

LINKAGE OF RESEARCH, EDUCATION AND EXTENSION IN
RWANDA

Plan B Master Research for the Degree of M. S.
MICHIGAN STATE UNIVERSITY

Callixte GATALI

2003

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**PERCEIVED BARRIERS AND OPPORTUNITIES TO THE
LINKAGE OF RESEARCH, EDUCATION AND EXTENSION IN
RWANDA**

By

Callixte GATALI

A Plan B Master Research

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

MASTER OF SCIENCE

**Department of Agricultural and Natural Resources
Education and Communication Systems**

2003

ABSTRACT

PERCEIVED BARRIERS AND OPPORTUNITIES TO THE LINKAGE OF RESEARCH, EDUCATION AND EXTENSION IN RWANDA

By

Callixte Gatali

The purpose of this study was to investigate perceived barriers and opportunities to link research, education and extension in Rwanda. Data were collected between June and August 2002 from 46 participants in six Provinces of Rwanda. Data were analyzed using the Statistical Package for Social Sciences (SPSS) and descriptive statistics. Four research questions guided this study. The instrument used face-to-face interviews and was developed using open-ended questions.

Findings revealed that many issues confronting Rwandan extension services are still unsolved such as low educational level, poor training and lack of logistics for extension staff; weak linkages between research, education and extension with each service operating separately; and lack of farmer participation in decision- making. Outstanding barriers to the establishment of linkages included unwillingness to collaborate, weak financial resources to support linkage activities, lack of framework for collaboration between partners, coordination and farmer participation. The study findings also indicated that many opportunities for building linkages exist. Based on the study findings, recommendations include: improve extension professionals through training, provide them with adequate means, reorganize institutions, formalize linkages, ensure collaboration of partners, improve communication mechanisms, set up a structure of coordination and enhance farmer participation in decision-making.

DEDICATION

**To our families and friends in Rwanda for their love,
guidance, encouragement and support.**

ACKNOWLEDGEMENTS

I am grateful to Dr. Frank Brewer, my Major Professor, for his guidance, advices and many enrichments to my field experience through my participation in two AIAEE conferences (South Africa & North Carolina), many field trips (Washington D.C, Kentucky & North Carolina, Michigan Extension Tour, Ogemaw County) and his visit to Rwanda to help me to get started with my research data collection.

I am also grateful to Dr. Dave Krueger, my committee member for the design of my research and the methodology used for data collection, and Dr. Herb Bucholtz, my committee member too for his excellent help and advice in the field of Animal Science.

My gratitude is also expressed to the chairperson of the Department of ANR Education and Communication Systems, Dr. Kirk Heinze.

I am also indebted to Dr. Cynthia Donovan and Miss Patricia Farrell for their contribution for the development of the instrument used in this study and data analysis tools (SPSS). I would like to express special thanks to Mary Pierce, Gloria Bateman, Diane Davis and Julie McDaniel for their enthusiastic help in administrative matters.

I would like to extend my sincere thanks to David Weight, Dan Clay and Tim Schilling, respectively Coordinator of PEARL project, Director of Institute of International Agriculture at MSU and in-country Coordinator of PEARL Project to have made possible my studies through the financial support of PEARL Project.

I have been enlightened by my wife Epiphany MUKUNDIYIMANA and been helped by her in field data collection, entry and constant encouragement throughout this endeavor. My deepest appreciation is extended to NUR authorities and study participants.

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KEY TO SYMBOLS AND ABBREVIATIONS

AKIS/RD	Agricultural Knowledge and Information Systems for Rural Development
ANR	Agricultural and Natural Resources
AOE	Area Of Expertise
ATS	Agricultural Technology System
DES	District Extension Service
GDP	Gross Domestic Product
GTZ	Gesellschaft für Technische Zusammenarbeit
FAO	Food and Agriculture Organization
ISAE	Institute of Agriculture and Livestock
ISAR	Rwandan Institute of Agricultural Sciences
ISNAR	International Service for National Agricultural Research
MAES	Michigan Agricultural Experiment Station
MINAGRI	Ministry of Agriculture, Livestock and Forestry
MINIFIN	Ministry of Finance and Economic Planning
MSU	Michigan State University
MSUE	Michigan State University Extension
NAERC	National Agricultural Extension and Research Committee
NGO	Non-Government Organization
NUR/UNR	National University of Rwanda

PEARL	Partnership for Enhancing Agriculture in Rwanda Through Linkages
PERC	Provincial Extension and Research Committee
PSA	“Projet Service Agricole” (Agricultural Service Project)
REE	Research- Education-Extension
SAA	Sasakawa Africa Association
SAARFA	Strengthening African Agricultural Research and Faculties of Agriculture
SAFE	Sasakawa Africa Fund for Extension Education
SG2000	Sasakawa- Global 2000
SPSS	Statistical Package for Social Sciences
UM	University of Minnesota
USAID	U.S. Agency for International Development

CHAPTER 1

INTRODUCTION

1.1 Background and Setting

Agricultural Extension is an informal educational delivery system that can serve as the link between people and knowledge and it is an essential element in any agricultural and rural development program. Extension outreach helps people solve their own problems, thereby improving their livelihood (Brewer, 2001). In order for extension programs to be relevant and responsive to people, there needs to be a structure in place that is responsive, flexible and adaptative to meet the needs of families and communities in an increasingly complex, interdependent, rapidly changing, resource limited world, Brewer stated.

Adams (1982) also defines agricultural extension as an advice and assistance for farmers to help them improve their methods of production and marketing. Extension is part of the effort to achieve a balanced social and economic development of rural areas. Providing farmers with the opportunity of acquiring updated information is one of the primary goals of public extension services in developing countries.

In order to manage farms optimally and to earn more stable income, farmers need to acquire proper information about more profitable crops, new farming techniques, fertilizing, pest management, irrigation, changing factors and market prices for crops, and so on (Boz, 2002).

Governments in developing countries are facing new extension challenges: globalization and market liberalization, privatization, commercialization and agribusiness, democratization and participation, environmental concerns, disasters and emergencies, information technology break-through, rural poverty, hunger and vulnerability, HIV/AIDS epidemic, biotechnology and genetic engineering, criticism of public extension services, integrated, multi-disciplinary and holistic development, meeting the need to provide food for all, raising rural incomes and sustainably managing natural resources...(Qamar, 2002). All these critical issues exist in a rapidly changing world and are putting new pressure on the developing countries in their effort to develop.

Rivera, Qamar, and Crowder (2001) have articulated the role of extension in alleviating poverty and improving food security. Agricultural and rural extension is one of the means available to help alleviate poverty and improve food security. It promotes the transfer and exchange of information that can be converted into functional knowledge, which is instrumental in helping to develop enterprises that promote productivity and generate income, said Rivera et al.

According to Quinones (2000), to arrest the problems of poverty, food insecurity, and degradation of natural resources in Sub-Saharan Africa, the critical role of agricultural intensification as the engine of broader economic growth is becoming increasingly clear to African governments and leaders.

Many economically developing countries are in the process of establishing or redeveloping an extension system to strengthen a fragile agricultural industry and meet the great needs of rural people and communities. Small inefficient farm units characterize

those countries with low farm profitability, limited government support and unsure markets (Brewer, 2001). Crowder, Lindley, Bruening and Doron (1999) also found that extension, as a non-formal educational input, can make important contributions to sustainable agricultural production and rural development.

However, the continuing effort to stimulate economic growth in Africa through agricultural development reflects the rise and fall of the different 'fads' and 'fashions' in international development over the past 50 years (Simpson & Owens, 2002). As the 'poor cousin' in most agricultural development strategies, agricultural extension and education has been particularly affected by the changing trends in external financing (p. 29).

The previous situation reflects ongoing endeavors currently unveiling in Rwanda, a country that has been severely affected by the 1994 genocide where approximately 1 million people were killed and many socio-economic infrastructures destroyed. After the country genocide, the government of Rwanda has put numerous efforts in boosting the national economy including the agricultural sector through agricultural extension programming. The foremost focus of this new agricultural extension system has been on conserving water and forest resources; increasing soil fertility; bolstering farm input supplies; and controlling livestock diseases. Despite these efforts, challenges facing agricultural development in Rwanda include: 1) poverty and food insecurity reduction; 2) market-oriented agriculture; 3) building a more responsive extension system, and 4) enhance farmer involvement. To address these challenges the extension system has begun to pull together a multidisciplinary approach that links important contributions from various research with producers, families and communities.

Even though agriculture plays a key role in the Rwandan economy, the agricultural extension service has failed to achieve its mission to disseminate agricultural knowledge to farmers (Ministry of Agriculture [MINAGRI], 1997). Rwandan agriculture cannot any more assure the food security to the population, reports MINAGRI.

This challenge of Rwandan agriculture to assure food security is more than just technology and production, it may also be the system used to transfer knowledge and technology to people, to help use them efficiently and effectively, and to improve people's living conditions. For example, Nezehose (1990) notes that the Rwandan extension system suffered mainly from (1) a lack of coordination between all stakeholders, (2) a lack of enough means to reach out to the farmers, (3) a low adoption of relevant innovations due to the farmers' poverty, and (4) a lack of enough process skills for extension agents. On the other hand, Barry (2000) stated that a lack of linkages between research-education and extension (REE) was among the weaknesses observed in the Rwandan extension system.

The failure of Rwandan extension to disseminate knowledge to the end-users has been observed since the colonial period where extension services were more concerned with the introduction of cash crops for export, e.g., coffee, pyrethrum, quinine, cotton and wheat for the breweries, than with educating the agricultural community. The main causes of that failure could be attributed to: 1) low educational level, poor training and lack of equipment for extension staff at low administrative levels; 2) weak linkages between research, faculty teaching and extension with each service operating separately;

and 3) lack of farmers' participation in planning, implementation, evaluation of development programs, and decision-making.

Although agricultural research and extension have common objectives, there is a lack of close coordination between them. Because of this, their ability to help farmers effectively and to contribute to agricultural development is often limited (Cernea, Coulter & Russell, 1985). This is particularly important for Rwanda where agricultural research, education and extension are compartmentalized in separate institutions without any formal linkage. Although some studies (MINAGRI, 1997; Ministry of Finance & Economic Planning [MINIFIN], 2002; Roche, 1998) mention the relevance of Rwandan extension, little research has been done on research, education and extension linkages. This is why a study addressing specifically inhibiting factors or barriers and opportunities to the establishment of linkage of research, education and extension in Rwanda is needed for building an efficient and more responsive system to the clientele needs.

This study involves the analysis of factors affecting the barriers and opportunities to the linkage of research, education and extension in Rwanda. This chapter addresses the background and setting, problem statement, purpose of the study, research questions, definition of major terms, assumptions and limitations of the study.

1.2 Statement of the Problem

The government of Rwanda has made poverty reduction one of the national priorities, reports the Ministry of Finance and Economic Planning ([MINIFIN], 2002) in the National Poverty Reduction Programme & Statistics Department.

The Ministry goes on to say that Agriculture must be a central element of poverty reduction strategy in Rwanda, and “Agricultural extensions (where effectively delivered) are very important services and are big inputs for raising productivity among farmers (p.37)”.

However, agricultural extension is still limited in Rwanda, states the Ministry of Finance and Economic Planning (2002) and it is facing increasing challenges in providing quality services to the customers. Extension systems would not be effective and efficient without any direct collaboration with research and education, which are responsible for releasing new technologies and people who work in extension.

Unfortunately, there is a paucity of information and studies addressing research, education and extension linkages in Rwanda and describing the feelings, expectations, and challenges of different partners toward extension services to meet farmers’ expectations. According to Rivera, Qamar, and Crowder (2002), linking the triangle’s institutions with their common clientele, namely farmers, and with each other requires systematic planning. This system integrates farmers, agricultural educators, researchers and extensionists (Figure 4). In addition, the quality of services provided would greatly improve if all the three concerned institutions were linked together and well-designed programs would attract more donors.

Therefore, the complex situation of lack of linkages between research, education and extension in Rwanda requires a detailed research. The assumption is that linkages between research, education and extension and end-users are likely to promote learning,

generating, sharing and using agriculture-related technology, knowledge and information. Thus, the problem to be addressed in the present study is the perceived barriers and opportunities to the linkage of research, education and extension in Rwanda.

This study is the first to specifically address linkages between research, education and extension in Rwanda. It will have a direct bearing on research, extension and education relationships. In fact, there is a need for agricultural scientists (researchers, educators and extension staff) to work together to address the problem of food security (the production of food, the marketing of food and the entitlement of food), bring knowledge to the farmers and sustainable solutions to agronomic problems in particular to help farmers to improve their productivity, income and living conditions. The findings of this study should encourage research, extension and education institutions to strengthen their relationships and build a strong Agricultural Knowledge and Information System (AKIS).

We are confident that the findings from an examination of perceived barriers and opportunities to the linkage of research, education and extension in Rwanda would help in efforts to build a more effective, efficient and responsive extension system to meet farmers' needs and problems. Furthermore, the findings will help to build genuine collaboration and information exchange system between different partners.

1. 3 Purpose of the Study

The researcher's purpose in this study was:

- To gather information relative to the perceived barriers and opportunities to link research, education and extension in Rwanda.

Therefore, the concise information collected from this study will provide a reference tool for enhancing the collaboration between the extension services of the Ministry of Agriculture, the Rwandan Institute of Agricultural Sciences (ISAR), faculty teaching institutions such as the National University of Rwanda (NUR) and the Institute of Agriculture and Livestock (ISAE), local and international Non-Government Organizations (NGOs), agricultural secondary schools and farmers.

- To create foundation for future research.

1.4 Research Questions

This study addresses the following questions:

- (1) What are the characteristics and constraints/weaknesses of Rwandan Extension System?
- (2) What are the perceived opportunities to the linkage of research, education and extension in Rwanda?
- (3) What are the primary inhibiting factors or barriers to the linkage of research, education and extension?
- (4) If linkage is being made, (i) what model of linkage can be appropriate to Rwanda?
(ii) What will be the role and responsibilities of different partners?

1.5 Definition of Major Terms

For the purpose of this study, the following terms are used:

- **Research, education and extension linkages:**

“By linkage between research, extension and education we understand an integrated agricultural knowledge and technology system that includes such actors as farmers themselves, educators and researchers, extension workers, NGOs, businesses and make them work together for improving the effectiveness of agricultural technology. Even actors can belong to separate institutions, the integrative approach might focus not only on their organization and structural linkage, but also on their functions and complementary information and promoting group or team approaches to problem solving system” (Crowder & Anderson, 1996).

- **Agricultural Knowledge and Information System (AKIS):**

An Agricultural Knowledge and Information System (AKIS) is a system of people and institutions that generates, transfers and utilizes agricultural knowledge and information. The system is characterized by its key subsystem: agricultural research, agricultural extension and agricultural education. Farmers, their needs and opportunities drive education, extension, and research and for each provide direct input into design, funding, priority setting, execution and evaluation (FAO & World Bank, 2000).

- **Extension worker:**

A person, employed by the government or NGOs, who is in charge of delivering extension messages to the farmers.

- **Farmers' association:**

A group of farmers with a various number of individuals, but not less than 7 people to form an association, sharing interests around one or more commodities

such as land use, crop production, livestock, inputs management, and so on.

Legislation exists on farmer associations in Rwanda.

1.6 Basic Assumptions

The basic assumption of this study is that an integrated research, education and extension system generates synergy and is likely to be more flexible, responsive and effective in meeting farmers' needs and problems:

- Research will sustain teaching and extension through new science-based knowledge;
- Faculty teaching will prepare researchers, extension personnel, and teachers to service workforce needs;
- And extension will serve to disseminate knowledge to the farmers and link together researchers, educators and farmers/rural communities.

1.7 Limitations of the Study

The researcher recognizes the following limitations of this study:

1. The study is geographically limited by time and means to a sample of 46 people.
2. The study is limited by availability of previous studies on linkages of research, education and extension in Rwanda.
3. The findings may have direct relevance only to the participants.
4. The study data was self-reported and may present varied interpretations of the questions asked and hence articulations of responses.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Once again agriculture extension plays an important role in agricultural development in Rwanda (MINAGRI, 1997; MINIFIN, 2002). This chapter analyzes the current situation and constraints/problems of the Rwandan extension system, addresses the role of teaching and research institutions in supporting extension, and makes a comparison with the US Land– Grant System as a model of linking between research, education and extension. Relative to literature review the following topics are analyzed:

- Basic information on Rwanda;
- Overview and evolution of the Rwandan Extension System;
- The role of the National University of Rwanda in agricultural research and extension systems;
- Understanding research, education, extension, and farmer linkages;
- Factors affecting research, education and extension linkages in Rwanda; and
- Michigan State University Extension: A U.S. Land Grant model of formal and successful linkage between research, education and extension.

2.2 Basic Information on Rwanda

Geographical and Demographical Aspects

Rwanda is a land locked country located in the eastern part of central Africa. According to the 3rd General Census of Population and Housing (Ministry of Finance and Economic Planning, 2003a), the country has a population of 8.2 million people living on a land area of 26,368 sq. km. The population density is 431 per sq. km (CIA World Factbook, 2002) making Rwanda the most densely populated country in Africa (opposed to an average of 26 per km² for Sub-Saharan Africa). At the current growth rate of 2.9% per annum, the population is expected to reach 11.4 million by the year 2010 (Rwandan Institute of Agricultural Sciences [ISAR], online).

