farmers in urban areas have different knowledge of agricultural production with some not having any agricultural background before the Special Period. Therefore, findings cannot be generalized to rural areas in Cuba.

Conclusions

The following conclusions can be drawn from the study:

1. The role of extension in the Cuban AKIS is to provide information and training to all levels of agricultural organization to ensure national food security. The Cuban model of extension involves the distribution of the extension function throughout the AKIS. It does not really fit any of the models suggested in the literature. It has characteristics in common with some suggested models as observed previously, and some unique features. It also has a persuasive and an emancipatory role. The Cuban AKIS has a philosophical foundation inspired by José Martí's and Paulo Freire's thoughts of solidarity, justice, and social equality.
2. The AKIS developed by Cuba is one in which farmers, governmental and non-governmental institutions, educational centers, and research institutes are trying to find a way to interact together in a logical and centrally coordinated manner. Such a model might aptly be termed a Centrally Coordinated AKIS Model.
3. The AKIS and the Special Period circumstances have created a connection between urban consumers and agricultural production.
4. The Cuban extension system has proven to be flexible and proactive in adapting to changing trends. It responded to an external shock and rapidly adapted to new circumstances. Particularly impressive is the level of commitment that the Cuban Government and Communist Party have shown toward maintaining the well-being of its population through its response to the Special Period. The Party and the Government ensure that clear targets are established. Having a clear target (food

security) helps to organize extension activities. The system has benefited from support from government policy makers and from the Communist Party.

5. Previous AKIS frameworks have provided a good foundation to understand AKIS in other countries. However, to effectively analyze an AKIS it is necessary to include all operators who play an important role within the system. In the Cuban case, non-governmental institutes play as big a role as the traditional public sector operators identified in other models. Based on the literature review and findings, this research proposes a generalized AKIS model for use in analyzing AKIS in other countries. Figure 8 displays the generalized AKIS model. In this model, the system's main sources of inputs are human and economic resources, equipment, infrastructure, a vision, and information. The throughput of the model can be explained as one in which operators such as government, research centers, agricultural universities, non-governmental organizations, businesses, and farmers interact to exchange knowledge and provide feedback to improve the system to enhance agricultural production. The Government plays a supportive and regulatory role. The model assumes that the government is engaged and responsible for the country's development. It has defined a plan of development to improve citizens' quality of life and enhance food security. This plan of development has been put together through the active participation and feedback of main AKIS operators. The government regulates the participation of AKIS operators, meaning that they work and interact together to approach and meet needs of farmers. The extension system is the connection that all operators have in common, and throughout this connection, they communicate among themselves to provide information to farmers. Farmers in this model are the center of the system and their role is key to achieving societal well-being. They provide feedback to the information providers. The environment where these operators interact is influenced by the guidelines, direction and vision provided by the political party in power, as well as the culture and values of society. The principal outputs of the model are food for self consumption and for sale, biofuels, medicines, fiber, and export commodities. The desired impacts are food security, economic well-being and health.

