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Is approved by the final examining committee:

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Head of the Graduate Program Date

PREFERENCES OF MALAWIAN GOAT FARMERS REGARDING METHOD OF INSTRUCTION AND CHARACTERISTICS OF TECHNOLOGY ADOPTERS

A Thesis

Submitted to the Faculty

of

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by

Roy C. Kwelepeta

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To the Malawian smallholder farmer, of whom we expect too much, yet whose vision remains blurred in this century.

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DEFINITION OF TERMS

This section defines and operationalizes key concepts and terms used in this study:

- **Agricultural Development Division** (ADD): Zonal offices of the Ministry of Agriculture in Malawi, providing technical and administrative oversight for two or more districts.
- **Agricultural Extension Development Officer** (AEDO): A government official in the Ministry of Agriculture and Food Security who serves as the primary contact between the Ministry and farmers.
- **Agro-dealer**: One who sells agricultural inputs, equipment and produce in the vicinity of a community.
- **Extension Planning Area** (EPA): Subdivision of districts into smaller ecological and administrative zones, usually based upon the number of farming families.
- **Extension approaches**: Communication approaches used by extension to reach out to farmers. Individual farmers are often contacted at the household level, also known as the ‘door-to-door’ approach. Groups of farmers are often engaged through messaging with formal and informal organizations such as clubs, associations and cooperatives. Mass media approaches utilize print and electronic media (radio, television, newspapers, magazines, and leaflets) to engage farmers with technology-related and other messages.

- **Lead farmer**: A farmer who has been elected by the community to perform technology-specific farmer-to-farmer extension and is trained in the technology.
- **Non-governmental organizations** (NGOs): These organizations sometimes employ field staff at the level of the AEDO.
- **Piece work (*ganyu***): Short-term jobs, usually labor intensive, assigned to an individual for a mutually agreed-upon wage. Examples include making ridges, weeding and harvesting. Off-farm examples include mowing, carrying heavy goods (on the head), and building grass fences.
- **Pluralistic extension**: A system of reaching farmers with information on new technologies by more than one service provider. The Malawi government recognizes other service providers, such as NGOs and farmer organizations, as partners in providing extension services to farmers.

ABSTRACT

Kwelepeta, Roy C. M.S., Purdue University, August 2013. Preferences of Malawian Goat Farmers Regarding Method of Instruction and Characteristics of Technology Adopters. Major Professor: Colleen M. Brady.

A developing country in southeast Africa, Malawi relies heavily on smallholder farmers who account for 70% of the country's gross domestic product. While the country has benefited from substantial donor programs over many years, it has until very recently suffered from chronic food insecurity at both household and national levels. More than half of the population in Malawi is classified as poor, which poses a serious constraint to agricultural growth. Goat production offers several advantages in this regard, as goats are an inexpensive source of milk and meat protein for sectors of the population that cannot afford beef, pork or fish.

This study explored preferences of Malawian goat farmers among four technology disseminators: government extension workers, extension field staff from non-governmental organizations, agro-dealers and lead farmers. The study also examined the preferences of goat farmers regarding commonly used methods of instruction, and the characteristics of adopters of goat production and management technologies in the Blantyre and Salima districts of Malawi. Blantyre district is located in the southern region of Malawi; Salima district is located in the central region, along the shores of Lake Malawi. Data were collected from 76 goat farmers who submitted to structured

interviews in the study areas. The study was designed with the goal of making recommendations for existing extension programs to better serve goat farmers.

Significant differences were found in the preferences regarding technology disseminators and methods of instruction between farmers who belong to groups and those who do not. Preferences did not vary significantly between adopters and non-adopters; however, some demographics distinguish farmers in these two categories. NGOs and agro-dealers were the least preferred technology disseminators, and leaflets were the least preferred method of instruction.

Results revealed that more women than men raise goats in the two study districts. Landholding sizes were very small for the goat farmers participating in this research. The Malawian Government should design interventions deliberately tailored to women with small landholding sizes if goat production in the two districts is to develop substantially. Also recommended is an extensive, nationwide evaluation of the effectiveness of using lead farmers in technology message dissemination. Additional research is needed to help extension fulfill its mission of serving the needs of smallholder farmers.

CHAPTER 1: INTRODUCTION

Background and Setting

One of the most important roles extension plays is that of linking researchers and farmers, transferring new technologies developed by scientists. To build strong linkages with clientele, extension uses communication methods and tactics that are relevant for end-users. In most extension systems in the world, there exists pluralistic service provision where there is more than one extension service provider. Service providers may include government extension workers who provide the fundamental basis for message transfer, staff employed by non-governmental organizations (NGOs), local agricultural traders and lead farmers who reside in each village. Consequently, different methods are used in transferring technologies from research to farmers. At the same time, it is important to note that farmers may have a preferred method of instruction that differs among adopters and non-adopters of recommended practices and technologies (Riesenberg & Gor, 1989). There may also be particular characteristics that distinguish adopters and non-adopters (Bultena & Hoiberg, 1983; Diederen, van Mejil, Wolters, & Bijak, 2003; Rollins, 1993).

Farmers who adopt new technologies do so for various reasons. Previous studies indicate that farmers may adopt a technology due to social factors such as belonging to a group, association or village (Adesina & Moses, 1993; Bandiera & Rasul, 2006). Other

adopters are simply intrigued by the novelty of the new technology and its potential to improve their economic advantage or wellbeing (Adesina, Mbila, Nkamleu, & Endamana, 2000; Adesina & Moses, 1993). Similarly, farmers who do not adopt new technologies may also have reasons for not adopting. While some researchers argue that adoption occurs slowly as the new technology gains popularity, other schools of thought assert that non-adopters simply do not perceive the benefits of adopting (Diederen et al., 2003). Previous studies have also shown the differences in perceptions of the new technology by adopters and non-adopters, perceptions that are influenced by personal opinions on one hand and market forces on the other (Mendola, 2007).

In the studies cited above, adopters are separated from non-adopters based purely on their responsiveness to a new technology. Little demographic data is collected to substantiate the claim of existing differences between adopters and non-adopters (Zeller, Diagne, & Mataya, 1998). Diederen (2003) examined several innovations and the factors influencing the farmer's adoption decision. However, the researcher acknowledged that the weakness with compounding different innovations is that specific characteristics of adopters are compounded for all innovations. This means, for example, it would be difficult to generalize the results of that study specifically for goat farmers in a rural country, since other innovations might have included heavy farm machinery unavailable to this category of farmers (Diederen et al., 2003).

The current study was designed to identify characteristics that distinguish adopters from non-adopters, traits that are peculiar to each category for goat farmers in two districts of Malawi. The study explored goat farmers' preferred method of instruction

and the various characteristics that distinguish goat production technology adopters and non-adopters.