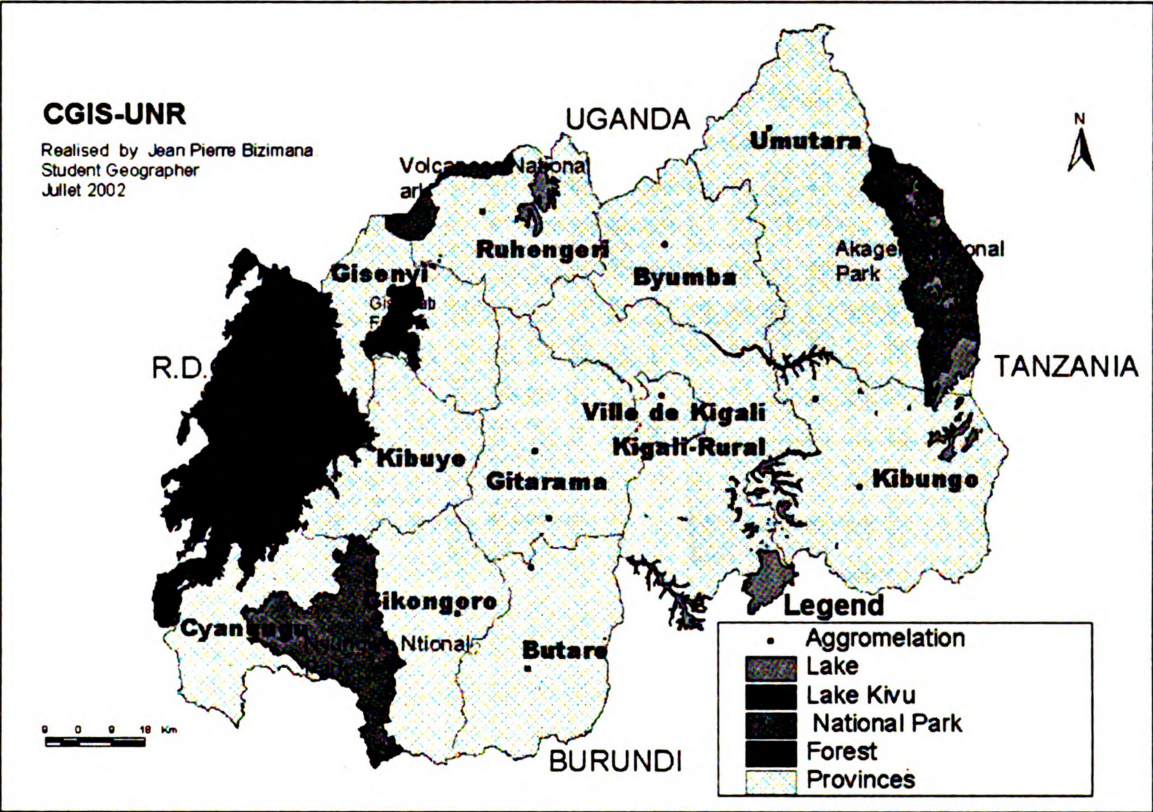
Uganda to the North, Tanzania to the East, Burundi to the South and Democratic Republic of Congo to the West border Rwanda (Figure 1). The country extends between 1 degree and 3 degrees south of the equator, 29 degrees and 31 degrees East of Greenwich (Longitude). The climate is moderate and characterized by temperate conditions, especially in higher altitudes in the Northwest of the country. The topography is hilly to mountainous with altitude ranging from 950 meters above sea level in the southern part of the country up to 2,500 meters and 4,500 meters (highest peaks) in the volcanic regions of the northwest.

Administrative Aspects

The capital of Rwanda is the City of Kigali with 608,141 inhabitants. The country is divided into twelve provinces (Figure 1), each with a town designated as the center of local government. Provinces are divided into Districts (Figure 2).

Districts are divided into Sectors, which in turn are divided into Cells, the smallest political and administrative units of the country.

Figure 1. Twelve Provinces that Make up Rwanda



CGIS-UNR
 Realised by Jean Pierre Bizimana
 Student Geographer
 Juillet 2002

Map of the Democratic Republic of Congo (RDC) showing administrative districts, forest areas, and National Parks.

Legend:

- Forest (hatched pattern)
- National Park (solid black)
- Lac Kivu (solid black)
- Limit of District (solid line)

Neighboring Countries: UGANDA, TANZANIA, BURUNDI.

Scale: 10 0 10 20 Km

Social, Political and Economic Conditions of Rwanda

Rwanda is one of the poorest countries of the world. Its economy is primarily based on agriculture. Agriculture constitutes the main economic resource of the country (MINAGRI, 1997). It accounts for 91.1% of the employment for the active population and remains the main source of economic growth. The agricultural sector contributes 36.6- 41.6% to the Gross Domestic Product (GDP) (Ministry of Finance, 2002; ISAR, online; World Bank, 2002). The main agricultural export item is coffee, which in 1997 contributed 52% of the national foreign earning while at the same period tea as the second most important export commodity item contributed 24% of the foreign currency earning (ISAR, online). The industrial sector is still in an embryonic stage and comprises of factories that process and assemble imported semi-manufactured products. Processing plants for tea, coffee, sugar, and tobacco dominate the Rwanda's small industry. Industry contributed only for 21.8% to the GDP in 2002 according to the World Bank.

Rwanda's economic characteristics are a result of its colonial and post-colonial history of the country according to the Rwandan Ministry of Finance and Economic Planning (2003b) in Vision 2020. The economy of Rwanda is characterized by internal and external macro-economic disequilibria, which are observable in the budget deficit and the Balance of Payment deficit, deficit between internal savings and gross investment, high unemployment and underemployment rates (Table 1).

Table 1. Rwanda's Macro-Economic Indicators from 1995 to 2001

Indicator		1995	1996	1997	1998	1999	2000	2001	ASS (1999)
Inflation rate (%)	IPC	48.2	13.3	11.7	6.8	-2.4	3.9	3.4	
	GDD deflator	50.4	10.2	15.6	2.0	-5.2	1.3	0.7	12
Savings less investments	(In % of GDP)	-19.0	-19.2	-17.4	-17	-16.7	-16.3	-16.4	-2.6
	(in 10RwF)	-64.4	-81.9	-97.1	-105.6	-107.7	-115.0	-123.7	
Internal absorption (% of DGDP)		122.8	120.3	124.6	120.4	118.7	113.7	-113.9	102.6
Global fiscal deficit (% of GDP)	Aid excluded	-13.7	13.2	-9.2	-8.3	-9.7	-8.9	-9.5	-5.6
	Aid included	-2.4	-5.8	-2.5	-30	-3.8	0.1	-1.1	-4.5
Current deficit balance (% of GDP)		-20.5	-19.2	17.3	-16.8	-17.1	-16.9	-16.3	
		4.5	-0.2	-3.2	-9.4	-7.6	-5.1	6.5	
GDP per capita (USD)							227	263	470
Debt servicing (% of exports)			20	14	17	26	25		10

Source: - 2001 Rwanda Development indicators: Africa database 2001
- Rwanda Vision 2020, Draft 4, English, February 2003

The imbalances became a source of macro-economic instability and an insurmountable debt burden, given the meager resources. In addition, Rwanda has a weak GDP per capita, compared to other countries and for this reason the purchasing power of the population is very weak. This has a negative influence on other socio-economic indicators as shown in Table 2.

Table 2. Rwanda's Basic Socio-Economic Indicators

INDICATOR	1990	1996	1999	2000
Population (Millions)	6.879	6.167	7.494	7.711
GDP per capita (\$)	374	224	253	227
Life expectance (years)	53	46	49	49
Infertile mortality (for 1000 live birth)	120		124	107
Registration in primary education	76.6	80.1	88	
Poverty index (% inhabitants)	47.5	71.1	65.4	64.1
Access to safe drinking water (% of population)	49		44	44
Gross Domestic Investment (%GDP)	13.5	15.2	18.0	18.2
Gross national savings (% GDP)	6.00	-3.96	4.88	3.6
Private consumption (% GDP)	83.7	95.9	85.9	90.2
Inflation (Price index to the consumption (Annual average %)	9.1	9.33	-10.23	2.12
Gross official reserves (less imports)	1.7	4.9	8.1	
Unpaid debts (% of GDP)	37.7	86.1	74.2	82.5

Sources: - PFP, IMF Bulletin of the report of the World Bank Personnel;

- Rwanda Development indicators, 2000
- Rwanda Vision 2020, Draft 4, English, February 2003.

2.3 Overview and Evolution of Rwandan Extension System

Studies have shown that extension services have made significant impact on agricultural development, leading to self-reliance and Rural Poverty Alleviation (RuPA) in Africa, Asia, and the Caribbean (Ngomane cited in Ngomane & Flanagan, 2002).

Others have identified and some have evaluated the constraints limiting extension effectiveness in promoting RuPA (Bruening & Reynar; Radhakrishna cited in Ngomane & Flanagan, 2002).

Rwanda has had an extension system since the colonial period. During this period, which is situated before the 1960s, extension had as main objective the promotion of

export crops such as coffee, tea, cotton and cinchona but farmers were neither consulted nor associated to any decision- making (MINAGRI, 1997).

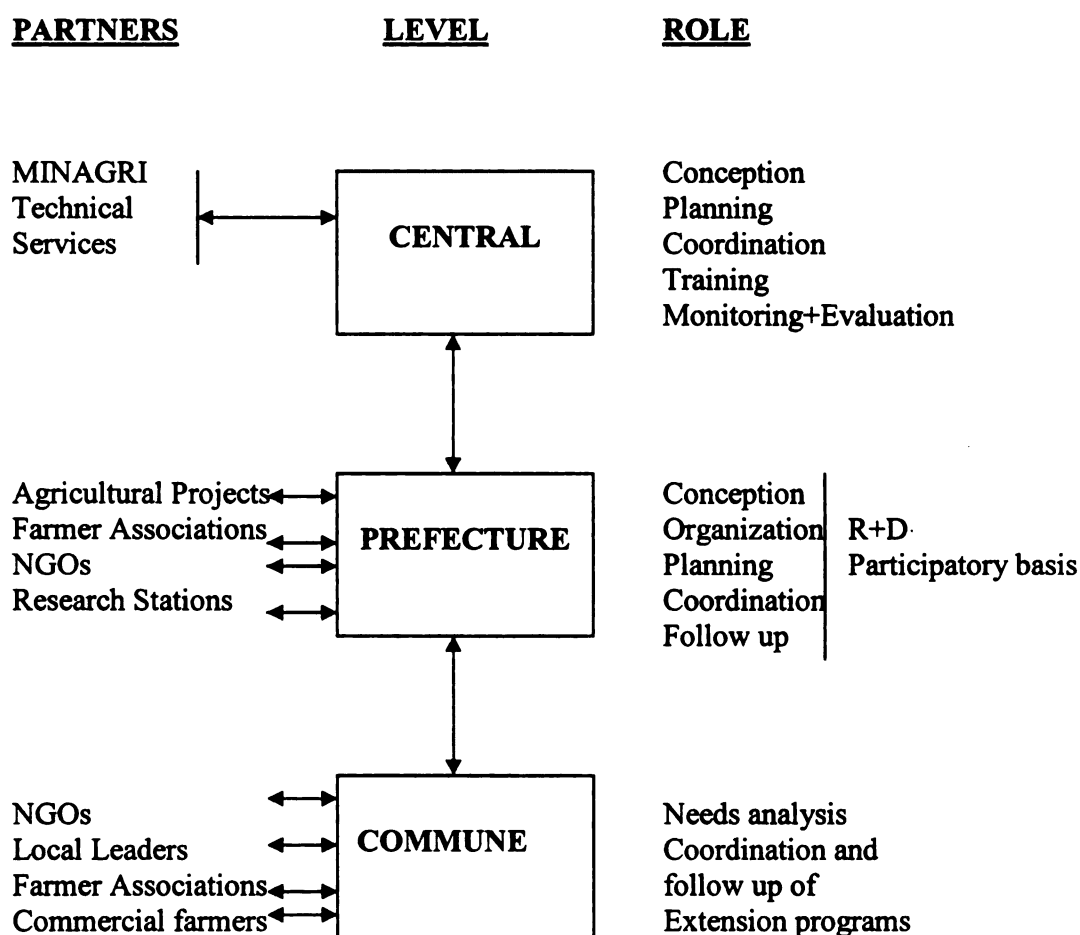
In the 1980s, a national extension system was created and put under the Ministry of Agriculture responsibilities (Nezehose, 1990). However, there were a great number of partners whose extension approaches were uncoordinated and the new agricultural extension system failed to meet its goals due to, (1) a lack of coordination between all stakeholders, (2) the system was not mature yet, and (3) the extension lacks enough tools to carry out relevant on-farm trials for innovations (Nezehose, 1990).

In the 1990s, another Extension System, the PSA (“Projet Service Agricole”) emerged under the auspices of a World Bank fund and introduced the Training and Visit (T&V) system. PSA covered the majority of the country (MINAGRI, 1997). Yet, this new system did not respond as well to the farmers’ expectations and needs due to high costs required in employing, training and providing transport to large number of extension staff, reports MINAGRI. As MINAGRI notes, there have been many factors that were associated with the partial implementation of PSA such as:

- Extension agents had other things to do rather than extension;
- Information systems had only partially functioned;
- Proposed themes had less performance;
- Extension agents on field had a low level of education and they did not benefit from necessary training and support; and
- Farmers were not really involved in the process.

In order to improve that situation, in 1997, the Ministry of Agriculture set up a “National Agricultural Extension System” (Figure 3) with the following general objective, *“Increase, diversify, specialize and intensify agro-sylvo-pastoral production under reasonable, profitable economic conditions, for the State and the farmers as well, while preserving patrimony”* (MINAGRI, 1997, p.8).

Figure 3. The National Extension Service (Source: MINAGRI, n.d.)



Note: Former “Prefecture” and “Commune” have been recently renamed PROVINCE and DISTRICT respectively.

Specifically, the new system is aimed to solve the following problems:

Conserving and maintaining soil fertility for improving productivity; adapting production systems to regional potential; using fertilizers; equipment modernization; market-oriented production; increasing product added value through quality; organizing punctual interventions and implementing an extension approach for accompaniment.

The main features of this new extension system are: (1) an extension service to promote the commercialization of food crop, livestock and cash crop production; (2) the use of farmer groups and associations to promote farmer-to-farmer-extension; (3) a participatory approach to testing and adapting recommendations; (4) institutionalization of the links between research and extension; and (5) process of continuing education for extension staff and the coordination of extension with other different partners (MINAGRI, 1997).

The implementation of the new system therefore depends on various approaches as the philosophy that guides its activities: (1) *National Agricultural Services (General agricultural extension approach)*; (2) *Training and Visits (T&V System)*; (3) *By Products or by Commodity*; (4) *By Project*; (5) *Agricultural educational institutions*; (6) *Agrarian systems and research-development*; (7) *Participatory approach*; and (8) *Expenses sharing* (MINAGRI, 1997, pp. 10-13). Axinn (1988) and Brewer (2001) have previously described most of these approaches. According to the Ministry of Agriculture no one of these approaches is applicable to all conditions, all objectives or clientele, so the

extension services may relay on different approaches for problem solving and for different purposes, stated MINAGRI.

Rivera et al. (2001) underline efforts undertaken jointly by Rwandan government and the Food and Agriculture Organization (FAO) to promote institutional reforms such as decentralization, participation, and provider pluralism.

However, many issues confronting the Rwandan extension services are still unsolved such as: 1) low educational level, poor training and lack of equipment for extension staff; Brewer (2001) notes that low qualification of extension workers leads to limited effectiveness of extension services and lack of confidence by both the extension agents and the people they try to advise; Adams (1982) also points out that the extension agent, the most important link in the chain, is often the less supported with transport, equipment and technical guidance; 2) lack of farmers' participation in decision-making; and 3) weak linkages between research, faculty teaching and extension with each service operating separately.

As stated in the introduction section, building a more responsive extension system through strengthening research-education-extension linkages is one of the critical challenges facing Rwandan extension system. The next sections analyze the role of National University of Rwanda in agricultural research and extension systems; understanding research- education- extension –farmer linkages; factors affecting research, education and extension linkages in Rwanda and Michigan State University Extension (MSUE) as a model of formal and successful linkage between research, education and extension.

2.4 The Role of the National University of Rwanda in Agricultural Research and Extension Systems

According to National University of Rwanda (NUR) authorities, NUR has four important missions (NUR, online):

(1) To provide teaching at a higher level: The main task of the NUR is to transmit scientific knowledge to its students in a way that new ideas may come out and professional aptitude is acquired (NUR, online).

(2) To organize scientific research:

Research activities at the NUR comprise all creative works undertaken in a systematic way in order to increase scientific and technological knowledge, including the knowledge of man, culture and society, also making good use of that knowledge in new situations. The scientific research at University level is not only lecturers and researchers' affair but also that of students in "licence" and doctorate, as it is inscribed in their final papers (dissertations, doctorate and specialization theses). In this way, the development of scientific research contributes to the improvement and the strengthening of education structure (NUR, online).

(3) To provide service to the community:

This task works hand in hand with the two mentioned above. Our University is aware that its credibility lies in the need of serving the community where it originates. By providing knowledge and know-how to the community, the NUR contributes to the full development through its various and adequate services to the needs of local population (NUR, online).

(4) To promote culture

The three tasks mentioned above are means, which enable the NUR to participate to the enrichment and promotion of culture. Culture comprises both traditional

and modern aspects by the fact that it increases technological and scientific knowledge in such domains as Sciences, Technology, Arts, etc... This enrichment enhances a better understanding of relationships between man and his natural, physical, social and human environment. It also contributes to the improvement of this environment for the benefit of man and society...(NUR, online).

The College of Agriculture of National University of Rwanda is involved in carrying out NUR mission through agricultural teaching, research, services to the community and promotion of culture. The extent of College involvement in these activities depends on availability of qualified human resources, equipment for laboratories and research stations, basic infrastructures and educational technologies.

Throughout the world, there is a basic faith in the power of education to solve problems. Higher education can provide the future intellectual capital necessary to spark positive growth in a country. In particular, agricultural higher education can provide the critical difference in whether we can meet the needs of an increasing world population or face serious threats to food security across the world (Bjelland, Masuku & Ndimande, 2002).

Maguire (2001) observed that African Universities had achieved much in a short time, he said the mandate given to these institutions at independence required assessment as a result of changes in the world, in Africa and in the universities themselves, he also noted that agricultural education faced a variety of challenges and dilemmas, but observed that there were also new opportunities and possibilities. He outlined problems facing African universities and agricultural education in Africa to include:

- Enrollments are often greater than the capacity of universities to handle
- Unsustainable patterns of expenditure for higher education

- Decline in the quality of education
- Weak connection with other parts of the agricultural education system- colleges, vocational schools, farmer training networks
- Poor linkages and lack of communication with the employers of the graduates of the university
- The shift in focus from agriculture to rural development
- High unemployment of graduates from the university, often due to a lack of relevance of curriculum
- Information technology
- Globalization (pp. 29-30).

Some of the problems underlined by Maguire are similar to what currently faced by National University of Rwanda.

Gil (1987) reports that through research, Agricultural colleges and universities are able to generate solutions to problems confronting the rural poor. Their aim is to develop essential technologies for agricultural and rural development, said Gil. He also points out that farming has become more of a business enterprise necessitating managerial and business skills among graduates of agriculture.

The World Bank (1999) also underlines the fact that university faculty typically devote 25 percent on their research designed to solve social problems, support teaching programs, promote their own professional development, and generate income. Commonly university roles in research systems are national research, basic research, regional research and consultant services, stated the World Bank

Recognizing the important role of African universities in improving agricultural extension services, particularly in developing responsive training programs for mid-career agricultural extension staff, Zinnah (cited in Breth, 1999) stressed the importance of partnerships within the universities themselves as well as with other universities, NGOs, and government ministries. Partnership is necessary, he said, because individual organizations lack the breadth of knowledge, skills, resources, and power needed to deal with the complex problems of agriculture and rural development including the training of agricultural extension staff (p. 73). In addition, for successful partnership between partners, Zinnah recommends genuine consultation and dialogue, effective communication, committed leadership and need for organizational change.