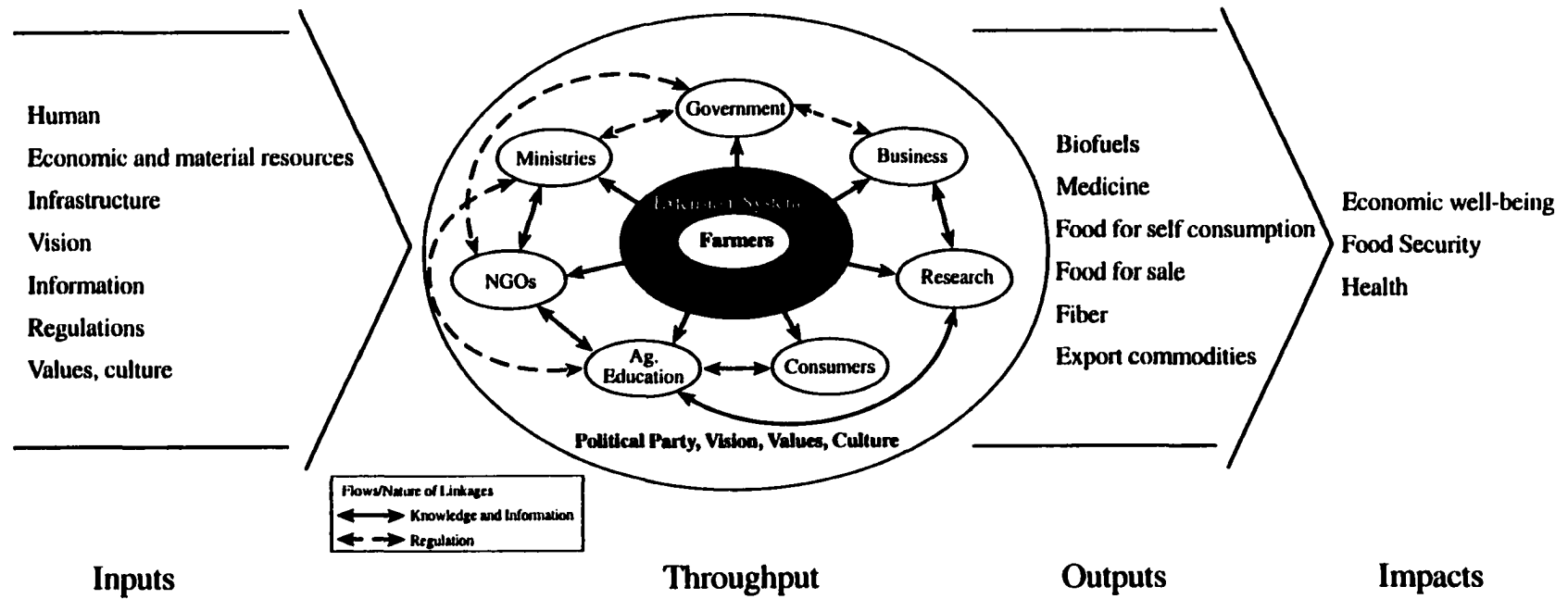


Figure 8. Generalized AKIS Model

Recommendations

Based on the findings and conclusions of this study the following recommendations are provided by the researcher to four audiences: 1) nations seeking to achieve sustainable food security; 2) Cuban AKIS operators; 3) researchers interested in conducting further studies about agricultural knowledge systems in Cuba; and 4) researchers interested in conducting AKIS research in other countries.

For Other Countries Seeking Sustainable Food Security

- 1) The implementation of a well-organized knowledge system is needed to strengthen the agricultural production, market development, storage, and distribution of food in developing countries. Urban sustainable agriculture can be an alternative to solve food demands at local levels. In many countries, there are available urban plots where agriculture production could be implemented; this would allow more and efficient utilization of unused land. Mayors of cities interested in implementing this type of agriculture should visit Havana City Province to learn about its experiences with this activity.

For Cuban AKIS Operators

- 1) Ensure that AKIS operators are receiving and providing information among themselves to avoid duplication of efforts, contradictory messages, and waste of resources. Operators need to improve communication channels. An efficient electronic communication system would assist greatly in this coordination effort.
- 2) Find the reasons that cause the low UBPC profitability and take action to solve this problem.

For Further Studies in Cuba

- 1) Conduct an AKIS study in other provinces as well as in rural areas in Cuba to have a better understanding of the national AKIS and how it might be improved.

For Further AKIS Research in Other Countries

- 1) Test the applicability of the generalized AKIS model proposed by the researcher.
- 2) Compare results to determine where improvement of the suggested model can be made.

APPENDIX A. HUMAN SUBJECTS APPROVAL

Last name of Principal Investigator Carrasco**Checklist for Attachments and Time Schedule****The following are attached (please check):**

12. Letter or written statement to subjects indicating clearly:
- a) the purpose of the research
 - b) the use of any identifier codes (names, #'s), how they will be used, and when they will be removed (see item 17)
 - c) an estimate of time needed for participation in the research
 - d) if applicable, the location of the research activity
 - e) how you will ensure confidentiality
 - f) in a longitudinal study, when and how you will contact subjects later
 - g) that participation is voluntary; nonparticipation will not affect evaluations of the subject
13. Signed consent form (if applicable)
14. Letter of approval for research from cooperating organizations or institutions (if applicable)
15. Data-gathering instruments

16. Anticipated dates for contact with subjects:

First contact

October 20, 2000

Month/Day/Year

Last contact

December 20, 2000

Month/Day/Year

17. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

Month/Day/Year

18. Signature of Departmental Executive Officer

Date

Department or Administrative Unit

10/03/00IAP/AGEDST

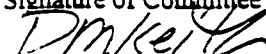
19. Decision of the University Human Subjects Review Committee:

 Project approved Project not approved No action required

Name of Human Subjects in Research Committee Chair

Date

Signature of Committee Chair

Patricia M. Keith10-6-00

APPENDIX B. LETTERS OF CONSENT

October 2000

Dear (research respondent name type here)

My name is Alejandrina Carrasco, and I am a graduate student at Iowa State University. I am researching the role of extension education and the Cuban Agricultural Knowledge and Information System (AKIS). I am particularly interested in researching your experience in education, training and your participation in the agricultural system. The result of this research will serve as the basis of my Doctoral dissertation.

I would like to interview you one or two times in the following two months. The interviews will last for 1 hour approximately. In addition to interviews, I would like to spend some time with you to observe your interactions with the people related to extension work. The objective of my research is to describe the role of extension in the Cuban AKIS.