The site for this research was Malawi, a developing country in southeast Africa. The Republic of Malawi is bordered by Zambia to its northwest, Tanzania to its northeast, and Mozambique on the east, south and west. The country is separated from Tanzania and Mozambique by Lake Malawi, the fifth largest lake in the world (LakeNet, 2003). In terms of size, Malawi covers more than 118,000 square kilometres and has an estimated population of more than 13.9 million. Lilongwe is the capital city and the second largest city behind Blantyre.

Agriculture is the most important sector of the Malawian economy, employing about 80% of the total workforce, contributing over 80% to foreign exchange earnings, accounting for 39% of gross domestic product (GDP) and contributing significantly to national and household food security. The agricultural sector has two main sub-sectors: the smallholder sub-sector that contributes more than 70% to agricultural GDP and the estate sub-sector that contributes less than 30% (Malawi Ministry of Agriculture [MMoA], 2008). Smallholder farmers cultivate mainly food crops such as maize (the main staple grain), cassava and sweet potatoes to meet subsistence requirements. Estates focus on high-value cash crops for export such as tobacco, tea, sugar, coffee and macadamia. Smallholder farmers cultivate small and fragmented land holdings under customary land tenure with yields lower than in the estate sector. Malawi Ministry of Agriculture (MMoA) (2008) notes that owing to population pressure, resulting in the fragmentation of land, the national average land holding size has fallen from 6 acres per household in 1968 to 2 acres per household in 2000.

Because Malawi's independence, development resources, strategies and policies have been heavily biased toward agricultural development. Malawi has benefited from substantial donor programs over many years but, until very recently, has suffered from chronic food insecurity at both household and national levels. Agricultural exports have remained undiversified, with little value addition. Most Malawians are poor, with more than half (52.4%) of the population living below the poverty line (MK44 per person per day) and nearly one-fourth (22.4%) of the population barely surviving. Socio-economic indicators illustrate the depth and intractability of poverty. For example, levels of malnutrition remain high, with 43.2% of under-5-year-old children stunted and 22% underweight in 2004 (Kaumbata, 2009). Infant mortality and morbidity remain high with 104 deaths per 1,000 live births in 2004-05. There is also high prevalence of HIV and AIDS, recently estimated at 12% (National Statistical Office of Malawi, 2006).

Crop yields have been too low to provide adequate national growth. Furthermore there has been low uptake of improved farm inputs and smallholder agriculture remains unprofitable. This situation is exacerbated by weak links to markets, high transport costs, few and weak farmer organizations, poor quality control and inadequate information on markets and prices. Due to high risks in agricultural production and poor access to credit, investment and re-investment have been poor. Most studies show that the performance of the Malawi economy and the agricultural sector was much better in the first 15 years of independence, a period that was characterized by active state interventions in markets. The growth in per capita agricultural output averaged 1.9% in the 1970s, compared to minus 2.3% in the 1980s, 5.5% in the 1990s and 0.36% between 2000 and 2005. However, these aggregate figures disguise the fact that growth was narrowly confined to

the estate sector and to smallholders with larger landholdings. The poor were excluded from many development programs, leaving a legacy of poverty (MMoA, 2008).

Prevailing poverty is a serious constraint to agricultural growth. The track record of past development programs has dramatically changed with the introduction of broad-based initiatives which began with the starter pack program in 1998. In this program, farm families were provided with a free pack containing 20 kg fertilizer and 2 kg maize seed. This initiative was further developed into the bold Farm Input Subsidy Program (FISP) since the 2005-06 agricultural season to date. Under FISP, farmers purchase 2 50 kg bags of fertilizer, one basal and one top dressing, 10 kg maize seed and 5 kg of selected legume.

These programs have explicitly recognised that the major factor holding back adoption of more productive and diversified agricultural technologies is the lack of purchasing power among the 52% of Malawians who are classified as poor. Farmers have been requesting access to inputs they need to lift themselves out of poverty. There is strong evidence showing that where Malawians can get the inputs they need, their response to production technologies is fast and substantial (Buffie & Atolia, 2009; MMoA, 2008).

Livestock production is an integral part of agricultural production in Malawi. Compared to crop production, livestock constitute a relatively small sub-sector in Malawi's agriculture, with rural populations more likely to own livestock than their urban counterparts (Pica-Ciamarra, Tasciotti, Otte, & Zezza, 2011). The livestock sector is typically a low-input-low-output management system with more than half a million smallholder families (E. Chirwa, Kumwenda, Jumbe, Chilonda, & Minde, 2008; Malawi

Ministry of Agriculture [MMoA], 2003a). Higher outputs of livestock production are achieved by a relatively small number of large-scale intensive commercial livestock/poultry enterprises, most of which are located in the urban and peri-urban areas of Blantyre, Lilongwe and Mzuzu cities. Intensive production enterprises include broiler and layer production, beef cattle feedlots, pig and dairy. Malawi is a typical example of the distribution of livestock species across the farming population otherwise known as the 'livestock ladder,' in which poorer populations keep poultry and small ruminants, and the more affluent raise large ruminants such as cattle (Pica-Ciamarra et al., 2011).

Major constraints to livestock production include lack of improved breeds, lack of affordable high-quality feed, a weak livestock extension system, lack of appropriate managerial skills, lack of appropriate technology and weak livestock veterinary services. Of these, lack of quality feed at affordable prices is the major problem. With low productivity, the livestock sector contributes less than its potential to national economic and agricultural growth (Safalaoh, 2004).

In an attempt to facilitate the sustainable development of the livestock sub-sector in Malawi and to respond to current national development objectives, the Malawi Government developed a National Livestock Master Plan in 1999. The plan includes a coherent strategic framework of desired policies, institutional reforms, legislative adjustment and investment programs. The plan recognizes the functional link between the crop and livestock sub-sectors in relation to the livestock feed base (MMoA, 2003a).

Assistance by the Malawi Government has focused largely on increasing production of various livestock species. However, these efforts are not accompanied by a matching investment on the delivery system of livestock-oriented extension services,

leading to a general disinterest toward privatized livestock enterprises. The poor performance of the livestock sector is partially a reflection of the lack of emphasis in the agricultural strategies and policies toward the sector (E. Chirwa et al., 2008). This slow development of the livestock sector is due to, among other factors, low levels of investment in the industry, low production levels, economic policies biased against the sector, decline in funding for livestock programs, and inadequate services in the sector (Banda, 2008). However, potential for growth exists as demand for livestock and livestock products increases at the household level. Banda (2008) asserts that given current livestock demand and supply trends, there will be a supply gap of between 15% and 30% among the various livestock products by the year 2017.

Livestock populations have been increasing at a slow, steady rate. Goat populations have increased due to the increasing presence of non-governmental organizations that have promoted goats as a cheap source of protein (Banda, 2008; Banda, Kamwanja, Chagunda, Ashworth, & Roberts, 2011).