Different partners have been involved in helping the College of Agriculture of NUR to carry out its mission of teaching and disseminating adaptive research in agriculture through different projects such as the UNR/UM/SAARFA project entitled “ Building the Capacity of the Rwandan Research System to Conduct, Disseminate and Teach Adaptive Research in Agriculture” (UNR/UM/SAARFA, 1993) and the Partnership for Enhancing Agriculture in Rwanda through Linkages, PEARL (CANR International News, 2002). In addition, the College has been initiating a series of curriculum reform since 2001, with the financial support of the PEARL project, to adopt new orientations in order to produce professional, market -oriented agriculturists.

However many factors are still limiting to the effectiveness and quality of teaching, research and outreach activities at the College of Agriculture of NUR such as insufficiency of qualified human resources, lack adequate equipment in laboratories, library and research stations, lack of basic infrastructures such as buildings, lack of educational technologies and research tools (limited access to Internet and web-based resources), lack of direct/formal linkage with the Ministry of Agriculture in charge of extension and other national partners involved in agricultural development such as the Rwandan Institute of Agricultural Sciences (ISAR) and non-government organizations (NGOs). Even though a memorandum of understanding for collaboration between NUR and ISAR was signed few years ago, there are still no commitments to collaborate and no joint activities between the two institutions.

This lack of linkages between extension, education and research is a serious challenge that limits on one hand access of extension services to research-based information and adequate training, and on the other hand feedback from farmers to reach researchers and teachers. Consequently, the result of this situation is duplication of efforts and lack of responsiveness to the needs and problems felt by the end-users of technology.

2.5. Understanding Research- Education- Extension- Farmer Linkages

The ISNAR (International Service for National Agricultural Research) 1997 Annual Report stated that linkages between researchers, extensionists, and farmers are essential. They ensure effective flows of information from the farm (often via extension) to the laboratory. They can also help bring useful technologies from research

organizations to farmers. The quality and types of the linkages determine to a large extent the relevance of research products.

According to Agbamu (2000) the concept of linkages implies the communication and working relationship established between two or more organizations pursuing commonly shared objectives in order to have regular contact and improved productivity. He noted that effective communication links between researchers and extensionists are vital in the modification of technological recommendations and in initiating further research. Such links enable new technologies and management practices to be suited to local ecological conditions. Furthermore, the participation of extension workers in adaptive research trials allows them to become familiar with the technologies they are expected to promote and also helps to ensure that the sociological dimensions of farming are not neglected. Havelock (as cited in Agbamu, 2000) argues that if the barriers between two systems are permeable enough for messages and responses to flow out of each to the other, then a link has been created between the two. From the viewpoint of the previous statement, agricultural research and extension services are two systems, which are linked by information flow and feedback. For agro- technologies to be relevant to local needs, researchers, extension workers and farmers must play important roles in identifying research problems, adapting the recommendations to local conditions and providing feedback to researchers about the innovations that have been developed, said Agbamu.

In principle, agricultural extension receives relevant information from the agricultural education system and feeds backfield observations to this system.

Extension is also professionally linked to the agricultural vocational and higher education systems in the sense that these systems also produce the agents who work in extension. The relationships between agricultural extension and agricultural research is even closer, because the knowledge that agricultural extension transfers is usually generated by agricultural research through applied and adaptive agricultural development (Rivera et al., 2001).

Writing about the need for more effective linkages between agricultural extension, agricultural research, and farming people, Kaimowitz (cited in Axinn and Axinn, 1997) notes:

“... Increasingly, the major breakthroughs take place in sophisticated laboratories, far from farmers’ fields. Nevertheless, there will still be a need for adaptive research and feedback on how these technologies perform. New links will have to be designed between the laboratories, extension, and private marketing divisions to make this possible (p. 128).”

Munya, Adams and Thomsom (2002), in Designing effective linkages for sustainable agricultural extension information systems among developing countries in Sub-Saharan Africa, stated that to fulfill its mission of effectively educating and facilitating learning among farmers, extension organizations have depended on research institutions to provide relevant and reliable information on improved technologies and practices. They however noted that the research-extension linkage has been weak and is an institutional problem yet to be resolved.

Writing on genuine collaboration, Axinn and Axinn (1997) point out three factors that are essential: 1) trust and respect for the competence of individuals and organizations

involved; 2) each participant having something to offer to others for which the others have a need; and 3) willingness on all sides to invest time and money in sufficient communication (p. 107).

Niangade (1999) notes a key element in the process of reform to bringing together researchers and end users is the creation of a consultation framework through which all research proposals had to pass. All partners are consulted in the planning stage, and there is also a system of follow-up assessment of all the activities, said Niangade.

Warning that partnerships are not an end in them, Foege (1999) said the test is how does the partnership help? “ It is not worth the effort if we can not see the outcome (p. 10).” Foege said productive partnerships require partners who have complementary strengths, who have broad interests and experiences, and who share a common view of the desired outcomes.

Thinking in the same way as Foege, Obimpeh (1999) stressed that effective partnerships require a common vision among the partners, which allows them to establish common objectives and plan. He writes:

“ The development of rural areas will depend on effective collaboration among stakeholders to facilitate the sharing of resources, experiences, skills, and knowledge to solve the inherent problem of food insecurity and poverty.” (p. 9).

2.5.1 Types of Research, Education and Extension Linkages

Kaimowitz, Synder and Engel (cited in Leholm, Suvedi and Vlasin, 1998) have identified various types of mechanisms to link research, education and extension functions. Four of the mechanisms are described below.

1. Joint Planning and Programming: This includes activities such as joint problem diagnosis, joint priority setting and joint program review meetings. Examples of joint professional activities include collaborative trials and demonstration, joint decision-making in release of recommendations, regular field visits, and informal sharing of tasks and responsibilities.

2. Collaborative Professional Activities: This area includes opportunity for researchers and educators to meet together to plan, implement and evaluate educational initiatives across the disciplines. Examples could include participation in in-service training programs, formal collaboration in trials, community needs assessment surveys, and joint responsibility for release of recommendations. This approach encourages teamwork and reduces status differences between researchers and educators.

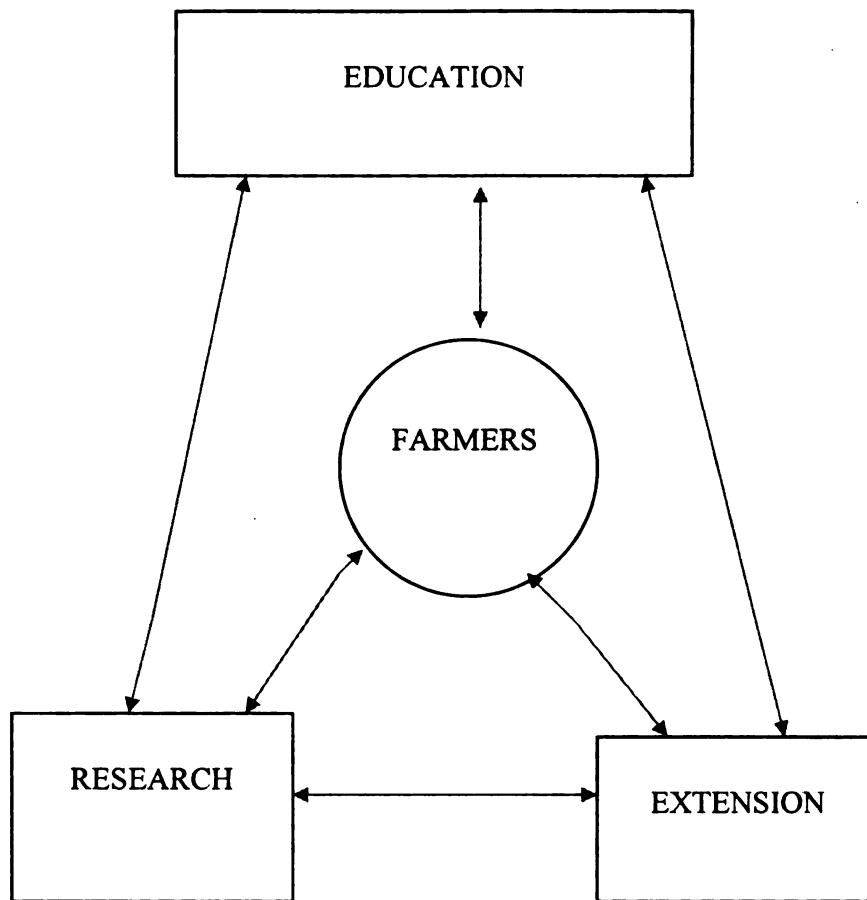
3. Resource Allocation: Some organizations allocate staff time, funds or office space, technology or other resources to support linkage activities between research, education and extension functions. Examples of resource allocation include rotation of staff to pool experience and expertise and get collaborative activities going, sabbatical leave or other exchange of staff between organizations, and sharing office space for fieldwork.

4. Communication between organizations: Communication can occur through various mass and interpersonal media channels. Examples include radio and video programs, two-way interactive communications, telephones, fax machine, electronic mail servers, and various print media. Joint publications, videotape, web pages or other

software resulting from joint programs may provide excellent examples of successful linkages.

For illustrating linkages between research, education and extension, the Food and Agriculture Organization (FAO) of the United Nations developed the “Knowledge Triangle”- the Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD) (Figure 4) that links rural people and institutions to promote mutual learning and generate, share and utilize agriculture-related technology, knowledge and information (Rivera et al., 2001).

Figure 4. Agricultural Extension as Part of AKIS/RD (Source: Rivera et al., 2001)



As Figure 4 illustrates, agricultural knowledge and information systems for rural development link people and institutions to promote learning and generate, share and use agriculture-related technology, knowledge and information. According to the *AKIS/RD Strategic vision and guide principles* (FAO/World Bank 2000 cited by Rivera, 2001) the system integrates farmers, agricultural educators, researchers and extensionists, enabling them to harness knowledge and information from various sources to improve farming and livelihoods.

2.5.2 Barriers to extension-education-research linkages

According to Leholm et al. (1998), linking research, education and extension functions has been a considerable challenge to professional agriculturists at all levels. They noted that linkages have been a major problem in both developed and developing countries; only the degree of severity is different. In developing countries, agricultural researchers maintain limited communication with educators at agricultural colleges and universities, stated Leholm et al. They have identified several barriers that hinder research, education and extension links. Some of these barriers are described below.

1. Policy and institutional contexts of links and organizational factors

Agricultural community knows the linkage problems not only reduce Extension efficiency, it also impairs Extension's performance and diminishes the impact of agricultural research.

2. Functional barriers and organizational structures to more functionally linking research, education and extension

There tends to be inadequate collaboration between researchers and educators. Yet, the research, education and extension functions tend to be the responsibility of three or more agencies. Organizational structures of agricultural development agencies in most countries tend to inhibit the seamless interface between education, research and extension. Agricultural colleges and universities often operate under the Ministry of Education and have limited operating ties with agricultural research and extension services, which operate under the Ministry of Agriculture or an autonomous agricultural research organization. Further, the international agricultural centers tend to work mainly with national institutions that have similar functions, not with higher education or the

extension service. Teamwork between agricultural researchers and educators is not very well appreciated or recognized.

3. Narrow specialization of research problems: Sometimes this tends to discourage collaborative relationships among different agencies. Although specialization can lead to breakthroughs in specific areas, it tends to reduce the researcher's ability to deal holistically with broader issues on the context with which they occur. In colleges and universities, the tenure and promotion system tend to encourage individual accomplishment and specialization rather than multidisciplinary teamwork. As a result, researchers and educators are less motivated to work across disciplinary boundaries to strengthen the link between research, education and extension.

4. Differences in recognition and rewarding systems: In many countries, agricultural research tends to be better recognized and rewarded than agricultural education or extension work. Perceived status differences exist between researchers and extension professionals. Research is still viewed as superior to extension work or agricultural education.

5. Inadequate funding: Funding has been mentioned frequently as the major problem of linking research, education and extension functions in the developing countries. Further of the mobility of research, education and extension professionals is constrained by poor transportation facilities, further limiting their collaboration. A majority of professional agriculturists lacks basic communication networks like telephones, fax or electronic mail services. Professional development opportunities such as joint seminars, workshops and field visits are declined due or constrained

to budget limitations.

Sigman and Swanson (cited in Leholm et al., 1998) argue that a continuing flow of information between extension services and national agricultural researcher institutions has been lacking. On the other hand, Swanson, Bentz and Sofranko (1997) have articulated the lack of a close working relationship between national agricultural research and extension organizations, and with different categories of farmers and farm organizations to be one of the most difficult institutional problems confronting ministries of agriculture in many developing nations. Research and extension organizations generally compete over the same scarce government resources and, frequently, leaders of these institutions do not see themselves as part of a broader system: the agricultural technology system (ATS). Instead, they try to increase the flow of resources coming to their respective institutions and to solve day-to-day management problems, rather than ensuring that their respective organizations contribute to the broader goal of getting improved agricultural technology to all major categories of farmers, said Swanson et al.

Crowder and Anderson (1996) also found that weak linkages among research, education and extension (REE) institutions result in systematic “bottlenecks” in national agricultural technology systems and can limit their effectiveness to contribute to development; evidence shows that integrating research, education and extension can improve the overall performance of agricultural technology systems. On the opposite side, pursue Crowder and Anderson, when research, extension and education institutions are organized and function in an integrated system approaches, even when physically separate, then linkages among them and with farmers are more likely to receive attention.

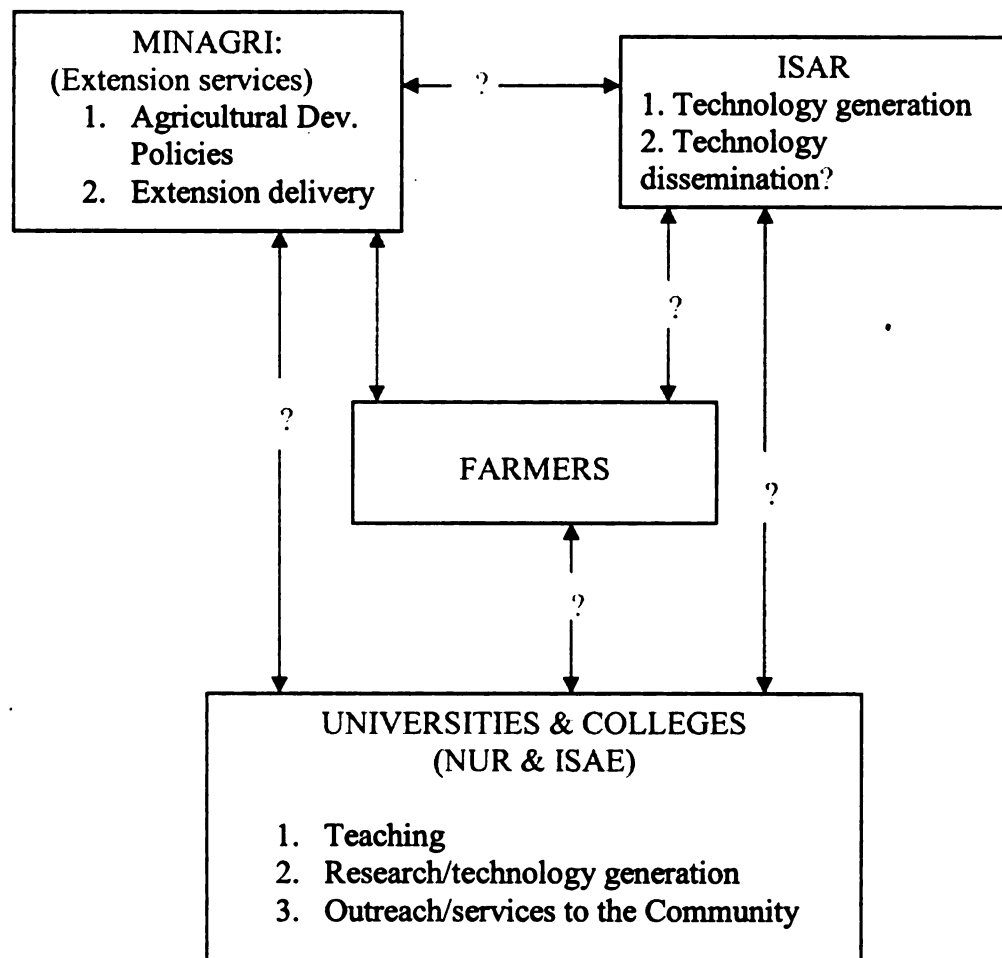
An integrated approach to REE attempts to link all system participants -- researchers, extension workers, educators, input suppliers, farmers and others -- so that they are jointly involved in the agricultural technology innovation process. The common denominator among these participants is information and knowledge; when linked, they form an agricultural knowledge and information system that draws on both modern science and farmers' indigenous knowledge.

According to the AKIS/RD Strategic vision and guide principles of FAO and the World Bank (2000) a lack of systematic collaboration among educators, researchers, extension staff and farmers has limited the effectiveness and relevance of support services to the rural sector.

2.6 Factors Affecting Research-Education and Extension Linkages in Rwanda

Agricultural research, education and extension in Rwanda operate in separate institutions making linkages between them more difficult (Figure 5). The main players of agricultural research, education and extension in Rwanda are the Ministry of Agriculture, (MINAGRI), the Rwandan Institute of Agricultural Sciences (ISAR), faculty teaching institutions (e.g. NUR, ISAE), NGOs involved in agriculture and farmers.

Figure 5. Current Relationships between the main Actors of REE in Rwanda



As Figure 5 illustrates, the arrow indicates a direct link between two partners. The question mark means whether link between partners does not exist, is weak or is informal. The figure shows that direct collaboration exist only between MINAGRI and farmers. Collaboration between MINAGRI and ISAR seems to be vertical and not horizontal. Even though a memorandum of collaboration was signed between ISAR and NUR, ISAR researchers and NUR teachers lack opportunities of collaboration in several domains including joint seminars and workshops, joint field visits, joint problem

diagnosis, joint priority setting, collaborative trials and communication, and joint decision –making in release of recommendations.

Extension

Extension falls under the Ministry of Agriculture and extension services are aimed to raise farmers' income/quality of life by focusing on the promotion of improved crop and livestock technology, crop protection, input/credit support and marketing information (MINAGRI, 1997). A Director of extension and marketing coordinates extension activities at the central or national level. Extension is also managed by provincial and district extension offices, which are connected to the provincial and district authorities respectively.