All of these interviews will be tape recorded, in order to preserve and accurately cite your responses. Opportunities for observation referred to above will be decided upon by both you and I. Your name, place of work, and specific occupation will remain confidential. I will take the responsibility for masking your name and other defining information with pseudonyms. You may decline to participate in the study at any time, during any of the interviews or observational situations. Your participation is completely voluntary.

If you have any questions about this study, you can contact me at (Telephone in Havana, Cuba).

Your participation is greatly appreciated.

Sincerely,

Alejandrina Carrasco
Iowa State University
Doctoral Candidate

October 2000

Dear (name of the director of the institute/graduate program)

My name is Alejandrina Carrasco, and I am a graduate student at Iowa State University. I am researching the role of extension education and the Cuban Agricultural Knowledge and Information System (AKIS). I am particularly interested in researching your students' experience in education, training, and their participation in the agricultural system. The result of this research will serve as the basis of my Doctoral dissertation.

I would like to hold a focus-group interview with them one or two times in the following two months. The focus-group interviews will last for 1 hour approximately. In addition to interviews I would like to spend some time with them to observe their interactions with the people related to extension work during their practical activities in the field (if any). The objective of my research is to describe the role of extension in the Cuban AKIS.

All of the interviews will be tape recorded, in order to preserve and accurately cite their responses. Opportunities for observation referred to above will be decided upon by both you and I. Their name, place of study, and other specifics will remain confidential. I will take the responsibility for masking their name and other defining information with pseudonyms. They may decline to participate in the study at any time, during any of the interviews or observational situations. Their participation is completely voluntary.

If you or your students have any questions about this study, you/they can contact me at (Telephone in Havana, Cuba).

Their participation and your help are greatly appreciated.

Sincerely,

Alejandrina Carrasco
Iowa State University
Doctoral Candidate

APPENDIX C. GUIDING QUESTIONS

In qualitative research questions emerge through out interactions. However, the following questions grouped by categories will guide the interviews.

Businesses and Parastatal:

- What type of service does your company offer to the agricultural sector?
- How long has your company provided service to the agricultural sector?
- Who are your main customers?
- Does your company provide any type of training/advice to customers? What kind of format?
- Who trains your personnel? Level and type of education.
- Is there any linkage among your company and other institutions (Ministry of Agriculture, NGO, Research Centers)? Describe.
- What type of educational material do you produce? How do you distribute them? What is the source of this information?
- Do you have people going out to the fields?

Farmers:

Name:

Age:

Gender:

Head of household?

Years working in agriculture production:

Are you a full time or part time farmer?

Describe land tenure /ownership in your community:

Size of the family:

How many of them are involved in the agricultural production?

- What do you grow/raise?
- What type/level of education do you have?
- Do you receive any technical assistance from extension staff? What type? Who provides that service for you?
- Have you received any training? How often? What type?

- Do you have access to credit?
- How many people are involved/working on the farm? Do they receive training?
- How you market your products?

Governmental Office (Ministry of Agriculture and Research Centers):

- Please describe the organization of agriculture service in Cuba
- How many research, extension, and training programs does your office manage? What type?
- What are the main agricultural products the government is emphasizing through research and extension?
- What is the role of the government in providing technical assistance, credit, supplies and land to the farmers?
- What is the relationship of the government with the various agricultural entities (research centers, NGO, business companies, and agrarian universities)?

Specifically for research centers: How are you transferring information to farmers?

How do you determine the research agenda?

Non-Governmental Organizations (Churches, ACTAF, Organic Farmers Associations and others):

- Type of Programs
- Whom do you serve?
- Scope
- What types of services does the NGO provide to the farmers?
- Relationship with other NGOs, Government, Businesses, and Universities?
- What type of educational material do you produce? How do you distribute them? What is the source of this information?

Students (Post secondary and university students):

- Background: Rural/urban: Farm experience:
- Age: Gender:
- What themes related to Extension Education have you been taught? (Sociology, Communications, Methods, Adult Education, others)
- What other types of training would you like to receive?
- Have you visited or worked on farms/cooperatives? Describe your experience. Level of practical training (Internship experience?)
- What are you planning to do when you graduate?
- What areas (research, extension, teaching, farming) would you like to work in?
- When you graduate would you be ready to provide extension assistance to farmers?

Faculty:

- How long have you been working for the University?
- What is your specialty?
- What classes do you teach?
- Do you include extension components in your classes? If so, what areas?
- How often do you attend conferences/training course related to Extension?
- Research at University vs. Research at Institutes
- What type of research is the University/Institute conducting?
- What are you training your graduates to do?
- Provide your opinion on the AKIS in Cuba.
- Is the University involved in training farmers, and extension people?

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