Goat production offers several advantages. These livestock are easy to raise as they are not food-selective and can be left on free-range. Their feed consumption is much lower compared to other larger animal types like cattle. They also have short reproduction reproductive cycles, and can reproduce faster and in more numbers than other larger livestock species. Goats are prolific breeders, reaching sexual maturity at 10 to 12 months and often bearing twins (Saheb, 2011). In addition, goat housing is made from cheap, locally-available materials, making goat production a cost-effective enterprise for the average rural farmer. Goats are a good source of meat and milk protein for sectors of the population that cannot afford beef, pork or fish. They are also very

marketable, and are typically sold for an average of K1,500 to K2,500 ($40 to $50) in 2010.

Statement of Problem

There is perceived variation in how goat farmers in Malawi adopt technologies related to improving the productivity of their farms. The Malawian extension policy, in collaboration with other non-government extension service providers, assumes a blanket approach in delivery of new technology information to all farmers. The researcher hypothesized that goat farmers have preferred methods of instruction, and that there are quantifiable characteristics that differentiate adopters, non-adopters, and late adopters of these technologies. This study was designed to explore the preferences of the method of instruction by adopters and non-adopters, and to explore the different characteristics that define adopters and non-adopters among Malawian goat farmers. This study was designed with the goal of making recommendations for existing extension programs to better serve goat farmers.

Importance of Study

At the dawn of the new millennium, the Malawi government recognized the need to embark on a shift in policy from state-controlled extension service provision toward pluralistic demand-driven services (Malawi Ministry of Agriculture & Irrigation [MMoaI], 2000). This shift had several implications, including a deliberate involvement of other extension service providers in carefully planned service delivery systems. The implementation of the new extension policy hinges heavily on collaboration with the partners as one of the guiding principles.

One of the resultant effects of the policy shift was the proliferation of extension service providers, especially at field level. Where NGOs would rely on the government extension worker previously, they began to employ their own field staff to transfer technologies to farmers. Simultaneously, farmers were increasingly organizing into associations and cooperatives, some of which started offering extension services to fellow farmers. Only a couple of years after the inception of the new policy, extension service provision was no longer the sole responsibility of government-employed staff (Khodamoradi & Abedi, 2011a).

The Malawian agricultural extension system has had its own challenges throughout the decades. One of the major challenges is population increase, coupled with diminishing government extension staff levels due to staff turnover. To mitigate these negative impacts, the Malawi government has fostered collaboration with other stakeholders at the field level to disseminate agricultural technologies. The government has also engaged lead farmers in technology message dissemination. Lead farmers visit fellow farmers to introduce new technologies or to reinforce existing messages. They report to field extension workers on progress made in reaching out to farmer clubs and committees. However, the lead farmer concept has been implemented without thorough research and impact analysis.

The multiplicity of extension services posed a significant challenge: fostering coordination among the stakeholders. Coordination was earmarked as one of the unaddressed challenges of agricultural extension in Malawi (MMoAI, 2000), and pluralism poses more challenges yet. The same goat farmer, for example, is now reached with technical messages on feeding by the government agent, the NGO staff, the lead

farmer and the agro dealer from within the vicinity. Therefore, different messages may reach the same goat farmer, possibly with little or no awareness of the teachers themselves.

At the same time, the farmer likely has preferences on whom to listen to as a source of knowledge (Nooteboom, 1992). These preferences are based on such factors as the farmer's perceptions of reliability and availability of the extension service provider, and the perceived sustainability of the flow of information. Because farmers are still grappling with the novelty of pluralistic extension service provision, it is not unusual that the farmer would perhaps prefer to receive information from an extension worker employed by government. This is also compounded by inadequate involvement of field-level non-government extension service providers in policy and strategy development (Batley & Mcloughlin, 2010). It is important to explore farmers' preferences for educators among those that are also trained by the government extension worker. Such results would help identify the social factors that lead to preferences for a particular source of information as well as for a particular method of instruction over another.

Transfer of information is targeted toward adoption of a specific technology. What are the characteristics of farmers who adopt technologies? Knowing these characteristics will enable extension workers to package technical knowledge in more effective ways, helping increase farm productivity through increased adoption of new and relevant practices and technologies (Rogers, 1995). Through this research, extension would be able to better target adopters and non-adopters using relevant methods to improve their farming endeavors.

Research Questions

The following research questions guided this study:

1. What are the demographic characteristics that describe goat farmers in two districts of Malawi who do, and do not, adopt new animal management technologies?
2. What are goat farmers' preferences for delivery systems and methods of instruction regarding information on new goat production technologies?
3. What are goat farmers' preferences for delivery systems and methods of instruction regarding goat production practices and technologies by those who have participated in group instruction compared to individual instruction?
4. What are goat farmers' preferences of delivery systems and methods of instruction among those who have adopted innovative goat production practices and technologies compared to non-adopters?

Basic Assumptions

Several assumptions were made in the study, as follows:

- The researcher assumed that goat farmers are willing to participate in governmental efforts to advance and promote the production and utilization of goats and goat products.
- It was also assumed that the government would be interested in knowing how to reach goat farmers with relevant and timely technological messages with the

overall objective of increasing the adoption of adoption of recommended practices and technologies.

- The researcher assumed that extension service providers would be willing to receive feedback on farmers' perceptions of their performance, with the aim of developing better service packages and improving their effectiveness.
- The researcher assumed that farmers would be more likely to participate in the research if the protocol used existing procedures for contacting and recruiting farmers, that is, through village structures and extension systems. The study therefore used extension workers as the channel to reach village leadership who, in turn, informed potential farmer participants of the study.
- Finally, the researcher assumed that the use of questionnaires translated into the vernacular language would adequately capture the required information from participants, based on low literacy levels. The prevalence of low literacy levels in the study area also encouraged the use of research assistants to further probe for requested information.

Limitations

The study was conducted in the Blantyre and Salima districts of Malawi. The location of the study limits generalization of results to other districts in the country. Results may be specific to the farmer-participants in this study.

A second limitation results from the high levels of illiteracy in the rural farming communities from which the samples were drawn. The researcher translated the questionnaire into the vernacular language and, as discussed in Chapter 3, employed structured interview techniques to administer the questions to participants. In addition,

research assistants were recruited to explain and clarify questionnaire items to participants.

Finally, a limitation exists, as is typical in social science research, in that the researcher brings his own biases and preconceived notions into the research process. Several steps were taken to address this potential limitation. First, the researcher was guided by the literature and his theoretical perspective (Chapter 2) in conceptualizing and designing the study. Second, in order to acknowledge and reflect on his own potential biases (as a government extension professional) that could influence study outcomes, the researcher described his research paradigm in Chapter 3. Finally, the researcher was encouraged to work with his graduate committee throughout the research process so that key decisions could be based, as much as possible, on recommended social science conventions and recommended research practices.