In the context of new decentralization policy launched in the country few years ago, provincial and district extension services no longer depend on MINAGRI, they administratively depend on the authority of the Prefet of the Province and District Mayor respectively. They only depend on MINAGRI for technical and partial financial support. According to informal sources, coordination of different levels of extension services in this context of decentralization is one the challenges facing extension services. MINAGRI is responsible for the planning and implementation of all national policies, strategies and programs related to agricultural development in general. Certain collaboration exists between MINAGRI and NGOs involved in agricultural and only informal linkages exist between MINAGRI services and teaching institutions that report to the Ministry of Education.

Agricultural education

University agricultural education is provided at the College of Agriculture of National University of Rwanda as described above and at the Institute of Agriculture and Livestock (ISAE), which both operate under the Ministry of Education. Besides formal teaching, research and services to the community/outreach activities are part of attributions of these institutions. In order to provide the energy, materials and knowledge to feed, house, nurture, educate and employ the growing country population, Rwandan universities and colleges must develop a seamless link between research, education and extension.

Agricultural research

Agricultural research is conducted both by ISAR and universities (NUR & ISAE). The role of National University of Rwanda in agricultural research as part of its mission has been already explained in section 2.4 of this chapter.

ISAR as the main agricultural research institution in the country has responsibility for all agricultural research conducted in the country. ISAR is governed through its board members, which is chaired by the General Secretary of the Ministry of Agriculture. ISAR is accountable to the Ministry of Agriculture and has a semi autonomous status (ISAR, online). The mandate given to ISAR at its creation in 1962 was to promote the scientific and technical development of agriculture and livestock in Rwanda. The main focus of its activities was on basic and strategic research without any extension appointment.

However, according to ISNAR (as cited in UNR/UM/SAARFA final report, 1993) the decline of effectiveness and productivity of ISAR as national leader in agricultural research over the past 10-15 years (almost 20 years), in spite of technical assistance provided by a number of donor agencies (USAID, GTZ, World Bank, FAO) has been already observed. As the report mentioned, this decline was due to a critical lack of qualified Rwandan scientists and staff. According to the same report, Rwandan Agricultural research system would need around 300 qualified scientists to function properly.

According to ISAR authorities, an institutional reorganization is needed to enable ISAR to shift emphasis toward more adaptive research; have an effective and efficient mechanism for linking to farmers, agricultural business persons and partners; have mechanism and ability for generating, acquiring, storing, retrieving and efficiently disseminating information to its clients; and have a mechanism for direct contact with clients who are attempting to use new technologies from a variety of sources (ISAR, online).

The previous statement from ISAR shows the need of Rwandan research, education and extension institutions to develop “genuine collaborative relationships” for more responsiveness to the needs and problems felt by the end-users of technology.

Barriers to research, education and extension linkages in Rwanda may be described as both structural and functional and include, but not limited to policy and institutional contexts, departmentalization, more hierarchical organizational structures, lack of understanding linkages as a priority and commitment to collaborate,

lack communication networks that enable the flow of information between institutions, lack of multidisciplinary teamwork, lack of rewarding systems and motivations, and lack of adequate funding to support linkage activities.

This problem of poor relationships between research, education and extension as well as the need for collaboration between different partners has also been discussed when the Faculty of Agriculture of National University of Rwanda held a National Seminar on May 3-4, 2001 at the former Meridien Hotel in Kigali to reform its course curriculum to better respond to the needs of Rwandan Agriculture by producing better informed, more applied, connected and “development- ready” agriculturists to tackle the challenges of the millennium as reported by PEARL Project in The Reachout, No 1 (2001). Over 100 participants representing approximately 30 different sectors and organizations that attended the Seminar highly recommended a close collaboration between the Ministry of Agriculture, the College of Agriculture of NUR, ISAR, other partners and farmers for more efficiency and responsiveness to the clientele needs.

In the National Extension System, MINAGRI (1997) states that linkages between research and extension must be formalized in order to improve complementarity between the two systems and guarantee both feasibility and efficiency of extension messages (p.9).

Based on these statements provided in the previous sections and other documents consulted, lack of dialogue, consultation and information exchange, lack of coordination between partners, informal contacts, weak linkages and lack of active communication seem to characterize current collaboration between the main players of research,

education and extension in Rwanda.

2.7 Michigan State University Extension: A U.S. Land Grant Model of Formal and Successful Linkage between Research, Education and Extension

An example of successful and strong linkage between research, education and extension is the United States of America Land Grant University System by which America enjoys much of the economic and social prosperity. Michigan State University is a Land Grant University and is part of the Land Grant college system established in the United States by the Morrill Act of 1862. The Hatch Act of 1887 created the Agricultural Experiment Stations and the Smith-Lever Act of 1914 created the Cooperative Extension Service. “As a land-grant university, Michigan State University has been a leader in expanding its extension service network and in creating and performing outreach research and education activities that respond to the evolving needs of the people of Michigan and the nation (Michigan State University [MSU], online).”

Michigan State University Extension (MSUE) is a Land Grant, University- based System, organized through the College of Agriculture, with county and multicounty offices that localized technical knowledge to help people improve their lives through an educational process that applies knowledge to critical issues, needs and opportunities.

The first characteristic of this system is a direct link between research, classroom teaching and extension outreach: Research sustains teaching and extension through new science-based knowledge; Teaching faculty prepares researchers, extension personnel, and teachers to service workforce needs; and Extension serves as a link between researchers and farmers/rural communities and provides opportunities for researchers,

teachers and students to work in real-life settings (Brewer, 2001).

What distinguishes this system from others is the active involvement of an institution whose primary function is formal education in the non-formal out of classroom role of extension education, Brewer said.

The Mission of Michigan State University Extension (MSUE) is to help People improve their lives through an educational process that applies knowledge to critical issues, needs and opportunities. MSUE provides information and offers on-going educational programs in three main areas:

- Agriculture and Natural Resources
- Children, Youth and Family Programs
- Community and Economic Development (MSU, online).

MSUE has as type of extension research integration- the *Area Of Expertise (AOE) team approach* (Brewer, 2001; Leholm et al., 1998) with both campus and field staff working together as an integrated team. The potential for improving both the research and extension functions is maximized in this approach. A key to effective meeting citizen needs is to directly involve them in identification of their needs and actively engage them in the research process and Extension Programming. This involvement includes problem identification and clarification, necessary research and analyses, demonstrating applications of results, and conduct of extension education for and with clientele (Brewer, 2001, p. 25).

The concept of Area Of Expertise Teams (AOE Teams) comes from a Partnership between Michigan State University Extension (MSUE) and Michigan Agricultural Experiment Station (MAES) for implementing self-directed area of expertise team (AOE teams) as its major educational development and delivery model (Brewer, 2001). Areas of Expertise (AOE) teams involve Extension specialists, agents, researchers and/or stakeholders organized around a particular commodity, interest area and/or issue. They are charged with listening to stakeholders, identifying priorities, planning and providing educational programs, and evaluating program outcomes and impacts.

The reasons that Michigan State University has adopted AOE teams are the following:

- Unhappy customers
- Agents can't cover all subject areas
- Specialized educational needs of customers
- Demand quality, cutting edge, research-based educational product
- Better link between campus and field
- Better link between University and customers
- Group of employees fully responsible for planning, implementing and evaluating educational programs in a self-directed manner
- Concept developed in the private industry
- Teams are more productive, efficient and deliver quality programs
- Close to the customers, bottom-up programming.

AOE teams have the following structure: the initial AOE teams created were in production agriculture and were formed as a result of stakeholder demand. The boundary conditions suggested for use by AOE teams were:

- Shared leadership: AOE teams have *co-chairs*; one from the campus and another from off-campus; the on-campus co-chair has a joint research-extension appointment.
- Co-chairs *rotate every two years*
- A coordinator or *Coach* is a team facilitator, aligned with management, communicates and links.
- AOE teams develop their own micro-vision, and operating procedures
- AOE teams have an interdisciplinary, problem-solving, customer-orientated focus
- AOE teams develop a plan for program delivery and curricula for staff development
- Involvement of stakeholders is expected, including stakeholder information input for program/project selection direction and evaluation. Several of the teams have formalized stakeholder involvement with advisory/partnership committees that serve a two-year term.
- Each AOE Agent member has an opportunity to select a mentor.
- AOE teams are expected to be entrepreneurial and generate resources for enhanced programming.
- Most teams are composed of 6-20 agents, specialists (those having both Extension

and Experiment Station appointments) and selected others (customers, cooperators, etc.) (Brewer, 2001, p. 31).

According to Brewer (2001) successful implementation of the AOE team model in Michigan can be attributed to main four factors:

- Adhering to team basics as described by Katzenbach;
- Recognizing organizational basics that include a supportive environment for the teams;
- An Extension administration that understood and practiced a shared leadership and empowerment philosophy;
- An Extension and MAES administration that supported the teams created (p. 35).

Lessons learned from Michigan State University Extension for Rwandan research-education and extension institutions should be the following:

- (1) A pluralistic approach for problem-solving and direct link between research, classroom teaching and extension outreach;
- (2) Extension serves as link between researchers and rural communities and provides opportunities for researchers, teachers and students to work in real-life settings;
- (3) Active involvement of an institution whose primary function is formal education in the non-formal out of classroom;
- (4) Team work approach in the process of planning, implementation and evaluation of activities; and
- (5) A two-way communication system with active participation of rural communities.

In summarizing this chapter, it is clear that this complex situation of Rwandan extension system and the lack of its link with research and education require an independent study to investigate ways of improving this situation for building a more responsive system to the clientele needs/problems.

CHAPTER 3

RESEARCH METHODS

3.1 Introduction

In order to accurately describe the participant's perceptions on perceived barriers and opportunities to the linkage of research, education and extension in Rwanda, it was essential a proper research protocol be followed throughout this study. A quantitative research design has been chosen and personal face-to-face interviews were used as a method of data collection. Because of this study involved human subjects, a copy of this section with instrument development, a personal consent form and a research study application were submitted to the Michigan State University's University Committee on Research Involving Human Subjects (UCRIHS). Approval to conduct the study was granted by UCRIHS (see Appendix A).

In this Methodology chapter, the following sections are discussed: Research Design, Target Population, Sampling, Instrument Development, Methods of Data Collection and Data Analysis.

3.2 Research Design

This study was quantitative in nature because it dealt with subjects' opinions and perceptions about the problem under investigation, and the specific methodology used is that of face-to-face interviewing.

The design was descriptive research and followed recommendations described by Ary, Jacobs and Razavieh (2002). The method of personal face-to-face interviewing has been selected as it provides the most effective and efficient method of gathering data on participants' opinions, perceptions and feelings about the situation in their own words.

Gay (1987) reports that when well conducted, interviews can produce in-depth data not possible to obtain with a mail or telephone questionnaire; the interview is most appropriate for asking questions, which cannot effectively be structured into a multiple-choice format, such as questions of a personal nature. In contrast to a mail questionnaire, the interview is flexible and can adapt the situation to each subject. By establishing rapport and a trust relationship, the interviewer can often obtain data that subjects would not give on a questionnaire. The interview may also result in more accurate and honest responses since the interviewer can explain and clarify both the purpose of the research and individual questions; another advantage of the interview is that the interviewer can follow up on incomplete or unclear responses by asking additional probing questions.

3.3 Population

According to Ary et al. (2002) the word population refers to the entire group of individuals to whom the findings of the study apply; defining the population is essential for identifying the subjects appropriate to select for study and for knowing to whom the results can be generalized.

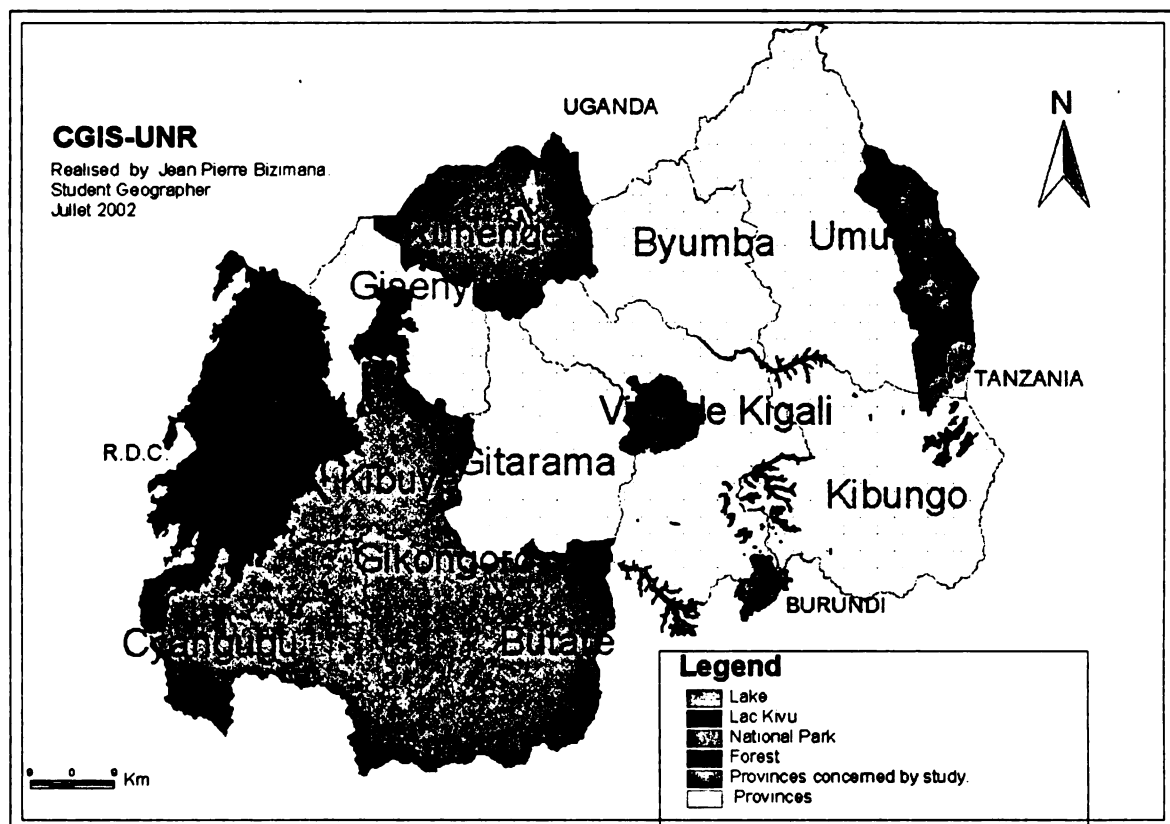
This study involved six Provinces of Rwanda: *Butare, Cyangugu, Gikongoro, Kibuye, Kigali City and Ruhengeri* (Figure 6) chosen randomly by writing the names of all twelve provinces on slips of paper, mixing thoroughly and pulling six names. The target population of this study belonged to the following institutions within the six Provinces:

- (1) Extension services of the Rwandan Ministry of Agriculture at the central level;
- (2) Faculty members of the College of Agriculture of National University of Rwanda and the Institute of Agriculture and livestock (ISAE);
- (3) Researchers of Rwandan Institute of Agricultural Sciences (ISAR);
- (4) Local and International NGOs: ARDI, INADES FORMATION, Care International, ACDI VOCA and FAO;
- (5) Agricultural secondary schools: Kabutare and Ntendezi;
- (6) Extension workers at Province level in the 6 Provinces;
- (7) And members of farmers' associations.

Those institutions were deliberately chosen to represent the main actors within agricultural production, extension, teaching and research and their choice was based on the degree of involvement in research, education or extension activities.

Sampling of institutions and participants was purposive.

Figure 6. The Six Provinces concerned by the Study



3.4 Sampling

The researcher selected a purposive sample of people he believed were key in terms of providing the best information as participants based on different factors including availability of participants at the moment of the study, role of participant in research, extension, education or farmer association. Writing about purposeful sampling, Patton (1990) notes:

“The logic and power of purposeful sampling lies in selecting *information-rich cases* for study in depth. Information rich-cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term *purposeful sampling* (p. 169).”

According to the recommendation of Ary et al. (2002), “Qualitative researchers select purposive samples believed to be sufficient to provide maximum insight and understanding of what they are studying...”(p. 428), the sample of persons to be interviewed was based on judgment regarding the characteristics (diversity) of the target population and the need of the study.

The sample size was 46 people within those main actors of agricultural development cited above. Of those participants, eleven (11) were individual farmers or members of farmer associations, seventeen (17) were government extension workers, seven (7) were NGO extension staff, two (2) were secondary school teachers, four (4) were faculty staff and five (5) were researchers. Of the interviewees 83% were male and 17% were female. Faculty teachers, researchers, government and NGO extension staff, and agricultural secondary school teachers were selected through institutional public documents available at place of work.

Members of farmers' associations were selected based on information given by the extension services at the Province or District level.

3.5 Instrument Development

The researcher developed a set of open-ended questions for face-to-face interviews (Appendices E &F). Formulating interview questions, the Researcher followed recommendations described by Fowler (1995) in Improving survey questions. Some of these recommendations were:

- Beware of asking about information that is acquired only secondhand
- Beware of hypothetical questions
- Beware of asking about causality
- Beware of asking respondents about solutions to complex problems
- Ask one question at a time
- Avoid asking two questions at once
- Avoid questions that impose unwarranted assumptions
- Beware of questions that include hidden contingencies (p. 78-83).

Questions were developed to obtain information pertaining to each of the four research questions.

A panel of experts familiar with agriscience, qualitative research, interview design and research methods within the Department of ANR Education and Communication Systems verified the content validity of the instrument, and then changes were made to improve clarity.

According to Patten (2002) to determine the content validity of an instrument, we make judgments on the appropriateness of its content (p. 55).

Many researchers recognized usefulness of open-ended questions for face-to-face interviews. According to Ary et al. (2002), open-ended question permits a free response rather than restricting the respondent to a choice from among stated alternatives. Individuals are free to respond from their own frame of response... The researcher must read and interpret each response, then develop a coding system that will permit a quantitative analysis of the responses (p. 390).

Patton (1990) recommends open-ended questions for the following reason:

“Because of limited time, when it is desirable to have the same information from each person interviewed, a standardized open-ended format may be used in which each person is asked essentially the same questions. The interview questions are written out in advance *exactly* the way they are to be asked during the interview (p. 285).”

Interview questions were formulated in a simple manner to be understood by respondents with different backgrounds. The order of questions was also taken into account to ensure that the researcher will collect the needed information and respondents will receive the same questions. All the interviewees were asked the same questions regarding:

- The characteristics and constraints/problems of the current Rwandan Extension system
- The perceived opportunities to the linkage of Research, Education and Extension in Rwanda
- The primary barriers to the linkage of Research, Education and Extension
- The perceived structure of linkage (model) and responsibilities of partners in the

linked REE. The sample of interview questions is included in Appendix C.

Finally, as this study used human-as- instrument, the researcher took into account advice given by Ary et al. (2002), “ Qualitative design requires the researcher to become the research instrument. This means the researcher must have the ability to observe behavior and must sharpen the skills necessary for observation and face-to- face interview”(p. 426).

3.6 Pilot Study

A pilot study was conducted for testing reliability of the instrument. According to Yin (cited by Smith, 2000), a pilot study helps the investigator refine plans with respect to both the content of the data and the procedures to be followed. This pilot study was conducted with three members of one of the farmers’ associations operating at Mwogo Valley (Karambi) in Karaba District of Gikongoro Province and two extension agents based at the Province level (Gikongoro). All the five interviewees understood the questions and only small modifications were made to the Instrument.

The pilot study served as a useful tool in refining the research procedures such as duration of interview, quality of the recorded interview, how to correctly ask questions in order to get more information.

3.7 The face-to-face interview/Data Collection

The researcher used open-ended questions for interviews (Appendices E &F) as said above. The method of data collection was chosen according recommendations

of Fowler (1993) who said that the choice of data collection mode - mail, telephone, personal interview, or group administration is related directly to the sample, and available staff and facilities; it has implications for response rates, question form and survey costs.

Two weeks prior to the interview, the researcher made a tour in the six provinces and the corresponding institutions identifying participants. At this opportunity, an introductory letter (Appendix D) was given by hand (mailing by post office could cause delays) to the supervisors seeking permission to interviewing people under their authorities. A second contact was made, sometimes by telephone when it was possible, to schedule interview.

The day of interview, upon arrival the researcher introduced himself, explained the purpose and objective of the study, assured the confidentiality of the interview, asked the interview participant to fill out a consent form (Appendices B & C), asked permission to tape record interview, and began the interview. The majority of the interviews lasted from forty minutes to one hour, and all interviews were conducted between June 2002 and July 2002. All interviews took place in either (1) institution conference room (2) participant's office (3) at a mutually agreed upon location, where there was privacy and where the participant felt comfortable. As stated in the personal Interview Consent Form that addressed confidentiality and stated that the interviewee privacy will be protected to the maximum extent allowable by law, all information given was kept confidential, and responses were not associated with individuals' names or institutions' names. Furthermore, the researcher was the only person gathering, analyzing and writing the reports.

3.8 Data Analysis

The researcher transcribed the structured interviews and stored them electronically on floppy disks. Because most of the interviews were in French or Kinyarwanda (mother language) the researcher gave the floppy disks to a specialized agency for translation in English and a contract was signed with this agency. After translation, the researcher reviewed the new disks for accuracy, corrected some errors, and filled in where the translator was unclear about technical language. Following this process, the researcher went through the electronic files of the interviews, and replaced any names or institution names with numbers (codes) to maintain confidentiality as stated within the Personal Interview consent Form. As this process happened, the researcher converted the taped text into a format that the computer software program, "Statistical Package for Social Sciences (SPSS version 10.0)," required to assist with handling and analyzing the data. Each interview question was imported into SPSS program as a separate "case", treating each participant, type of respondent and different answers to the question as different variables. As all questions were open-ended, Multi Response Sets within SPSS were used to handling analysis. Descriptive statistics (Frequencies and Percentages) were used for analysis purposes. Results are reported in the next chapter.

CHAPTER 4

RESULTS

4.1 Introduction

The researcher's purpose in this study was to investigate perceived barriers and opportunities to the linkage of research, education and extension in Rwanda. The data that were collected in six Provinces of Rwanda: Butare, Cyangugu, Gikongoro, Kibuye, Kigali City and Ruhengeri (Figure 6) from 46 people from different partners including research institutions, teaching institutions, government and NGO extension staff, and farmers, who responded to the face-to-face interviews are described in this chapter. Of those participants, eleven (11) were individual farmers or members of farmer associations, seventeen (17) were government extension workers, seven (7) were non-government extension workers, two (2) were secondary school teachers, four (4) were faculty staff and five (5) were researchers. Of the interviewees 83% were male and 17% were female.

In order to gather information on perceived barriers and opportunities to the linkage of research, education and extension in Rwanda, participants were asked questions based on four research questions mentioned above. SPSS was used to summarize the multiple response sets to different questions.

4.2 Characteristics of Rwandan Extension System

One of the focuses of this study was to investigate the characteristics of current extension system. To begin to address this complex question, the researcher asked participants a series of sub-questions including: participants' general opinion on current extension system; role and challenges of agricultural extension; constraints and weaknesses of extension; existing relationships between research, education and extension institutions; channels of information delivery and feedback from farmers; source of extension and research information; and important thing to be improved in the technology transfer.

4.2.1 Participants' opinions on current Extension System

Sub-question #1 addressed participants' general opinion on current extension and was formulated as follows: What are your opinions on Current Rwandan Extension System?

Participants had multiple responses to this question as described in Table 3. Thirty four percent (34%) of responses described the current extension system to be not efficient due to lack of adequate financial resources and logistics for extension staff, lack of competent extension staff and inadequate number of that staff, weak linkage between different partners and lack of training. Sixteen percent (16%) of responses described current extension to be efficient and to have good relationships with farmers, while 13% said there was weak link between partners. Other opinions on extension were: undeveloped extension (9%), agriculture remains traditional (6%), instability of the

system (4%), farmers have improved their skills through current extension (4%), extension is not participatory enough (4%), research results that are not published (3%), subsidies slow down extension (3%), lack of coordination (1.5%), and students practice within extension (1.5%).

Table 3. Participants' Opinions on current Extension

Opinion	Frequency	% Of responses
Extension is not efficient	23	33.8
Extension is efficient	11	16.2
Weak link between partners	9	13.2
Extension is undeveloped	6	8.8
Agriculture remains traditional	4	5.9
Good policy of agric. development	4	5.9
Extension is not participatory enough	3	4.4
Farmers have improved their skills through extension	3	4.4
Instability of the system	3	4.4
Subsidies slow down extension	2	2.9
Research results are not published	2	2.9
Students practice within extension	1	1.5
Lack of coordination	1	1.5
Total	68	100.0

The following comments made by the interviewees provide a deeper understanding on how they felt about current extension.

“Current extension policy and approaches are good despite some constraints related to lack of human and material resources, low quality of technicians from secondary schools, questionable literate level of farmers used by current extension to train other farmers ” (Government extension worker).

Another comment was:

“The current approach thought by the Ministry of Agriculture- based on using farmers' associations, professional associations might be efficient if there are good operators, good associations and good training ” (NGO extension worker).

Another respondent said:

“The current extension system is experimental, there is no fixed system, there is neither continuity, nor regularity... each time when there is a transfer at a Ministry Department, a new system and new priorities are introduced; there is a permanent change, which doesn't facilitate progress and regularity ” (Faculty teacher).

4.2.2 Challenges facing current Extension

Sub-question 2 was: What do you consider to be the challenges of agricultural extension in Rwanda? The aim of this question was to investigate role and challenges of current extension. Ten most important challenges described by participants to facing current extension are reported in Table 4.

Table 4. Ten Most Important Challenges facing current Extension

Challenge	Frequency	% of responses
Developing new technologies and/or farming techniques	12	12.4
Improve extension approaches/communication	8	8.2
Improve farmer literacy	8	8.2
Improve relationships between farmers and partners	7	7.2
Increase agricultural productivity	7	7.2
Improve farmer livelihood	7	7.2
Agricultural development	6	6.2
Availability of financial resources	6	6.2
Communicate research results	6	6.2
Poverty alleviation	4	4.1

As described in Table 4, twelve percent (12.4%) of the respondents felt that acquisition of new technologies was the challenge number one. Other important challenges described by respondents included to improve farmer literacy (8.2%),

improve extension policy and approaches (8.2%), improve relationships between farmers and partners (7.2%), improve farmer livelihood (7.2%), increase agricultural productivity and food security (7.2%), agricultural development (6.2%), availability of financial resources (6.2%), communicate research results (6.2%) and poverty alleviation (4.1%).

4.2.3 Constraints and Weaknesses of Rwandan Extension

Sub-question 3 was: Do you perceive any constraints/weaknesses of Rwandan extension system? If yes, what are they? As for the previous questions participants had multiple answers in response to this question. They described the main constraints of Rwandan extension to be inadequate financial resources and logistics (21.8%), lack of competent staff (12.2%), weak relationships between farmers and partners (7.5%), slow adoption of new technologies (7.5%), poverty in rural areas and subsistence agriculture, (6.8%), weak linkage between research, education and extension (6.1%), lack of agricultural technologies (6.1%), low literacy of farmers (4.8%), inadequate number of extension staff (4.1%), no clear extension policy (3.4%), lack of good planning (2.7%), less support to extension activities by local authorities (2.7%), lack of sources of information (2.0%), lack of motivation of staff (2.0%), lack of farmer participation (2.0%), inadequate teaching system (2.0%) and lack of coordination (1.4%).

4.2.4 Existing Relationships between Research, Education and Extension

Sub-question 4 was: What are your opinions on existing relationships between research institutions, teaching institutions and extension services in Rwanda?

All different responses to this question are reported in Table 5.

Table 5. Existing Relationships between Research, Education and Extension.

Relationship	Frequency	% of responses
Weak linkage between REE	25	41.0
Certain collaboration exists	7	11.5
Informal discussions between MINAGRI- ISAR	7	11.5
Limited to student & staff training	5	8.2
Collaboration should be beneficial	5	8.2
No dialogue between MINAGRI and teaching institutions	4	6.6
No coordination	2	3.3
Triangulation REE no functional	2	3.3
Duplications	2	3.3
Memorandum NUR-ISAR	1	1.6
No enough information	1	1.6
Total	61	100.0

For example, one respondent noted:

“There are some discussions between MINAGRI and ISAR on improving collaboration but there is no dialogue between MINAGRI and teaching institutions” (Government extension worker).

The next comment is similar to the previous but from another respondent:

“There is only informal information exchange between ISAR and extension services but no information exchange between extension services and teaching institutions” (Government extension worker)

Another quote that was offered by an ISAR researcher was this:

“Collaboration between research and teaching institutions is limited only to the students’ training. On the other hand, collaboration between ISAR and MINAGRI extension services is also limited to the training of staff.”

A government extension worker made the next comment:

“ISAR and NUR signed a memorandum of collaboration but there is no commitment for its implementation.”

Another respondent said:

“Even there is a service in charge of extension in the Ministry of Agriculture, extension is still undeveloped because of lack of competent extension staff and lack of effective collaboration between researchers, teachers and extension agents: the triangulation research-education and extension is not functional. If this triangulation was functional, it would enable extension to provide research-based information, which will be released by the collaboration between research and education.” (Faculty teacher)

4.2.5. Channels of Information Delivery/Communication

The next sub-question addressed communication channels and was asked to the participants as follows: What are the channels of information delivery? The six most stated responses to this question are listed in Table 6.

Table 6. Six most-stated Channels of Information Delivery

Channel	Frequency	% Of responses
Field trips and visitations	18	22.5
Face-to- face organized meetings	16	20.0
Extension worker report	7	8.8
Farmer association report	7	8.8
Farmers come to office	5	6.3
Researchers& teachers have no way to be informed about farmers needs and problems	5	6.3

Other channels of information delivery that were mentioned in response to this question included teacher/student reports (6.3%), teacher and researchers have no channel of getting information to or from farmers (6.3%), other reports (3.8%), workshops (2.5%), farmer training (2.5%), demonstrations (2.5%), collaboration with other institutions (2.5%), media (1.5%), publications (1.5%), and via agents in charge of development at the District level (1.5%).

One respondent reported:

“Researchers and teachers have no formal ways of knowing about farmers’ problems.”

4.2.6. Sources of Extension and Research Information

The next sub- question 6 was: What are the sources of extension and research information? Ten most important sources of research and extension information cited by participants are listed in Table 7.

Table 7. Ten most important Sources of Extension and Research Information

Source	Frequency	% of responses
Foreign scientific publications (including journals)	15	15.5
Workshops	15	15.5
Research institute (ISAR)	10	10.3
Internet and web-based information	7	7.3
Training	6	6.2
Study trips	5	5.2
Books	5	5.2
Face-to- face meetings	4	4.1
Media	4	4.1
Technical sheets	4	4.1

Other sources of information mentioned in the response to this question were:

NGOs’ publications (2.1%), national publications (2.1%), other sources (2.1%),

immediate supervisors (2.1%), agricultural concourses (1.0%), farmer knowledge (1.0%), regional trials (1.0%), and student “Memoires” (1.0%).

However, 6.2% of respondents stated that information was not available.

4.2.7. What to improve in Technology Transfer

The last sub-question 7 in this series asked to the respondents was: What do you feel is the most important thing to be improved in the technology transfer / extension message to the farmers? Ten most frequently mentioned improvements to make to the transfer of extension information in the response to the question are listed in Table 8.

Table 8. Ten most frequently suggested Improvements to Technology Transfer

What to be improved in the transfer of technology/extension information	Frequency	% of responses
Work more closely with farmers	9	11.8
Improve extension policy/approaches	8	10.5
More focus on “On-farm research”	7	9.2
Improve communication mechanisms	6	7.9
Enhance farmer participation	6	7.9
Adequate # of extension workers	5	6.6
Strengthen REE institutions	5	6.6
Training & study trips	5	6.6
Planning/monitoring	4	5.3
Increase extension budget	4	5.3

Other suggestions mentioned in response to this question were to improve relationships between partners (3.9%), decentralization (3.9%), improve chain of information delivery (2.6%), University and research institution involvement (2.6%), poverty reduction programs (2.6%), staff management (2.6%), input supplies (1.3%), improve the approach of using farmers to train other farmers (1.3%) and new farming practices (1.3%).

4.3. Perceived Opportunities to link Research, Education and Extension.

4.3.1 Necessity of Linkage of REE

A major focus of this study research pertains to opportunities to the linkage of research, education and extension. Another series of sub-questions was asked to participants to allow the researcher to fully investigate this research question.

First of all, participants were asked whether they perceived any necessity of linkage between research, education and extension and the question was formulated as follows: Do you perceive any necessity of linkage between research, education and extension in Rwanda? All forty-six respondents stated that linkage between research, extension and education was not only necessary and desirable, but also was a priority for more effectiveness and responsiveness of different partners to the farmers' needs and problems.

4.3.2 Opportunities to the linkage of REE

The next step for the researcher was to know what were the participants' perceptions of the opportunities to this linkage and expected outcomes/advantages. The next question, asked to the participants, was: What do you believe to be the opportunities to the linkage of research, education and extension in Rwanda? Six most frequently mentioned opportunities to the linkage of research, education and extension in response to this question are reported in Table 9. Other mentioned opportunities included: staff motivation (5.0%), demonstrations (5.0%), institution improvement (2.5%), market-oriented agriculture (2.5%), rural communication (1.3%), staff training (1.3%).

One percent (1.3%) of the respondents stated not having enough information to the question.

Table 9. Six most frequently mentioned Opportunities to the Linkage of REE

Opportunity	Frequency	% Of responses
1. Institution leaders' willingness to collaborate	21	26.3
2. Consultation & dialogue of partners	20	25.0
3. Farmer participation	7	8.8
4. Competent staff	6	7.5
5. Financial & material resources	6	7.5
6. Planning and coordination	5	6.3

4.3.3 Expected Outcomes of the Linkage of REE

Further, participants were also asked what were their perceptions about the expected outcomes of this linkage. The question was: What could be the expected outcomes of this linkage? Five most stated expected outcomes of the linkage were:

- Access research-based information 24.4%
- Functional triangulation REE/ competencies together 19.8%
- More physical contacts with farmers 13.5%
- Agricultural productivity/food security 13.5%
- Extension improvement 5.2%

Other advantages felt by respondents included knowledge (4.2%), avoiding duplication (4.2%), easy technology transfer and adoption (3.1%), agricultural development (3.1%), increasing farmers' capacities (1.0%), poverty alleviation and farmer livelihood (1.0%), research oriented to market economy (1.0%) and programs based on farmers' needs (1.0%).

4.4 Participants' Perceptions of Barriers to the Linkage of Research, Education and Extension

Another major research question pertains to participants' perceptions of barriers to the linkage of research, education and extension. The question was: What do you perceive to be the barriers to the linkage of research, education and extension?

Perceptions of respondents on barriers to the linkage of research, education and extension are reported in Table 10. As shown in this Table, the major barrier to the linkage of research, education and extension is unwillingness of institution leaders to collaborate (19%) followed by weak financial resources (17.5%) and lack of consultation and dialogue (12%).

Table 10. Perceived Barriers to the Linkage of Research, Education, and Extension

Perceived Barriers	Frequency	% of responses
Leaders' unwillingness to collaborate	18	18.6
Weak financial resources for supporting linkage activities	17	17.5
Lack of consultation and dialogue	12	12.4
Lack of coordination& monitoring	8	8.2
Lack of farmer participation in decision-making	7	7.2
Lack of good planning	7	7.2
Research takes long time to releasing results	6	6.2
Lack of competent staff	5	5.2
Lack of understanding linkage as priority	4	4.1
No clear extension policy/strategies	3	3.1
Poverty/subsistence agriculture	3	3.1
Slow technology adoption	3	3.1
Low salaries for extension staff	3	3.1
Farmer illiteracy	1	1.0
Total	97	100.0

4.5 Structure, Role and Responsibilities

Respondents were asked another series of question about the structure or model of linkage, role and responsibilities of each partner in the linked research, education and extension.

4.5.1 Participants' Perceptions of Moving Extension Services from MINAGRI to ISAR

The first sub-question of this series asked participants whether they perceived any necessity of moving extension services from the Ministry of Agriculture to the Rwandan Institute of Agricultural Sciences (ISAR). The aim was to know whether extension services would be more efficient under a research institution like ISAR rather

than under the Ministry of Agriculture. The question was: What are your opinions of moving the Extension Services from the Ministry of Agriculture to the Rwandan Institute of Agricultural Sciences (ISAR)?

Almost fifty nine percent (58.7%) of participants said yes for moving extension services to ISAR, while 39.1% of respondents stated for leaving extension into the Ministry of Agriculture and only 2.2% said that it was something to experiment.

Cross analysis on moving extension services from MINAGRI to ISAR produced the following output (Table 11.)

Table 11. Opinions on Moving Extension Services by Type of Respondent

Opinion	Type of respondent						
	Farmer	Gov. extension worker	NGO ext. agent	Secondary school teacher	Faculty teacher	Researcher	Total
A	8	10	4	1	3	1	27
B	3	7	2	1	1	4	18
C	0	0	1	0	0	0	1
Total	11	17	7	2	4	5	46

- Opinion code:
 - A- Yes for moving extension
 - B- Leave extension under the Ministry in charge of Agriculture
 - C- Something to experimenting

Table 11 shows that more than 67% (18 people out of 27) of participants who responded yes for moving extension services from MINAGRI to ISAR were extension agents and farmers.