CHAPTER 2: REVIEW OF LITERATURE

Purpose of the Study

Farmers have a preferred method of instruction that differs for adopters and non-adopters of new technologies in goat production. Adopters and non-adopters have distinguishing characteristics that are common for each category of adoption. This study explored preferred methods of instruction by adopters and non-adopters, as well as the different characteristics that define adopters and non-adopters among Malawian goat farmers.

Findings from this research will enable extension to better target adopters and non-adopters using relevant methods to improve their farming endeavors. Designed with the goal of making recommendations for existing extension programs to better serve goat farmers, the study addressed the following research questions:

1. What are the demographic characteristics that describe goat farmers in two districts of Malawi who do, and do not, adopt new animal management technologies?
2. What are goat farmers' preferences for delivery systems and methods of instruction regarding information on new goat production technologies?

3. What are goat farmers' preferences for delivery systems and methods of instruction regarding goat production practices and technologies by those who have participated in group instruction compared to individual instruction?
4. What are goat farmers' preferences of delivery systems and methods of instruction among those who have adopted innovative goat production practices and technologies compared to non-adopters?

This chapter provides a review of literature conducted to support study objectives. A summary of the review of literature methodology is provided, followed by a description of the Malawian extension system, extension approaches used in Malawi, and various social and structural challenges that could influence technology transfer. Conceptual and theoretical frameworks used to guide the study are then introduced, followed by a discussion of study variables.

Literature Review Methodology

The review of literature undertaken to support this study was conducted from the period of February 2011 to October 2012. To identify relevant online papers and documents, the researcher utilized search engines of Google Scholar and EndNote software through Purdue University Libraries. Both resources allowed for the retrieval of full-text documents from a variety of libraries and other sources. Keywords used in the search included 'adoption,' 'farmer preferences,' 'extension provision,' 'adopter characteristics,' and 'innovation diffusion.' Because relevant literature such as Malawian government documents was often not available online, the researcher also accessed a number of papers in hard-copy form while in Malawi.

The Malawian Extension System

Soon after independence in 1964, the Malawi government was significantly involved in the smallholder agricultural sector, controlling production, extension, marketing and technology development (Daudi, 2007).

The Department of Agricultural Extension Services is one of the seven departments in the Ministry of Agriculture and Food Security (MoAFS). Its headquarters is located in the capital city of Lilongwe, and eight administrative divisional offices are located according to ecological zones throughout the country. Each zonal office, referred to as Agricultural Development Divisions (ADDs), is responsible for a number of districts, from two to seven, also according to ecological zones. The districts are further subdivided into Extension Planning Areas (EPAs), where field officers work with farmers in sections of clustered villages (Figure 2.1).

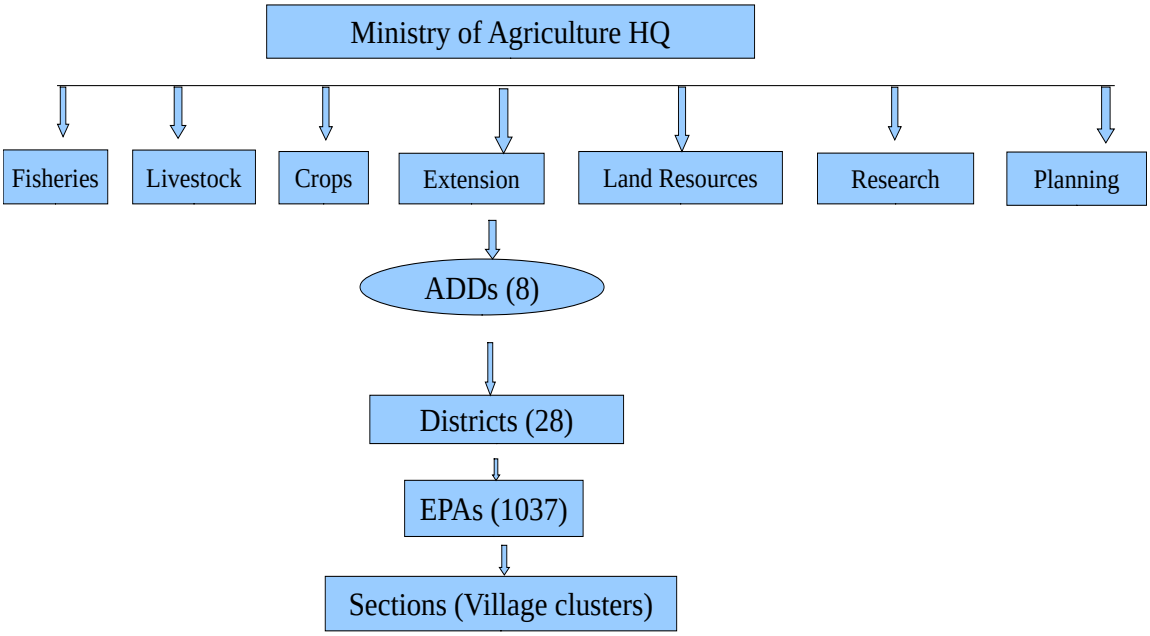

Figure 2.1 Structure of Ministry of Agriculture

In 2000, the Ministry of Agriculture and Food Security decided to align its operations at the district level to the newly introduced decentralization policy by developing a new extension policy (MMoAI, 2000). The policy aims at enabling farmers to demand for interventions required to develop their farming practices; it also recognizes the presence of several stakeholders in extension service provision, including NGOs, farmer organizations and other donors, alongside government.

The recognition of multiple players in extension service provision is one of the strengths of the new policy. Farmer organizations are on the increase in the country, fuelled by adoption of diversification messages (Buffie & Atolia, 2009). As more farmers diversify their farming practices, the need for more associations and cooperatives increases, as does the need for farmer organizations to have a forum for voicing their concerns.

Realizing this development, the Ministry of Agriculture responded by initiating an extension system that would aggregate farmer demands, seek relevant responses, and send feedback of utilization of those responses. The initiation of the new extension system coincided with a drive by the United Nations' Food and Agricultural Organization (FAO) to introduce pluralistic extension service provision in Asia and Africa. These new extension systems were expected to promote the sharing of costs and control of service provision between government and its implementing partners in the participating countries. Malawi thus introduced the District Agricultural Extension Services System in 2001.

Overview of the District Agricultural Extension Services System

The District Agricultural Extension Services System (DAESS) was developed to operationalize the new extension policy. The DAESS is the current system employed by the government of Malawi in reaching out to farmers with technologies and in collecting farmers' demands for research and other appropriate action (Malawi Ministry of Agriculture [MMoA], 2006).