Participants who stated for moving extension services from the Ministry in charge of Agriculture to the Rwandan Institute of Agricultural Sciences were asked additional question, “why it was important to move extension”. Respondents’ arguments for moving extension services in response to this question are reported in Table 12.

Table 12. Respondents’ Arguments for Moving Extension Services to a Research Institution

Reason for moving extension services	Frequency	% of responses
Direct interaction researcher-farmers	8	21.6
ISAR must be restructured & provided resources	8	21.6
Easy technology transfer	7	18.9
Minimize bureaucracy	5	13.5
Direct collaboration Extension -Research	3	8.1
ISAR used to know farmers' problems	2	5.4
Stability of staff	1	2.7
Research stations are available for demonstration & training	1	2.7
ISAR must adapt to decentralization	1	2.7
No explanation	1	2.7
Total	37	100.0

4.5.2 Participants’ Perceptions about the Creation of an Outreach Unit at Faculty Teaching Institutions

The next sub-question asked respondents whether the creation of an outreach unit at faculty teaching institutions was important or not.

Eighty seven percent (87%) of respondents said the creation of an outreach unit would be a good thing, 4.3% of respondents said it would be a duplication, other 4.3% said it would be not necessary, 2.2 % of respondents stated it would be overloading those

institutions and 2.2 % of respondents said they didn't know.

Respondents who answered yes to the previous question were asked additional question, "Why the creation of an outreach unit at faculty teaching institutions was important." Different arguments given by respondents in response to this question are reported in table13.

Table13. Participants' Arguments for the Creation of an Outreach Unit at Faculty Teaching Institutions

Argument	Frequency	% of responses
Mediate collaboration with MINAGRI extension services and other partners	14	30.4
No explanation	11	23.9
Enable technology dissemination from those institutions	6	13.0
Help to plan and implement teachers and students' field interventions	5	10.9
If financial and human resources are available	5	10.9
Objectives must be well defined	2	4.3
Enable more practical skills for students	2	4.3
If there is direct collaboration with ISAR	1	2.2
Total	46	100.0

4.5.3 Coordination of linked REE

Coordination in the new context of linked REE was the next question to the participants. Coordination was a critical issue because different partners belong to different institutions, then coordination would be important for more efficiency of the linkage. The question asked to the respondents was: How do you perceive the coordination of agricultural research, education and extension in Rwanda?

Forty nine percent (49%) of the respondents argued for a coordination committee; 21.6% said coordination should be done by the Ministry in charge of agriculture; by research institute (13.7%); in the new context of decentralization, the Province might assume the role of coordinator (7.9%); coordination on rotation basis (2.0%); no coordination committee (2.0%); and 3.9% of the respondents had no idea how to coordinate.

4.5.4 Role and Responsibilities of Partners in Linked REE

Participants also were asked what should be the specific role and responsibilities of each partner in this linkage. The question was: What should be the specific role and responsibilities of researchers, teachers and extension workers in the linked research, education and extension? Participants' responses to this question are reported in Tables 14, 15 and 16.

Table 14. Role and Responsibilities of Researchers in Linked REE

Role & responsibility	Frequency	% of responses
Research & generation of new technologies	35	63.6
Provide research-based information to other partners	8	14.5
Train extension staff and find solutions to problems felt by them	5	9.1
Find solutions to farmers' problems	3	5.5
Find ways of adopting technologies	3	5.5
Farmer training	1	1.8
Total	55	100.0

Table 15. Role and Responsibilities of Faculty Teachers in Linked REE

Role & responsibility	Frequency	% of responses
Update curriculum with research results	17	28.8
Formal teaching of future agriculturists	13	22.0
Research	12	20.3
Participation in training extension workers	7	11.9
According institution' s mission & goals	6	10.2
Find solutions to problems felt by farmers	3	5.1
Evaluate impact of research results	1	1.7
Total	59	100.0

Table 16. Role and Responsibilities of Extension Staff in Linked REE

Role & responsibility	Frequency	% of responses
Research –based information delivery	25	35.7
Serve as link between researchers, educators and farmers	22	31.4
Farmer training	16	22.9
According extension services' mission and goals	5	7.1
Find solutions to problems felt by farmers	2	2.9
Total	70	100.0

4.5.5 Perceived Sources of Funding for Linkage Activities

Another important issue for linkage of research, education and extension activities in particular is funding. Appropriate funding must be provided to enable those services to function correctly and be more responsive. Interviewees were asked to state possible sources of funding. The question was: What sources of funding for linkage activities do you perceive? Most important sources of funding mentioned by respondents in the response to this question are reported in Table 17.

Table 17. Perceived Sources of Funding for Linkage Activities

Source of funding	Frequency	% of responses
Central government budget	46	38.3
Foreign sponsors	31	25.8
Contribution of beneficiaries	27	22.5
Non- government organizations (NGOs)	5	4.2
Grants/projects	5	4.2
Local government budget	2	1.7
Bilateral donors	2	1.7
Special fund for agricultural development	1	0.8
Institution budget	1	0.8
Total	120	100.0

4.5.6 What should be improved in current Extension System

The next question asked respondents about the most important improvement to be made in the current extension. The question was: If any thing should be changed in the current extension system, what would you like to be changed?

Five most important improvements suggested by participants to the current extension system are reported in Table 18.

Table 18. Five most important suggestions for improving Extension System

Suggested Improvement	Frequency	% of responses
Proximity of partners to the farmers	9	11.8
Improve extension policies/strategies/ approaches	8	10.5
On-farm research	7	9.2
Improve communication	6	7.9
Farmer participation in decision-making	6	7.9

Other issues that were mentioned in response to this question included training and study trips (6.6%), adequate number of extension workers (6.6%), strengthen research and extension (6.6%), increase budget (5.3%), planning, monitoring& evaluation (5.3%), relationships research-education-extension (3.9%), decentralization (3.9%), University involvement (2.6%), poverty reduction programs (2.6%), staff management (2.6%), chain of information delivery (2.6%), input supplies (1.3%), new farming techniques (1.3%) and not use farmers to train other farmers (1.3%).

4.5.7. Additional Suggestions to the Linkages

The last question that was asked to the respondents was: Do you have any additional suggestion to the linkage of research, education and extension in Rwanda? Five most frequently mentioned suggestions to this question are reported in Table 19.

Table 19. Five most frequently stated additional comments to the Linkages

Additional suggestion to the linkage	Frequency	% of responses
“Genuine” consultation and dialogue between partners	18	28.1
Strengthen, improve & reorganize institutions	9	14.1
Publish research results	5	7.8
Improve relationships with farmers	5	7.8
Training	5	7.8

Other issues mentioned by respondents included strengthen farmer associations (3.1%), communication/exchange of information (3.1%), information on markets (3.1%), competent staff (3.1%), income generating activities (3.1%), coordination and monitoring (4.7%), input supplies on time (3.1%), farmer readiness to change (1.6%), on-farm trials (1.6%), avoid free thing to farmers (1.6%).

4.5.8 Chapter Summary

In chapter IV, the writer presented the findings from face-to-face interviews. The study participants offered data on characteristics and constraints of Rwandan extension, perceived barriers and opportunities to the linkage of research, education and extension, structure of linkages, and responsibilities of partners. The 46 participants were interviewed from June 2002 through August 2002. They provided valuable information on the research topic. Significant findings are presented and discussed in chapter V.

CHAPTER 5

DISCUSSION, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

5.1 Study overview

The researcher's purpose in this study was to investigate perceived barriers and opportunities to the linkage of research, education and extension in Rwanda. Interviewing 46 people in face-to-face interviews was used for this investigation. The instrument included 17 open-ended questions (see Appendix E) administered during one-on-one interviews.

The following four research questions guided this study:

- (1) What are the characteristics and constraints/weaknesses of Rwandan Extension System?
- (2) What are the perceived opportunities to the linkage of Research, Education and Extension in Rwanda?
- (3) What are the primary inhibiting factors or barriers to the linkage of Research, Education and Extension?
- (4) If linkage is being made, (i) what model of linkage can be appropriate to Rwanda?
(ii) What will be the role and responsibilities of different partners?

Descriptive statistics were used to present the findings. A discussion is organized around significant findings on each research question for which specific conclusions and recommendations are presented. Also included in this chapter are study conclusions, recommendations, implications and recommendations for future research.

5.2 Discussion of major findings, Conclusions, Recommendations and Implications

5.2.1 Research Question1: What were the characteristics and Constraints/weaknesses of Rwandan Extension System?

This research question addressed the following issues in order to characterize Rwandan extension system: a general appreciation of Rwandan extension system; challenges facing current extension; constraints and weaknesses of Rwandan extension; existing relationships between research, education and extension; channels of information delivery and feedback from farmers; sources of extension and research information; and what can be done to improve technology transfer.

Discussion. Findings pertaining current extension show that 34% of study participants characterized current extension as inefficient versus 16 % who found extension to be rather efficient. According to our respondents, the most important challenge facing extension was to release new technologies and farming practices (12%) followed by improving extension approaches and communication (8%), as well as improving farmer literacy (8%).

On the other hand, major constraints and weaknesses of current extension, according to the participants, included inadequate financial resources and logistics (22%), lack of competent staff (12%), weak relationships between farmers and partners (7.5%), and slow adoption of new technologies (7.5%). Furthermore, linkages between partners (REE) were found weak in 41% of given responses, or informal (11.5%).

However, 11.5% of respondents also found some collaboration between concerned institutions but it was limited either to staff or student training (8%). This study also found that channels of information delivery were especially limited to field trips and visitations (22.5%), face-to-face meetings (20%), extension worker reports (8.8%), farmer association reports (8.8%) and farmers who come to extension worker office (6%). At the same time, the most cited sources of extension and research information included foreign scientific publications (15.5%), workshops (15.5%) and research institutions (mainly ISAR) (10%). For improving technology transfer, participants most frequently suggested to work more closely with farmers (12%), improve extension policies/approaches (10.5%), focus more on on-farm research (9%), improve communication (8%), and farmer participation (8%).

Conclusions. This study's findings on characteristics of Rwandan extension were similar to previous studies describing extension systems in developing countries, especially in Sub-Saharan Africa where Rwanda is located (Brewer, 2001; Axinn, 1988; Adams, 1982; Carson, 2001; Crowder et al., 1999; Maguire, 1998; Roche, 1998; Simpson & Owens, 2002). For example, Carson (2001), writing about challenges facing extension in Sub-Saharan African Countries, said that while there was a general agreement that there was a need to bolster agricultural extension to enable it to continue to play its critical role in agricultural and rural development in sub-Saharan Africa, extension organizations were not able to cope with the emerging challenges they faced owing to poorly trained, poorly equipped and inadequate number of extension staff who were currently working in these extension organizations.

Some of the challenges pointed out by Carson included poor network mechanisms that could speed up the exchange of ideas on innovative education and practices...lack of consensus about the appropriate model of extension that should be used... low number of qualified staff, the majority of whom are poorly trained and ill equipped to effectively carry out their tasks; lack of strategic national training policies in most sub-Saharan African countries; the majority of extension staff (80%) possess only secondary school and intermediate level diploma and certificate credentials (p. 25).

Recommendations. In order to improve agricultural extension effectiveness and efficiency and enable it to continue to play its critical role in agricultural technology system (ATS), policy changes, institutional reorganization and strengthening are required. In the same way, it's important to improve quality of extension staff through training, improved communication skills, increased funding for extension activities and providing better means of transportation for provincial/district levels. Extension approaches may also focus on empowering farmers by increasing farmer participation in decision-making, and improving farmer literacy. For strengthening research-education-extension linkages, collaborating institutions' personnel should meet more often; researchers and teachers should be more actively involved in identifying farmers' problems. Institutions should exchange staff in order to enable personnel to work for a specified time in each other institution. In addition, researchers, teachers and extension workers should collaborate through joint planning, monitoring, conducting on-farm trials, evaluation of research and extension programs.

5.2.2 Research Question 2: What were the perceived opportunities to the Linkage of Research, Education and Extension in Rwanda?

This research question was a major focus of this study. The major study findings on this question are presented below.

Discussion. Study participants unanimously stated linkage between research, education and extension was necessary for building a more responsive extension system. Further, the most participants' perceptions on opportunities to this linkage included institution leaders' willingness to collaborate (26%), consultation and dialogue between collaborating institutions (25%), farmer participation in decision-making (9%), competent staff (7.5%), adequate financial and material resources (7.5%), and good planning/coordination (6%). Furthermore, participants felt the most expected outcomes of the linkage of research, education and extension were access research-based information (24%), functional triangulation between research, education and extension (20%), more physical contacts with farmers (13.5%), increasing agricultural productivity (13.5%) and extension improvement (5%).

Conclusions. Our findings on perceived opportunities to the linkage of research, education and extension are consistent with previous studies (Crowder et al., 1996; Swanson et al., 2000; Agbamu, 2000; Foege, 2000). As Swanson et al. (2000) stated in chapter 2 of this study, leaders of research and extension institutions do not see themselves as part of a broader system, the agricultural technology system (ATS), they individually try to solve day-to-day management problems of their respective

institutions rather than to ensure that their respective institutions collaboratively contribute to the broader goal of improving ATS. Foege (2000) warns that linkages in themselves are not an end: good linkages must produce outcomes. He further underlines that productive linkages require partners who have complementary strengths, who have broad interests and experiences, and who share a common view of the desired outcomes.

Recommendations. Make the triangulation between research, education and extension, which is between MINAGRI-ISAR- Faculty teaching institutions, functional. Institutions leaders' commitment to initiate collaboration for productive linkages is expected. Increasing financial resources will ensure more sustainable linkages.

5.2.3 Research Question 3: What are the primary inhibiting factors or Barriers to the linkage of Research, Education and Extension?

Another major research question of this study addressed linkage barriers.

Discussion. Participants perceptions of major barriers to the linkage included: Leaders' unwillingness to collaborate (19%), weak financial resources for supporting linkage activities (17.5%), lack of consultation and dialogue (12%), lack of coordination& monitoring (8%), lack of farmer participation in decision- making (7%), lack of good planning (7%) and research that takes long time for releasing results (6%). In addition, lack of competent staff, lack of understanding linkage as priority, farmer illiteracy, and low salaries for extension staff, subsistence agriculture and slow technology adoption were so far concerned.

Some questions such as institution leaders' commitment to collaborate, weak financial resources for supporting linkage activities, lack of consultation and dialogue, lack of coordination & monitoring, lack of farmer participation in decision-making, lack of good planning, lack of competent staff, farmer illiteracy, and low salaries for extension staff have been already addressed in previous research questions.

Conclusions. Once again, the study's findings confirm previous studies that addressed barriers to the linkage of research, education and extension, especially in developing countries (ISNAR, 1997 Annual Report; Agbamu, 2000; Leholm et al., 1998; Rivera, 2001; Axinn, 1988; Crowder and Anderson, 1996).

This study found weak linkages between REE. Linkage problems seemed to be both structural and functional. In respect to structural barrier, REE were compartmentalized in different institutions. Functional boundaries such as lack of communication and information exchange between partners, competition for scarce resources hamper the establishment of effective linkages and can undermine policies aimed at integrating REE activities.

Recommendations. Build a national capacity to identify and resolve linkage problems; increase participatory approaches in decision-making and conducting on-farm trials; and provide farmers with basic skills of reading and writing.

5.2.4 Research Question 4: If the linkage is being made, (i) what model of Linkage can be appropriate to Rwanda? (ii) What are the role and responsibilities of different partners?

An important question for this study concerned the model, strategies, approaches and functions to REE linkages. Study participants perceived findings presented below.

Discussion. Almost fifty nine (59%) percent of respondents felt that extension services may be more efficient under the Rwandan Institute of Agricultural Sciences (ISAR) rather than under the Ministry of Agriculture because of direct interaction between researchers and extension staff, direct technology dissemination and minimizing bureaucracy. But to make this happen, respondents recommend institutional reorganization and strengthening.

On the other hand, 87% of respondents found the creation of an outreach unit at faculty teaching institutions will really help to link those institutions with rural communities and other partners as well as to be involved in outreach activities. This unit will specifically mediate collaboration of faculty teaching with MINAGRI extension services and other partners; help teachers and students to diagnose problems and needs of rural communities, plan and implement their activities in the field; and help to disseminate research results from those institutions. This is true as well as the faculty teaching institutions in the country (NUR, ISAE) have Outreach activities/services to the community in their attributions. This study finding is also similar to the current structure of Michigan State University Extension, as mentioned in chapter 2, where a Director of Extension within the College of Agriculture and Natural Resources coordinates Extension and Outreach activities within MSU.

In order to better coordinate linkage activities this study found necessary to create a **National Coordination Position** (National Coordination Committee or National Coordination Liaison Office) with subcommittees at the Province and District levels.

This study also found the main role and responsibilities of researchers to be of

generating technology, providing research-based information to other partners, conducting adaptive research, participating in training of extension staff and evaluating impact research results; the responsibilities of faculty teachers will be to instruct future agriculturists who work in extension, update teaching curricula with research results, generate new technologies, conduct adaptive research, disseminate research results from their institutions and participate in training of extension staff and researchers; while extension staff will be responsible for research-based information delivery, serving as link between researchers, teachers and farmers, and farmer training.

To make more funds available for linkage activities, respondents felt that the main source of funding must come from the government budget as agriculture plays a key role in national economy (36.6–41.6% to the national GDP, see section 2.2) and employs more than 90% of the active population. Funds from foreign sponsors, bilateral donors and foundations, NGOs and from the contribution of beneficiaries are highly welcomed to support linkage activities, said respondents. In addition, in order to harmonize research-extension activities, government funding sources must come from the central, provincial and district levels. Another suggestion was to create a national Granting Agency for financing linkage activities and enhancing competitiveness between institutions.

For improving current extension system and enhance REE linkages, this study found that physical proximity to help improve communication between scientists and farmers/end-users of technology, policy/strategy/approach improvement, participation of farmers in decision-making, on-farm trials, strengthening and improving institutions,

emphasis on training, adequate planning, monitoring and evaluation are required.

Based on findings presented above, the researcher proposes a conceptual model for the functioning of REE formal linkages in Rwanda (Figure 7). As shown on this figure, the conceptual model is conceived as having relational parts, which have been grouped into:

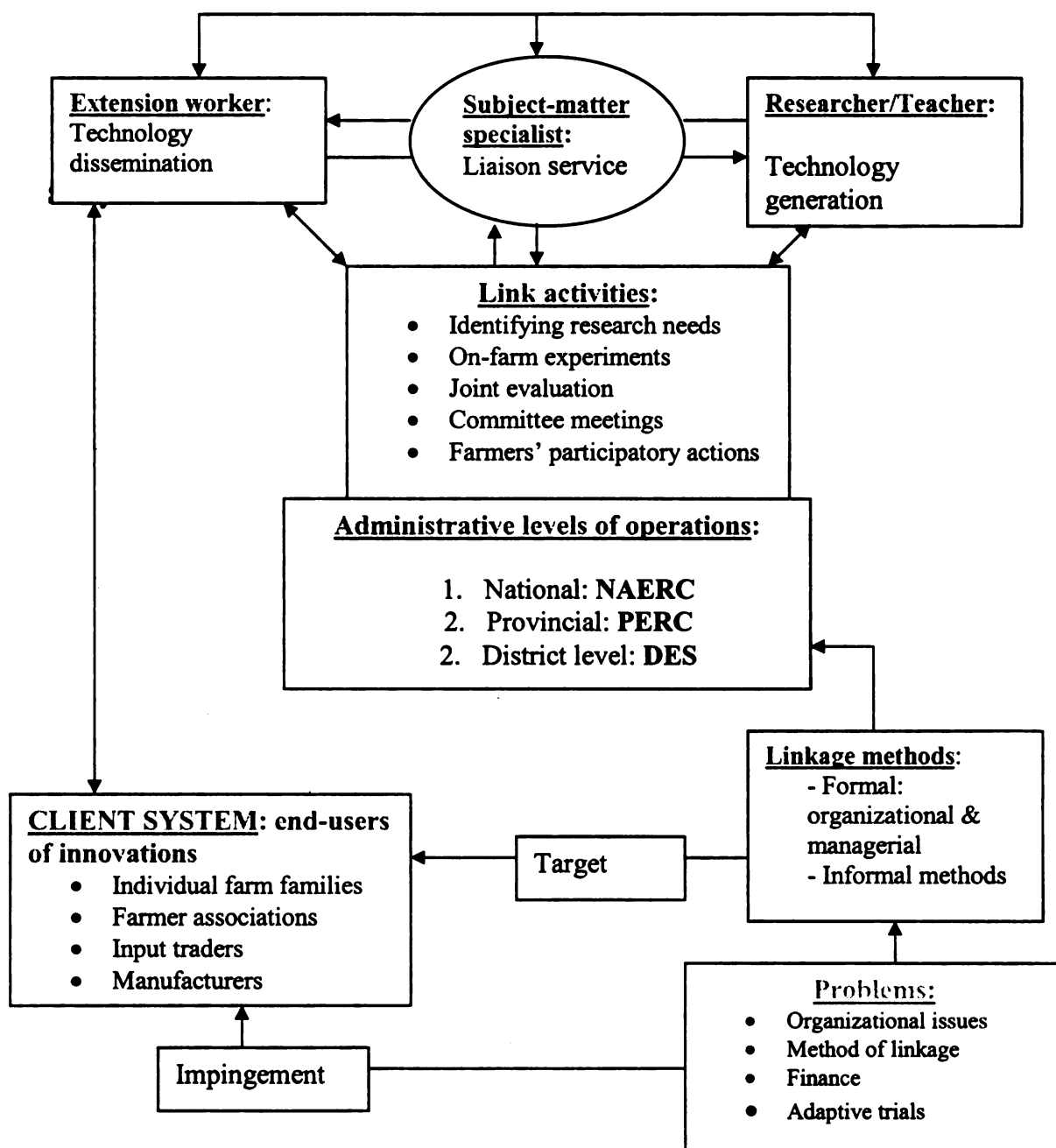
- (1) The **formal agricultural knowledge system** embracing researchers, educators, extension workers, subject-matter specialists, linkage activities and methods. The major actors of this knowledge system should be ISAR, NUR, ISAE and MINAGRI extension services.
- (2) The **client system**, i.e. farmers, farmer associations and cooperatives, input traders, manufacturers (end-users of technology); and
- (3) **Problems affecting linkage activities**

Linkage activities will be managed at varying administrative levels:

National, provincial and district levels. This bottom up approach of sourcing research problems and decision- making on linkage activities will have the advantages to involve farmers, all collaborating institutions and all administrative (district, provincial, national) levels in this process. Thus, extension will really serve as link between researchers, teachers and rural communities and provide opportunities for researchers, teachers and students to work in real-life settings. However, this method presumes that linkages will work efficiently if provincial or local governments possess their own independent agricultural research stations and extension agencies (Agbam, 2000). This problem can be solved through institutional reform: we for example, propose to increase

the number of ISAR experimental stations in order to provide each province with its own research station. Then, each research station will make a strong research-extension network with the provincial extension service.

Figure 7. A Conceptual Model for the Functioning of REE Formal Linkages in Rwanda (Adapted from Swanson et al., 1997).



To ensure a successful collaboration between MINAGRI, ISAR, faculty teaching institutions (e.g. NUR, ISAE) and other stakeholders and a better coordination, the researcher proposes the following structure (Adapted from ISAR, online):

- (a) A national coordinating position in the form of **National Agricultural Extension and Research Committee (NAERC)**
- (b) A **Provincial Extension and Research Committee (PERC)**
- (c) A **District Extension Service (DES)**

The proposed composition of the national committee should be:

- ♦ Ministry of Agriculture (MINAGRI)
- ♦ Ministry of Education (MINEDUC)
- ♦ ISAR
- ♦ Faculty teaching Institutions (NUR, ISAE)
- ♦ National Center of Artificial Insemination
- ♦ National Veterinary Laboratory
- ♦ A representative of farmers
- ♦ A representative of Agribusiness
- ♦ A representative of UN and other International NGOs
- ♦ A representative of local NGOs

Among attributions of the national coordination committee should be:

- Establish national policies and guidelines for REE linkage activities
- Ensure that the mandate of each partner are carried out as indicated

- Make general recommendation on research-extension activities at national level
- Analyze plans of linkage activities at national level and reports from the provincial committee
- Coordinate, monitor and evaluate linkage activities
- Ensure communication and information exchange between partners

The composition of the provincial committee should be the following:

- The “Prefet” (Governor) of the Province
- Director of agricultural and extension activities in the Province
- Local administrators
- District extension services
- A representative of ISAR
- Subject-matter specialists and knowledgeable persons
- Director of Education in the Province as a representative of teaching institutions
- Directors of projects operating in the Province
- Representatives of NGOs operating in the Province
- A representative of farmers
- A representative of the businessmen investing in Agriculture.

Attributions of the provincial committee should be:

- (1) Identify annual research and extension needs/problems of the Province
- (2) Adopt plans for research and technology dissemination
- (3) Conduct adaptive research
- (4) Ensure link with donors and sponsors and link between REE and the beneficiaries

- (5) Communicate information on available technologies
- (6) Analyze the impact of research results
- (7) Report to the national committee
- (8) Have an executive committee

The concept and role of this provincial committee have some similarities with the Areas Of Expertise (AOE) Teams used by Michigan State University Extension (see section 2.5). At the province level, REE linkages will also be promoted through a joint diagnostic survey involving staff of the Rwandan Institute of Agricultural Sciences (ISAR), Universities (NUR or ISAE), and MINAGRI extension services. At the province level, decisions on the selection of farmers' problems/needs as annual research themes will be finalized at this level by the PERC.

At the district level, farmers' problems and needs will be compulsory sourced by District Extension Services (DES) from farmers, farmer associations and cooperatives, by NGOs, schools and administrative officers. The District Mayor, agronomist, forest, veterinarian, sociologist and the responsible for development in the District should compose the DES for example. These local needs identified by extension workers will be supplemented with those identified by researchers, educators and subject-matter specialists.

Linkage activities will also be promoted through joint evaluation committees and on-farm adaptive experimental activities. Farmers' problems will be identified through data collected by researchers, extension workers and educators, local administrators, and NGOs. Researchers, educators, subject-matter specialists and other officers

represented in the research- extension committees at different levels as explained above, will take final decisions regarding research themes.

This study also defined major roles and responsibilities of researchers (generate technology, provide research-based information to other partners, participate in dissemination and evaluation of research results, and train extension staff), faculty teachers (update teaching curricula with research results, generate technologies, participate in dissemination and evaluation of research results, participate in training of extension staff) and extension staff (research-based information delivery, farmer training, link researchers and teachers with farmers). Furthermore, this study found that main source of funding for linkage activities must come from government budget as agriculture plays a key role in national economy. Further, for improving current extension system, proximity of partners to the farmers, improvement of extension policies and strategies, improved communication and farmer participation in decision-making are required.

Conclusions. This study's findings on model of REE linkage appropriate to Rwanda were consistent with previous studies conducted in other African countries including Mali, Senegal, Tanzania and Zimbabwe (ISNAR, annual report 1997). These studies found the planning of REE-user linkage activities to play a key element on quality and types of the linkages that in turn determine to a large extent the relevance of research-extension programs. In addition, researchers and extension workers must treat farmers as full partner in the technology –generation and transfer process.

Furthermore, the study's findings confirmed Obimpeh's (1999 findings that emphasize the fact that an effective or beneficial partnership exists when stakeholders work

with a common vision and understanding, establish common objectives and plans, and are dedicated to achieving a common goal.

Our findings were also consistent with previous studies conducted by Crowder and Anderson (1996). Based on their recommendations, we draw the following conclusions:

- Despite institutional divisions, which are likely to remain, it helps to view REE as an integrated agricultural knowledge and technology system;
- A focus on both REE functions and organizational structures might broaden the dialogue to include other partners and improved integration;
- A pluralistic approach is likely to have advantages, but to be effective linkages must be formed and strengthened. Policy and mandate changes, as well as changes in "organizational attitudes", may be needed;
- Linkages may be best improved through the promotion of informal networking at many levels with an incentive system that rewards collaboration.
- Strengthening and empowering "client groups" can result in more demand-driven REE services and put pressure on the system to improve linkages.

Recommendations

Based on findings presented above on REE structure and functions, the researcher recommends the following:

- To organize a national workshop on building REE linkages.

- Institutional reorganization, strengthening of collaborating organizations and policy changes to improve linkages.
- To set up methods and guidelines for planning and implementation of linkage activities.
- To build a national capacity to identify and resolve linkage problems.
- To create a national REE coordination liaison office with subcommittees at the provincial and district levels.
- To create a national Granting Agency in order to make more funds available for linkages activities and promote competitiveness.
- To create an outreach unit at faculty teaching institutions to involve them in extension activities.

5.3 Study Conclusions

Based on the findings of this study, the following conclusions were drawn:

Rwandan extension system has been subjected to frequent changes over the past years and in particular has been affected by the country 1994 genocide. Many issues confronting extension system are still unsolved such as: 1) low educational level, poor training and lack of equipment for extension staff at low administrative levels; 2) weak linkages between research, faculty teaching and extension that are compartmentalized in different institutions and operate separately; and 3) lack of farmers' participation in planning, implementation, evaluation of development programs, and decision-making.

Barriers that hinder the establishment of effective linkages between REE are both structural and institutional and include departmentalization, unwillingness to collaborate, weak financial resources for supporting linkage activities, lack of framework for consultation and dialogue, lack of consistent planning, coordination and monitoring of linkage activities and lack of farmer participation in decision- making.

However, different opportunities exist to make the triangulation research-education-extension possible and functional.

Recurrent linkage problems would require formal, institutional reforms. To be efficient and responsive both to farmers and to each other, REE organizations require structural and functional reorganization; policy, strategies and program change; strong planning, monitoring and periodic evaluations of linkage activities; high qualified personnel with adequate communication skills and equipped with means for transportation.

Improved communication channels such as electronic mail and web-based technology to facilitate exchange of information between different levels of extension services, between partners (i.e. REE, NGOs) and with outside collaborators are still very limited.

Participatory approaches to empowering farmers and farmer associations in decision-making and their participation in the whole process of extension and research programs are limited too. Physical proximity appears to help improve communication between scientists and end-users of technology.

Furthermore, formal linkage requires that all involved parties perceive that they receive benefits from the linkage relationships. In addition, REE linkages would require a pluralistic approach and should stress the importance of improved collaboration between NGOs and government agencies.

5.4 Study Recommendations and Implications

The recommendations and implications as follows are based on the findings directly related to the questions asked by the researcher.

1. Policy changes, institutional reorganization and strengthening of collaborating organizations are required to enhance research-education and extension linkages.
2. To improve quality of extension staff through training, increase funding for linkage activities and provide incentives to collaborate as well as better means of transportation to the researchers, educators and extension personnel. The implication is to increase technical skills and incentives to collaboration.

3. To ensure the harmonization of research and extension activities between national, provincial and district levels, and more available funds, the government funding of extension services must come from national, provincial and district levels.
4. To ensure more available funds for research-education-extension linkage activities and enhance competitiveness, the creation of a Grant Agency within the country (within the Ministry of Agriculture for example) is needed.
5. Cooperation between universities' research programs, research institutions and extension services. The exchange of staff between agricultural research institute, University and other faculty teaching Institutes, and extension services will enable personnel to work for a specified time in each other's establishment.
6. The creation of an Outreach Unit at faculty teaching institutions. The implication of establishing an outreach unit at faculty teaching institutions should enable these institutions to be involved in extension activities as extension is part of their mission.
7. In order to strengthen linkages at the province level and ensure more engagement/involvement from provincial authorities, each province should have its own experiment station;
8. Physical proximity appears to help improve communication between scientists and end-users of technology. Moreover, researchers, educators and extension agents should meet more often and be more actively involved in identifying farmers' needs and problems before any intervention.

9. Conduct a study on coordination of extension activities between provincial/district levels and the central (Ministry) level in the current context of decentralization.
10. Create a coordination position such as a research-education-extension liaison office at national level with subcommittees at the province and district levels to ensure better planning, monitoring, coordination and evaluation of linkage activities.
11. Increase informal contacts, regular meetings and create communication networks between institutions.
12. Increase participatory approaches in identifying farmers' needs and problems, deciding research and extension themes, conducting on-farm trials and evaluating research- extension activities. In addition, treat farmers' organizations as a full partner in technology-generation and –transfer process.
13. Scientists must recognize policymakers and administrative authorities as a target group for their research results. Bringing relevant research to the attention of policymakers and local authorities is an obligation for all agricultural researchers and faculty teachers, not only those working in typically “policy-related” sub-disciplines.

The researcher further recommends the following:

- To organize a national workshop on research, education and extension linkages.
- To build a national capacity to identify and resolve problems of weak research-education- extension- user linkages, and set up methods and guidelines for linkage planning and implementation.
- Study trips in other developing countries where research-education-extension linkages are functional.

5.5 Recommendations for Further Research

Many possibilities exist for further research in this area. These include the following:

1. To conduct a research study of feasibility of the establishment of formal research-education-extension linkages along with institutional reorganization.
2. To conduct a study of feasibility of designing a course to teach rural farmers basic reading and writing skills to empower them to participate in decision-making, technology generation and be more receptive to new technologies.
3. To conduct a study of feasibility of the creation of a Granting Agency in the country (within the Ministry of agriculture for example) to support linkages activities and encourage competitiveness.
4. To conduct a study of feasibility of improving extension staff skills through a training program of Bachelor's and Master's degrees.

APPENDIX A

UCRIHS APPROVAL (see next page)

MICHIGAN STATE
UNIVERSITY

June 28, 2002

TO: Frank L. BREWER
410 Agriculture Hall

RE: **IRB# 02-313 CATEGORY: EXPEDITED 2-6, 2-7**

APPROVAL DATE: June 27, 2002

**TITLE: PERCEIVED BARRIERS AND OPPORTUNITIES TO THE LINKAGE OF
RESEARCH EDUCATION AND EXTENSION IN RWANDA**

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete and I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project.

RENEWALS: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Projects continuing beyond one year must be renewed with the green renewal form. A maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for a complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB# and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/CHANGES: Should either of the following arise during the course of the work, notify UCRIHS promptly: 1) problems (unexpected side effects, complaints, etc.) involving human subjects or 2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.



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University Committee on
Research Involving
Human Subjects

Michigan State University
202 Olds Hall
East Lansing, MI
48824

517/355-2180

FAX: 517/432-4503

Web: www.msu.edu/user/ucrihs

E-Mail: ucrihs@msu.edu

If we can be of further assistance, please contact us at (517) 355-2180 or via email: UCRIHS@msu.edu. Please note that all UCRIHS forms are located on the web: <http://www.msu.edu/user/ucrihs>

Sincerely,

Ashir Kumar, M.D.
UCRIHS Chair

AK: bd

cc: ☒ Cellixte Gatali
1425 Spartan Village #K
East Lansing, MI 48823

APPENDIX B

PERSONAL INTERVIEW CONSENT FORM

Perceived Barriers and Opportunities to the Linkage of Research, Education and Extension in Rwanda.

Agricultural Extension is an essential element in any agricultural and rural development program. Extension outreach helps people solve their own problems, thereby improving their livelihood. It is particularly important for Rwanda where agricultural sector represents the backbone of the National Economy, employing over 90% of active population. The purpose of this interview is to learn more on perceived barriers and opportunities to the linkage of research, education and extension in Rwanda. This study assumes that a linkage between research, education and extension will be synergic, more responsive and effective in meeting farmers' needs and problems.

The interview should take no longer than one hour. Your participation in this study is completely voluntary. In order to protect participants' privacy, Callixte Gatali, the researcher and interviewer, will be the only one accessing and analyzing the data, and writing the final reports. Professional titles such as "teacher, extension worker, farmer and others," will be used instead of individual names in the final report. In addition, audiotapes containing interviews will be destroyed after interview transcription. All documents, including interview transcriptions will be kept in a locked file cabinet in the researcher's office.

Thank you for your cooperation and help in this study. If you have any particular questions about this study, please contact:

Dr Frank Brewer
409 Agriculture Hall
East Lansing, MI 48824, USA
Phone (517) 355- 6580 ext 204
Email: brewerf@msu.edu

Callixte Gatali
National University of Rwanda
PO BOX 117 Butare, Rwanda
Tel (250) 530 823
Email: gatalica@msu.edu

If you have questions regarding your role and rights in this study, you may contact:

Dr. Ashir Kumar, Ph.D.
Chair, University Committee on Research Involving Human Subjects
Phone (517) 355-2180
Email: ucrihs@msu.edu

I voluntarily agree to participate in this study.

Signature.....

Date.....

To ensure accurate data, the researcher requests to audio tape the interview. After the transcription of the audiotapes has taken place, the researcher will destroy the audiotapes.

I voluntarily agree that the interview can be audio taped for purposes of ensuring accurate Data.