The system runs parallel with the administrative local government system and structures at the district level. Linkages between the two structures are made from the local community level all the way to the district level.

According to MMoA (2006), the system is hinged upon four pillars. The first pillar focuses on creation of an enabling environment for farmers to voice their demands. This translates into organizing farmers into groups of common interests or enterprise for ease of identification of demands per enterprise. This pillar also necessitates linkages between these farmer groups and existing local administration structures called Development Committees existing at two levels: Village (a collection of about 20 to 40 farming families, led by a Village Headman) and Area (a collection of villages headed by a Traditional Chief). Field extension workers are expected to participate as members of the Area Development Committee, assisting local communities in voicing their demands and selecting appropriate service providers. These local administration structures are managed under the Ministry of Local Government, which is in charge of the decentralization drive, while most extension staff at field level are either under the Ministry of Agriculture, Health, Social and Community Development or Education.

The second pillar of the DAESS rests on collection of responses to the demands by various extension service providers. Once farmer groups have identified their demands with the assistance of extension workers, they can identify appropriate extension service providers best able to provide those services. It is at this point that pluralism comes into play; this pillar assumes that there is adequate awareness of numbers and types of existing service providers in various communities. Each service provider has a role of marketing itself to its clientele; however, the final choice of extension provider rests with the farmers. Through participation in the existing district technical forums, Extension service providers are made aware of potential intervention areas, and they select the physical location and type of intervention each can provide. This pillar necessitates the formation of a District Stakeholders Panel comprising all extension service providers including NGOs, farmer organizations and government extension workers at the district level. This concept has led to interaction of these district-level stakeholders in innovation platforms (Kabambe et al., 2012) as one way of encouraging farmer participation in technology development. It is at this panel that technical issues, including areas of potential further research, are transferred from farmers to extension workers and vice versa. Discussions also focus on relevant technologies suitable for that particular district. The District Stakeholders Panel also serves as a forum for farmers to interact with technocrats and give them feedback on improving contact and dialogue.

Malawi Ministry of Agriculture (2006), in the DAESS Implementation Guide, depicts the Stakeholders Panel as a forum for discussion of, or reaching consensus on, topical issues that concern farmers at the district level. The guide depicts the panel diagrammatically as shown in Figure 2.2:

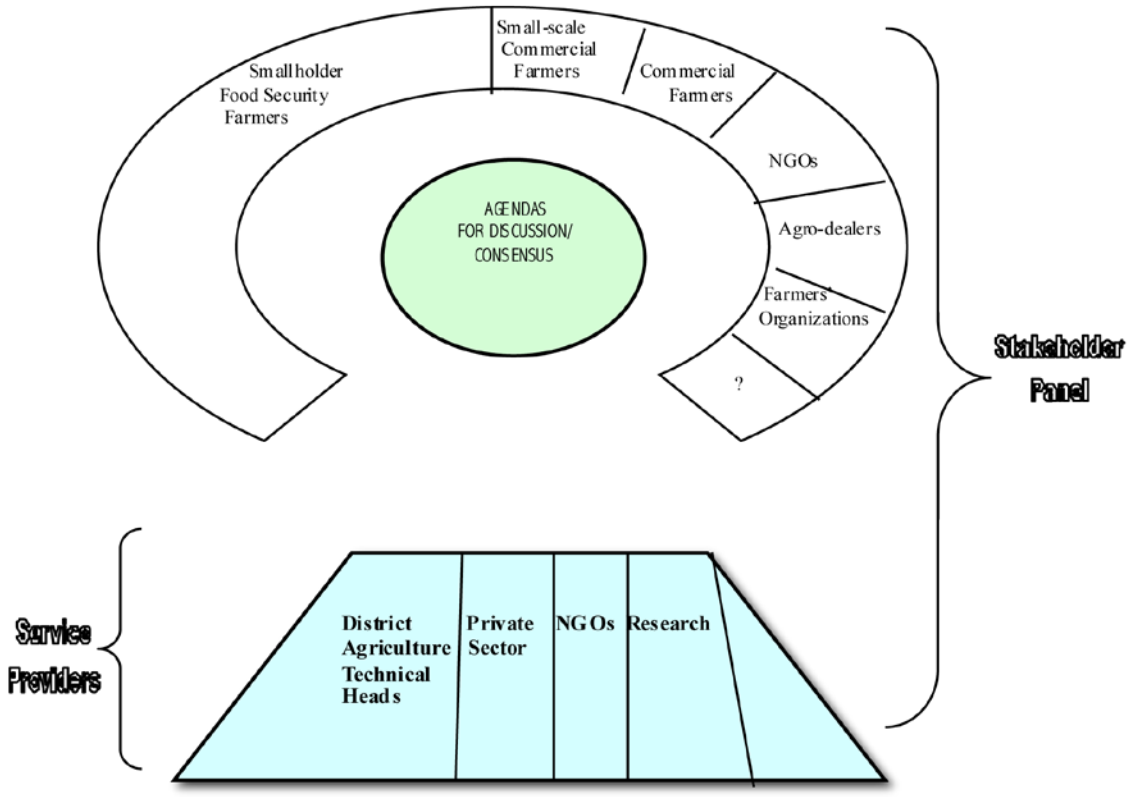

Figure 2.2 The District Stakeholder Panel

From responding to farmer demands, fostering coordination among the service providers is the third pillar. In a bid to avoid duplication and create synergies, the third pillar stresses collaboration mechanisms through utilization of existing local administration structures and creation of new ones. Existing structures at the district level, such as the District Executive Committee (DEC), serve as meeting points of all service providers in the district. Since the agenda for such meetings is usually quite long, incorporating technical issues from all sectors of the district, those extension workers dealing with agriculture created their own forum known as the District Agriculture Coordination Committee (DAECC). In DAECC, district-level extension workers plan,

implement and evaluate their interventions together in response to the identified demands from farmers. Reports of progress in the agriculture sector are produced and presented to the bigger technical forum, the District Executive Committee (DEC). The DEC is the largest technical arm of the local administrative structure. It reports to the Local Assembly (LA), which is made up of Traditional Chiefs and Members of Parliament.

The LA is responsible for identifying and authorizing relevant projects that will be funded through the Assembly's funds. If the LA determines that funds will not be sufficient for a particular project, it is mandated to identify alternative sources of funds. The LA is also mandated to request supplementary budgetary support from the central government. The DAESS therefore engages the LA in its last pillar which serves to identify sources of funding for the implementation of response activities. Members of Parliament take topical issues to Parliamentary sittings and lobby government's support for their areas. Agricultural projects that the LA cannot fund on its own are taken up by government, and appropriate donors identified. Because this task is already part of the job description of the Members of Parliament as local administrators, it is yet to be clearly stipulated in the DAESS how the Members can play additional roles in implementation of the DAESS' last pillar.

MMoA (2006) further explains the role of its field- and district-level staff in aiding the implementation of the system. However, the DAESS is silent on the role of lead farmers, who form an important and ever-growing part of the country's extension system. This may partly be attributed to the fact that the lead farmer concept is a relatively new phenomenon in the country, coming after the implementation of the DAESS. The actual lead farmer concept note is also silent on linkages between the lead

farmers and the DAESS. The lead farmer roles stipulated in the concept note deal only with specific technical issues that address technology transfer.

Extension Approaches Used in Malawi

The Malawian agricultural extension system utilizes several approaches in its delivery of extension services. Extension approaches used in Malawi include group, individual and mass media. The individual approach is characterized by an extension worker visiting individual farmers and persuading them to adopt technologies, then following up with farmers after adoption. Support is provided on a personal basis. The advantage of this approach is the personalized packaging of information based on the individual needs of the contacted farmers. This approach, however, relies largely on an extension worker who resides within the farming community and personally knows the farming and learning preferences of individual farmers in that community.

Studies have shown that research-extension-farmer linkages have economically impacted farm productivity, farm incomes, and consumer welfare (Evenson, 2001). Most of the farmers in Malawi are contacted through their self-formed groups or extension worker-facilitated committees. The group approach premeditates an organization of farmers into some form of club, association, cooperative or committee through which farmers can voice their demands, and extension can reach them with technical messages. These groups are either self-forming or formed by deliberate efforts of intervening organizations to facilitate rapid flow of information and encourage quick adoption of technologies. The extension worker thus meets the farmers in their interest groups as compared to meeting individuals from respective villages. This extension approach is the most preferred in Southern African countries, including Malawi (Bembridge, 1987).

Mass media are used in extension as a quick, efficient way of reaching a large number of people either as individuals or as groups. Radio, television, newspapers, magazines and other media are used to present emerging issues in agriculture, introduce new technologies and reinforce good husbandry practices in crop and livestock production. In Malawi, most agricultural radio programs are aired at strategic times to reach the smallholder farmer, usually in the afternoon when the farmer is back from the fields. More and more smallholder farmers own radios; there is also a growing culture of radio-listening forums or clubs (Manyozo, 2007).

The Department of Agricultural Extension (DAES) collects current issues from district agricultural offices after the District Agriculture Committee of the local assembly has given assent. Consequently, DAES, through its Agricultural Communications Branch, produces technical messages that are then aired on radio and television, distributed as leaflets, magazines and flyers, or reinforced by government extension workers through individual or group farmer contact (MMoA, 2006).

Challenges to Agricultural Extension in Malawi

Government of Malawi lists several challenges in the delivery of extension services in that country (MMoAI, 2000). However, these data were collected in 2000. A situational analysis of current issues in extension might reveal that some of these challenges have been mitigated, or worsened, or others have emerged.

Due to changes in the structure of the economy, government has reduced its spending in the public sector, leading to shrinking public-sector resources. There exists more competition for fewer resources for agricultural activities; hence prioritization has usually left very few resources available for agricultural extension work.

The country's ever-increasing population has translated into more work for existing extension staff. Some NGOs do not employ their own field staff, and depend on the same government field personnel. However, the number of government extension field staff has been decreasing due to attrition among other factors, resulting in higher farmer-to-extension worker ratios. This has forced the Department of Extension to initiate the use of lead farmers in the transfer of technologies as one of the coping mechanisms to the situation.

Poor coordination among stakeholders in provision of agricultural extension services was identified as one of the challenges to extension in Malawi in 2000. Since then, more NGOs and agro-dealers have emerged, emphasizing the need for better coordination among the extension partners (Davis, Faure, Nahdy, & Chipeta, 2009; Khodamoradi & Abedi, 2011b). Coordination is required at all levels, from the national level to district and field levels.

The government of Malawi embarked on a decentralization program under which functions of development, implementation, coordination and evaluation of activities would be devolved from central to local government. The program is listed here as a challenge to extension as the district now requires enhanced capacity to carry out these functions (Adebayo et al., 2010). At the time of the policy’s development in 2000, districts had insufficient human and material capacity to implement these functions, let alone generate their own resources to run independently. This challenge may justifies the presence of multiple stakeholders in the extension sector at district level to strengthen human capacity at that level.

The ‘Lead Farmer’ Concept

The Government of Malawi implemented the lead farmer concept as a means of mitigating the impact of a high and ever-increasing farmer-to-extension worker ratio caused by staff turnover among other factors (Malawi Ministry of Agriculture [MMoA], 2003b). MMoA (2003b) defines a ‘lead farmer’ as an individual farmer who has been elected by the community to perform technology-specific farmer-to-farmer extension and is trained in the technology. MMoA (2003) continues to describe the lead farmer as one who 'has been trained by the extension worker and has mastered the technology.' This means that any farmer can be elected by the community to serve as a lead farmer, as long as that farmer implements the specific technology and is trained by the extension worker. The lead farmer concept uses farmers who have adopted sustainable farming technologies to disseminate technical messages to other farmers. Lead farmers train fellow farmers and demonstrate the particular technologies and practice (Snapp & Minja, 2003).

The Government of Malawi explains the process of identifying lead farmers. Sensitization meetings to orient the village on the lead farmer concept are done before electing lead farmers to assist in technology transfer. Once nominees have been approved by the local leadership, they are informed of their new roles and immediately undergo training by the extension worker. Training topics include facilitation skills and further technical knowledge development in the farmer's particular field of interest.

Lead farmers perform various roles. According to MMoA (2003b), lead farmers' roles include teaching others, implementing new technologies, facilitating formation and implementation of action plans with farmers, and liaising with the extension workers. Lead farmers are also expected to multiply extension technologies through farmer

training, field days, extension meetings, demonstrations and local field tours. Lead farmers report to the AEDO, giving feedback on problems faced during adoption of extension technologies.

There are several advantages of lead farmers, according to MMoA (2003b). There is assumed easier and faster dissemination of technical information to farmers since the lead farmer lives in the community. The underlying assumption is that training the lead farmer is as good as training the whole community in which this individual resides, because the lead farmer will successfully transfer the learning to the rest of the community. The concept also proposes that there is enhanced communication because the lead farmer shares the same cultural beliefs and language as the community. Probably the most critical advantage proposed by the concept is the idea that there is more swift adoption of agricultural technologies because the learning is from fellow farmers. The assumption that learning from fellow farmers is easier is what drives this research.

Different organizations reward lead farmers differently. There is no set standard for rewarding or compensating lead farmers, hence, some NGOs would pay K6,000 ($40) and others a varied honorarium. The Malawi Government does not pay lead farmers in cash, but provides them with training, training kits and bicycles for free.