Signature.....

Date.....

APPENDIX C

FRENCH TRANSCRIPTION OF THE CONSENT FORM

Barrieres et Opportunités Ressenties au Lien entre la Recherche, l'Enseignement et la Vulgarisation au Rwanda.

La vulgarisation Agricole est un element essentiel a tout developpement agricole et rural. La vulgarisation aide les gens a resoudre leur propres problemes, de ce fait a ameliorer leurs moyens d'existence. C'est particulierement important pour le Rwanda ou le secteur agricole represente la colonne vertebrale de l'Economie Nationale, en employant plus de 90% de la population active. Le but de cette interview est d'apprendre davantage sur les barrieres et opportunités ressenties au lien entre la Recherche, l'Enseignement et la Vulgarisation au Rwanda. Cette etude presume qu'un lien entre la Recherche, l'Enseignement et la Vulgarisation serait synergique, plus reactif et effectif pour repondre aux besoins et problemes des fermiers.

L'interview pourrait prendre moins d'une heure. Votre participation dans cette etude est entierement volontaire. Pour preserver la vie privée des participants, Mr Callixte Gatali, le chercheur et enqueteur, sera le seul a acceder et analyser les donnees, et a ecrire les rapports finals. Les titres professionnels tels que "enseignant, agent de vulgarisation, fermier et autres" seront utilises a la place des noms individuels dans le rapport final. De plus, les cassettes contenant les interviews seront detruites après la transcription des interviews. Tous les documents, incluant les transcriptions des interviews seront gardes dans des classeurs verrouilles dans le bureau du chercheur.

Merci pour votre cooperation et appui dans cette etude. Si vous avez des questions particulieres au sujet de cette etude, contactez s'il vous plait:

Dr Frank Brewer
409 Agricultural Hall
E. Lansing, MI 48824, USA
Tel (517) 355 6580 ext 204
Email: brewerf@msu.edu

Callixte Gatali
Universite Nationale du Rwanda
PO BOX 117 Butare/Rwanda
Tel (250) 530 823
Email: gatalica@msu.edu

Si vous avez des questions concernant votre role et droits dans cette etude, vous pouvez contacter:

Dr Ashir Kumar, Ph. D.
President du Comite Universitaire sur la
Recherche Implicant des Sujets Humains
Tel (517) 355 2180
Email: ucrihs@msu.edu

J'accepte volontiers de participer dans cette etude

Signature.....

Date.....

Pour s'assurer de la fidelite des donnees, le chercheur a besoin d'enregistrer l'interview. Après que la transcription des cassettes aura lieu, le chercheur detruira les cassettes.

J'accepte volontiers que l'interview soit enregistree pour assurer la fidelite des donnees.

Signature.....

Date.....

APPENDIX D

INTRODUCTORY LETTER

{Date}

Sir/Madam.....

Address.....

Dear Sir/Ms

My name is Callixte Gatali and I'm a Graduate student in a Master's program at Michigan State University, USA. For my research topic, I've chosen to work on *Perceived barriers and opportunities to the linkage of research, education and extension in Rwanda*.

I will be investigating people's opinions and perceptions through one-on-one interviews. The study population has been chosen from the following institutions: the Ministry of Agriculture, the Rwanda Agricultural Science Institute (ISAR), faculty teaching institutions (National University of Rwanda (NUR) and Institute of Agriculture and Livestock (ISAE), local NGOs, agricultural secondary schools, extension workers and farmers' associations.

I am writing to ask your cooperation and permission to work with people from your institution.

As far as participants' confidentiality and/or institution's privacy are concerned, I would like to assure that the researcher and interviewer, will be the only one accessing and analyzing the data, and writing the final reports. Professional titles such as "teacher, extension worker, farmer and others," will be used instead of individual names in the final report. In addition, audiotapes containing interviews will be destroyed after interview transcription. All documents, including interview transcriptions will be kept in a locked file cabinet in the researcher's office.

I look forward to this opportunity to discuss issues surrounding the relationships between research, education and extension and I hope the collected concise information will enhance the collaboration between the concerned institutions, and their responsiveness in meeting the farmers' needs and problems.

If you have any particular questions about this study, please contact me at gatalica@msu.edu or contact the Dean of the Faculty of Agriculture of the National University of Rwanda at tel. (250) 530 823 or call Dr. Frank Brewer at (517) 355-6580 ext 204 or e-mail him at brewerf@msu.edu. Feel free to contact Dr. Ashir Kumar, Chair of the University Committee on Research Involving Human Subjects at (517) 355- 2180 or at ucrihs@msu.edu for questions involving your role and rights in this study.

We thank you in advance for your cooperation. Yours sincerely. Callixte Gatali

APPENDIX E

INSTRUMENT/ RESEARCH INTERVIEW QUESTIONS

Perceived Barriers and Opportunities to the Linkage of Research, Education and Extension in Rwanda.

Objective 1: Characteristics/current situation of Rwandan extension system

1. What are your opinions on current Rwandan Extension System?
2. What do you consider to be the challenges of agricultural extension in Rwanda?
3. Do you perceive any constraints/weaknesses of Rwandan extension system? If yes, what are they?
4. What are your opinions on existing relationships between research institutions, teaching institutions and extension services in Rwanda?
5. What are the channels of information delivery?
6. What are the sources of extension and research information?
7. What do you feel is the most important thing to be improved in the transfer technology / extension information to the farmers?

Objective 2: Perceived opportunities to the linkage of research, education and extension

8. a) Do you perceive any necessity of linkage between research-education and extension in Rwanda?

b) What do you believe to be the opportunities to the linkage of research, education and extension in Rwanda?
9. What should be the advantages/outcomes of this linkage?

Objective 3: Perceived barriers to the linkage of REE

10. What do you perceive to be the barriers to the linkage of research, education and extension?

Objectives 4: Structure, role and responsibilities

11. What are your opinions of moving the Extension Services from the Ministry of Agriculture to the Rwandan Institute of Agricultural Sciences (ISAR)?

12. How do you perceive the creation of an outreach unit at faculty teaching institutions?

13. How do you perceive the coordination of agricultural research, education and extension in Rwanda?

14. What should be the specific role and responsibilities of researchers, teachers and extension workers in the linked research, education and extension?

15. What sources of funding for linkage activities do you perceive? What should be the contribution of the beneficiaries?

16. If any thing should be changed in the current extension system, what would you like to be changed?

17. Do you have any other suggestion to the linkage of research, education and extension in Rwanda?

APPENDIX F

FRENCH TRANSCRIPTION OF THE INSTRUMENT

Barrieres et opportunités ressenties au lien entre la recherche, l'enseignement et la vulgarisation au Rwanda.

Questions pour Interviews

Objectif 1: Situation actuelle du système de vulgarisation agricole au Rwanda

1. Quelles sont vos opinions sur le système actuel de vulgarisation au Rwanda?
2. Que considérez-vous être les défis de la vulgarisation agricole au Rwanda?
3. Percevez-vous des contraintes/faiblesses auxquelles fait face le système actuel de vulgarisation au Rwanda? Si oui, lesquelles?
4. Quelles sont vos opinions sur l'actuelle collaboration entre les institutions de recherche, d'enseignement et de vulgarisation au Rwanda?
5. Quelles sont les voies de transmission de différents messages aux bénéficiaires?
6. Quelle est la chose la plus importante à améliorer dans le transfert des technologies aux fermiers?
7. Que peut-on améliorer dans le système actuel de transmission de l'information aux fermiers?

Objectif 2: Opportunités ressenties au lien entre la recherche, l'enseignement et la vulgarisation au Rwanda

8. a) Percevez-vous la nécessité d'un lien entre la recherche, l'enseignement et la vulgarisation au Rwanda?
- b) Quelles opportunités/conditions nécessaires voyez-vous pour l'établissement de ce lien entre la recherche, l'enseignement et la vulgarisation ?
9. Quels peuvent être les avantages de ce lien?

Objectif 3: Principales barrières au lien entre la recherche, l'enseignement et la vulgarisation

10. Quelles principales barrières ressentez-vous au lien entre la recherche, l'enseignement et la vulgarisation au Rwanda?
11. Quelle est votre opinion de déplacer les services de vulgarisation du Ministère de l'Agriculture à l'Institut des Sciences Agronomiques du Rwanda (ISAR)?
12. Comment percevez-vous la création d'une Unité de vulgarisation dans des institutions qui dispensent l'enseignement agricole universitaire?

Objectif 4: Structure du lien, rôle et reponsabilités des differents partenaires.

13. Comment percevez-vous la coordination entre la recherche, l'enseignement et la vulgarisation au Rwanda?
14. Quels seraient le rôle et les responsabilités des differents partenaires dans le lien entre la recherche, l' enseignement et la vulgarization au Rwanda?
15. Quelles sources de financement percevez-vous pour financer les activités de recherche, d'enseignement et de vulgarization au Rwanda? Quelle serait la contribution des bénéficiaires?
16. Si quelque chose pouvait être amélioré dans le système actuel de vulgarisation, que souhaiteriez-vous voir être amélioré?
17. Avez –vous une autre suggestion à ajouter à cette interview?

REFERENCES

1. Adams, M. E. (1982). Agricultural extension in developing countries. *Intermediate Tropical Agricultural Series*. Longman Group Ltd.
2. Agbamu, J.U. (2000). Agricultural research-extension systems: An international perspective. Network paper 106a. *Agricultural Research & Extension Network (AgREN)*: Odi
3. Ary, D., Jacobs, L.C., & Razavieh, A. (2002). *Introduction to research in education* (sixth edition). Belmont, CA: Wadsworth Group/Thomson Learning, Inc.
4. Axinn, G.H. (1988). *Guide on alternative extension approaches*. Rome: FAO.
5. Axinn, G.H. & Axinn, N. W. (1997). *Collaboration in international rural development: A practitioner's handbook*. Thousand oaks, California: Sage Publications, Inc.
6. Barry, A.W. (2000). *Rwanda prospects for agricultural commodity competitiveness: Constraints and opportunities*. Final report. Kigali, Rwanda: Ministry of Agriculture (MINAGRI).
7. Bjalland, D., Masuku, B. & Ndimande, T. (2002). International higher education loan program: A partnership for international education in agriculture. Outstanding poster presented at the 18th Annual Association for International Agricultural and extension Education conference, Durban, South Africa, May 26-30, 2003. *Journal of International Agricultural and Extension Education*, 9 (2), 46.
8. Boz, I. (2002). Does early adoption affect farmers' use of the extension service? *Journal of International Agricultural and Extension Education*, 9 (3), 77-82.
9. Brewer, Fr. L. (2001). *Agricultural Extension Systems: An international perspective*. North Chelmsford, MA: Erudition Books. Courier Custom Publishing, Inc.
10. CANR International News/Office of International programs/Institute of International Agriculture (Feb./March 2002). A focus on PEARL. 10, No.1. Institute of International Agriculture, Michigan State University.
11. CANR International News/Office of International programs/Institute of International Agriculture (2001). PEARL Project: The Reach –out. No 1. Institute of International Agriculture, Michigan State University.

12. Carson, A.G. (2001). Human resource survey of agricultural extension workers in sub-Saharan Africa. In **Kwarteng Joseph A. (Ed.)**, *Extension education: Reshaping African Universities and Colleges for the 21st century* (pp. 23-28). Geneva, Switzerland: Centre for Applied Studies in International Negotiations.
13. Cernea, M. M., Coulter, J. K. & Russell, J. F. A. (1985). *Research extension farmer: A two-way continuum for agricultural development*. Washington, D.C.: World Bank.
14. CIA World Factbook (2002). The world's most crowded places. [Online]. Available at: <http://www.mrdowling.com/800density.html>
15. Crowder, L. V., & Anderson, J. (1996). *Integrating agricultural research, education and extension in Developing Countries*. [Online]. Available at: <http://www.fao.org/sd/EXdirect/EXan0009.htm>.
16. Crowder, L. V., Lindley, W. I., Bruening, T. H & Doron, N. (1999). *Agricultural Education for Sustainable Rural Development: Challenges for Developing Countries in the 21st Century*. Rome: FAO
17. FAO & World Bank (2000). *Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD): Strategic Vision and Guiding Principles*. Rome
18. Foege, W. (1999). Good partnerships and productive partnerships. In **Steven, A. Breth (Ed.)**, *Partnerships for rural development in sub-Saharan Africa* (pp.10-13). Geneva, Switzerland: Centre for Applied Studies in International Negotiations.
19. Fowler, F. J. (1993). Survey research methods. 2d.ed. *Applied social research methods series. Vol. 1*. Newbury Park, CA: Sage Publications, Inc.
20. Fowler, F. J. (1995). Improving survey questions. *Applied social research methods series. Vol. 38*. Newbury Park, CA: Sage Publications, Inc.
21. Gay, L. R. (1987). *Educational Research* (3rd ed.). Merry Publishing Company.
22. ISAR (n.d.). About Rwanda. [Online]. Available at: <http://www.isar.cgiar.org/about/aboutrwanda.htm>
23. International Service for National Agricultural Research (ISNAR). Annual Report 1997. [Online]. Available at: <http://www.isnar.cgiar.org/publications/corporate/annual/1997/boxes.htm>

24. Leholm, A., Suvedi, M. & Vlasin, R (1998). Research-education-extension linkages. *Paper presented at the First International Congress on Agronomy, Environment and Food Security for the 21st century*. New Delhi, India: Michigan State University.
25. Maguire, C.J. (2001). Agricultural education in Africa: Managing change. In **Kwarteng Joseph A. (Ed.)**, *Extension education: Reshaping African Universities and Colleges for the 21st century* (pp 29-43). Geneva, Switzerland: Centre for Applied Studies in International Negotiations.
26. Michigan State University (2003). Extension and Outreach. [Online]. Available at: <http://www.msu.edu/extension/index.html>
27. Ministry of Agriculture (1997). *The National Agricultural Extension System*. Technical Document: TCP/FAO/RWA/5612. Kigali, Rwanda: MINAGRI.
28. Ministry of Finance and Economic Planning (2002). *National Poverty Reduction Program & Statistics Department: A profile of poverty in Rwanda*. A report based on the results of the household living standards survey. Kigali, Rwanda: MINIFIN.
29. Ministry of Finance and Economic Planning (2003a). *The General Census of Population and Housing Rwanda*. Report on the preliminary results. Kigali, Rwanda: MINIFIN.
30. Ministry of Finance and Economic Planning (2003b). *Vision 2020*. Draft 4, English. Kigali, Rwanda: MINIFIN
31. Munya, C. N., Adams, P.F. & Thomsom, J.S. (2002). Designing effective linkages for sustainable agricultural extension information systems among developing countries in Sub-Saharan Africa. *ALAE. Proceedings of the 18th Annual Conference*. Durban: South Africa. 301-307
32. Murray, L., & Brenda, L. (2000). *Practitioner based enquiry: Principles for Postgraduate research*. New York: Falmer Press.
33. National University of Rwanda (2003). University Mission. [Online]. Available at: <http://www.nur.ac.rw/mission.htm>
34. Nezehose, J.B. (1990). Agriculture Rwandaise: Problematique et perspectives. Rwanda: INADES. [Rwandan Agriculture: Problematic and perspectives]

35. Ngomane, T. & Flanagan, C. (2002). Hope and despair: Extension agents in a young democracy. *Journal of International Agricultural and Extension Education*. Vol. 9, No. 2, 37- 43.
36. Niangade, O. (1999). A research partnership with farmers in Mali. In **Breth, Steven A. (Ed.)**, *Partnerships for rural development in sub- Saharan Africa* (pp.27-29). Geneva, Switzerland: Centre for Applied Studies in International Negotiations.
37. Obimpeh, S. (1999). Partnerships: Perspective from a Ministry of Agriculture. In **Breth, Steven A. (Ed.)**, *Partnerships for rural development in sub- Saharan Africa* (pp.5-9). Geneva, Switzerland: Centre for Applied Studies in International Negotiations.
38. Patten, M. L. (2002). Understanding research methods (3rd edition): An overview of the essentials. Los Angeles, CA: Pyczak Publishing.
39. Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2d ed). Newbury Park, CA: Sage Publications, Inc.
40. Qamar, M.K. (2002). *Global trends in agricultural extension: Challenges facing Asia and the Pacific region*. [Online]
FAO. Available at:
http://www.fao.org/sd/2002/KN0903a_en.htm
41. Rivera, W.M., Qamar, M. K. & Crowder, L.V. (2001). *Agricultural and rural Extension worldwide: Options for institutional reform in the developing countries*. Rome: FAO
42. Roche, D. /BDPA/Forhom Institute (1998). *Professional training and agricultural Extension: Propositions for the setting up of a system of professional continuing education within the National Agricultural Extension Service*. Mission report. Kigali, Rwanda: Rwandan Ministry of Agriculture. TCP/FAO/RWA/5612
43. Saguiguit, G. C. (1987). *Higher agricultural education and rural development in developing countries in Asia and the Pacific*. UNESCO.
44. Simpson, B.M. & Owens M. (2002). Farmer field schools and the future of agricultural extension in Africa. *Journal of International Agricultural and Extension Education*. Vol. 9, (2), 29-36.

45. Smith, D.L. (2000). Recruiting and retaining minority 4-H volunteers in Tampa Bay Area, Florida: Doctoral dissertation, Michigan State University, 2000. Library Michigan State University, 134, 646, THS.
46. Swanson, B. E., Bentz, R. P., & Sofranko, A. J. (1997) *Improving agricultural extension. A reference manual*. Rome: Food and Agriculture Organization of the United Nations (FAO).
47. University of Minnesota/National University of Rwanda/USAID. (January 1993). Building the capacity of the College of Agriculture (UNR) to Conduct, Disseminate and Teach Adaptive Research in Rwanda. Final Report.
48. World Bank. (1999). *Integrating universities into national agricultural research and extension systems: Good practice for investment in agricultural university programs*. [Online]. Available at:
<http://lnweb18.worldbank.org/ESSD/essdext.nsf/26ByDocName/AKISResearchExtensionEducation>
49. World Bank (2002). *Rwanda at a glance*. [Online]. Available at:
http://www.worldbank.org/data/countrydata/aag/rwa_aag.pdf
50. World Bank (2003). *Agricultural Knowledge and Information Systems (AKIS)*. [Online]. Available at:
<http://lnweb18.worldbank.org/ESSD/essdext.nsf/26ByDocName/AKISResearchExtension>.
51. Zinnah, M. M., & Naibakelao, D. (1999). Bringing African Universities into Development: The SAFE program at the University of Cape Coast. In Steven, A. Breth (Ed.), *Partnerships for rural development in sub-Saharan Africa* (pp.65-75). Geneva: Switzerland: Centre for Applied Studies in International Negotiations.

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