Farm Input Subsidy Program

The agricultural extension system in Malawi has evolved over the years from a training and visit extension system to a more decentralized, pluralistic one (MMoAI, 2000). Sector changes have occurred, due to emerging policy directions, government interventions (such as input subsidies) and dynamic farmer demands (Denning et al., 2009). Probably the most notable achievement of the Malawi Government in the

agricultural sector within the past five years is the Farm Input Subsidy Program (FISP). This program has led to structural changes within the agriculture sector, which has experienced a record financial investment by the government (Harrigan, 2003). This investment, however, concentrated on purchase of farm inputs such as seed and fertilizer, with minimal or no extra budget allocations for local government structures and extension support to implement the program (Buffie & Atolia, 2009). The Malawi government acknowledges that the capacity of central and local government structures to handle such a large-scale program is a potential problem (MMoA, 2008). However, these structures are 'learning' by experience, as evidenced by subsequent implementation successes of annual subsidies from 2006 to date (Dorward, Chirwa, & Jayne, 2011). Effective extension involves timely and adequate access to information by farmers (Anderson & Feder, 2007). Extension has over the years failed to satisfy increasing demands for technology transfer, fuelled by pressures of increasing food production (Lodhi, Luqman, & Khan, 2006).

Umali-Deininger (1997) proposes that agricultural information can be divided into two categories: pure and embedded. Pure agricultural information may include cultural and production techniques, farm management, marketing and processing information, and community development, such as the organization of farmers' associations. Embedded agricultural information includes methods by which farmers can obtain agricultural information indirectly, through technologies used in farm production, such as new agricultural equipment, chemicals, seeds, pharmaceuticals, and livestock breeds; technologies that facilitate farm management, such as telecommunications, laboratory equipment, computers, and software; and post-harvest equipment, such as

threshing, drying, milling, storage, and packaging technologies. Oftentimes, these technologies are combined and presented to farmers as a package, usually in the form of credit or subsidy and technical assistance in the form of extension services.

Extension plays a critical information role in the Malawi Input Subsidy Programs. A crucial component of the programs involves information packs for farmers' use (FutureAgricultures, 2010). The training kits are information packs consisting of informational handouts or documents addressing the lead farmer's area of interest. These documents may explain the technology in question, and may also provide more information on facilitation skills for the lead farmer. While the actual contribution of the information packs to the success of the programs is yet to be established, the programs demonstrate a potentially viable avenue for extension to disseminate needed technology information to farmers.

Conceptual Framework

This review of literature has addressed the structure of the Malawi extension system as well as some of the approaches and the major actors involved in dissemination of agricultural information in Malawi. The current and following sections propose a conceptual and theoretical framework to help guide this research in support of study objectives.

The conceptual framework was based on the concept that farmers who adopt new goat management technologies have distinguishing demographic characteristics that differ from those of non-adopters. Additionally, it is asserted that the preferences for the method of instruction and technology disseminators are different for adopters and non-adopters. Preference for the technology disseminator is influenced by the availability,

reliability and consistency of the information source. This study was therefore based on the conceptual framework that characteristics, preferences for technology disseminators and preferences for method of instruction distinguish adopters and non-adopters, as depicted in Figure 2.3.

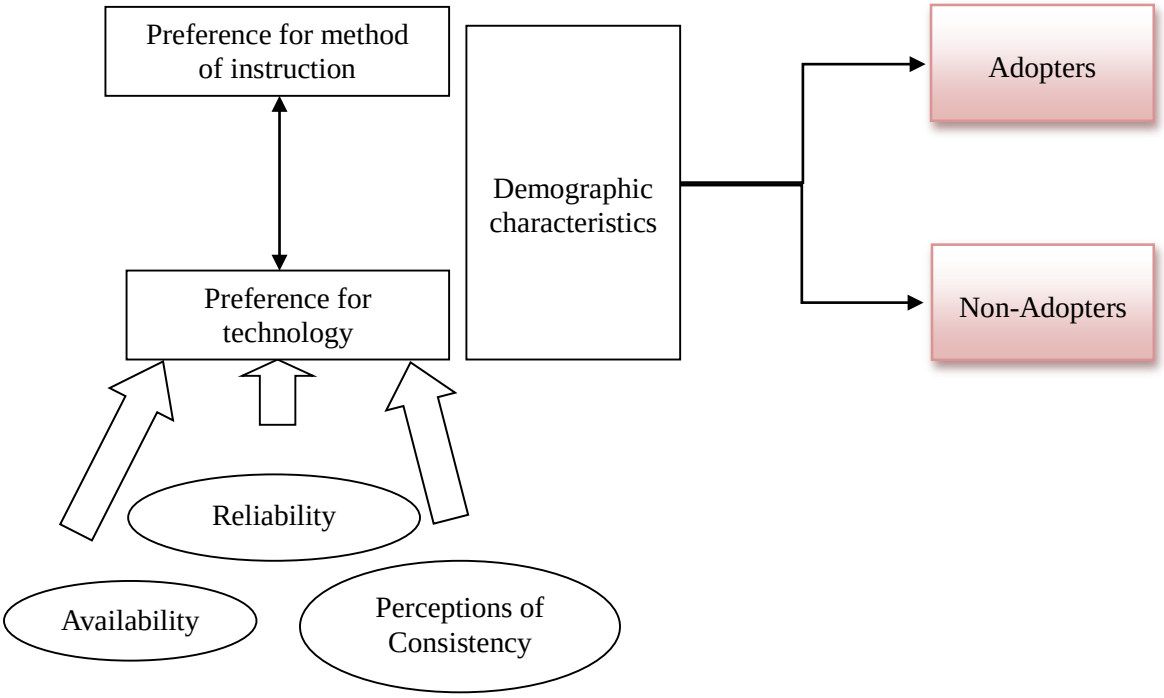

Figure 2.3 Conceptual Framework Depicting Demographic Characteristics Distinguishing Technology Adopters and Non-Adopters

Characteristics of Adoption Categories

Adoption behavior may be depicted by more than one variable. It may be depicted by a discrete choice, whether or not to utilize an innovation, or by a continuous variable that indicates to what extent an innovation is used (Sunding & Zilberman, 2001).

Adoption is measured in terms of behavioral change. Changes in behavior are determined by contextual, cognitive and affective factors, and existing adoption theories deal independently with each of these – no single theory accounts for all three factors.

Technology adoption and diffusion theories attempt to answer why individuals choose to adopt a technology, and the influence of social context on the decision to adopt. There are three aspects of adoption: First, technology adoption is a complex, inherently social, developmental process; second, individuals construct unique but malleable perceptions of technology that influence the adoption process; and lastly, successful facilitation of a technology adoption decision must address cognitive, emotional and contextual concerns of the individual (Straub, 2009).

Social and Technological Perceptions

Farmer perceptions of technology-specific characteristics significantly condition technology adoption decisions (Adesina & Moses, 1993). There is always an uncertainty about the performance and properties of new technologies (Sunding & Zilberman, 2001). Farmers will therefore want to familiarize themselves with characteristics of the technology before they adopt. This familiarity may be achieved through their own or others' experiences.

Technology-specific characteristics may include profitability of the technology, complexity of the technology and its ability to reduce risks (Batz, Peters, & Janssen, 1999; Sunding & Zilberman, 2001). Technologies are adopted through different means. Adoption may occur due to imitation as the farmer is in contact with others (Sunding & Zilberman, 2001). The importance of social networks in technology transfer is emphasized in empirical research on the diffusion of knowledge and innovations, and individual reasoned behavior (Rogers, 1995; Sheppard, Hartwick, & Warshaw, 1988). Earlier research found that individual decision-making on adoption is influenced and affected by social norms, cultures and structures. An individual's ability to acquire

knowledge and select alternatives is driven by the person's ability to learn from himself or herself and from other members of society (Bandura, 1991). Bandura's extensive work on social cognition has yielded substantial support for the effect of the society on an individual and vice versa. However, there is a strong suggestion that the individual's decision-making capacity can withstand social pressure, meaning the possibility for an independent decision that is not solely influenced by peer pressure (Bandura, 1989; 2001). This feature of decision-making underscores the importance of individual clientele developing a positive impression of a technology if adoption is to occur quickly. Related to this phenomenon, the current research examines the role of farmer perceptions of the characteristics of the technology disseminators. Technology disseminators are people who frequently socialize with the farmer, enabling the farmer to develop (or not develop) preferences for that particular technology disseminator.

Theoretical Framework

Farmer Preference

The current study draws upon several theories relevant to perception and adoption. A seminal work is Wildavsky's theory of cultural preference formation (Wildavsky, 1987). Wildavsky presents that preferences are developed as a result of living with other people, whose support for and opposition to different ways of life generate preferences. He argues that an individual will develop preferences for certain things by measuring them against shared values that legitimize social relations. He argues that the social filter is the source of preferences.

Other authors support this view (Arnould, 1989; Dubois, Fargier, & Perny, 2003). This theory forms a basis for understanding why Malawian goat farmers might prefer one

source of information over another. Government extension workers usually train local agro-dealers and lead farmers. NGO staff also usually work hand-in-hand with Government extension workers. This relationship confers a type of authority on Government extension workers in terms of experience and training as compared to other information sources, portraying them as experts and other sources as novices. The Expert-Novice theory states that an instructor's knowledge and skills increase in a stepwise and cumulative manner. Skill acquisition in each new area typically proceeds through five skill levels: novice, advanced beginner, competent, proficient, and expert (Dreyfus & Dreyfus, 1980). The stages are further summarized into three: an initial stage of survival and discovery, a second stage of experimentation and consolidation, and a third stage of mastery and stabilization. This categorization deals with professional skill as a set of knowledge, skills and attitudes that is independent of the practice.

This delineation of professional skill from practice does not take into account the role of other factors. For example, skill development at work is reinforced by management activities such as systems appraisal, career progression and incentives (Dall'Alba & Sandberg, 2006). These authors fault earlier models in their assertion an embodied understanding of practice, rather than attributes, forms the basis for professional skill and its development. They argue that professionals use their knowledge and skills in performing their work depending on their embodied understanding of the practice in question. The professionals' way of understanding their practice forms and organizes their knowledge and skills into a particular form of professional skill.

Given these theoretical insights, one might conclude that extension workers must have a better embodied understanding of technology dissemination that would enable

them to win farmer confidence in technology transfer. They are advantaged by being in an established system that provides for skill development through managerial functions, including a monthly remuneration package. The theory suggests that, in the transfer of goat production technologies among Malawian farmers, field extension workers might well be preferred as sources of technological information over other sources, including lead farmers.

Adoption Behavior

This study also addresses the role of characteristics of adopters and non-adopters, and is driven by the diffusion of innovations theoretical perspective that was best articulated by Rogers (1995). The theory asserts that an innovation will be adopted in phases, diffusing first to a very few individuals and later spreading across the wider populace. Rogers describes how characteristics of the technology affect the adoption decision. The current study explores the method of instruction that will most influence goat farmers to adopt technologies, and the characteristics that distinguish adopters and non-adopters.

Studies have shown that learners have higher levels of motivation when learning in groups rather than as individuals (Slavin, 1980; 1991; 1996). Cooperative learning utilizes the power of peer review within and outside the classroom. Group social dynamics improve the sense of security and limit the fear of failure, leading to more complete acquisition of instruction. The current study examined whether goat farmers prefer cooperative learning as advocated by the current extension system, or individual contact, because they conduct their goat farming enterprises as individuals.

Very few of the theories and studies outlined in this chapter are based on rural African settings. This study therefore tested these theories in this context, providing further empirical support of the various constructs of the theories. Additionally, the selected theories are implicitly used as underlying assumptions in the current agricultural extension system in Malawi. Research using these theories will form a basis for their inclusion in subsequent revisions of the system, using redesigned approaches based on recommendations from this study.

Adoption Decision-Making

Research has been conducted in Africa examining the adoption of technologies and factors affecting adoption. Rogers's theory of innovations argues that adopters have different characteristics from non-adopters (Rogers, 1995). The current study explored some of these characteristics, including gender, landholding size, income level and education level. Several studies provided information on the relationship of these adopter characteristics to adoption.

In the case of gender, research by Chirwa (2005) on adoption of fertilizer in Malawi revealed that the gender of the household head determines whether or not that household will adopt a new technology. Results showed that female-headed households were less likely to adopt new farming technologies, especially those having to do with fertilizer application (Chirwa, 2005).

Low literacy rates are also associated with adoption decision-making. A study on adoption of agroforestry in Malawi showed that low literacy rates were a barrier to adoption of the technology. The study revealed that farmers with at least an elementary education contributed to 16% of the literacy rate. The study also showed that these rates

declined for female-headed households, by an average of 7.5%. Most of the study participants could not write in their native language, let alone speak English (Blatner, Bonongwe, & Carroll, 2000).

Landholding sizes are also associated with the adoption of technologies, and were a major factor contributing to the classification of farmers as adopters and non-adopters in the previously cited agroforestry study. Study findings revealed that farmers with smaller landholding sizes tended to adopt technologies much later than those with larger landholdings (Blatner et al., 2000). Another study on adoption of a certain bean variety called 'Kalima' in Malawi corroborated these results (Masangano & Miles, 2004) and recommended the use of information that can be easily understood by farmers in the promotion of technologies to ensure increased adoption even on smaller landholdings.

In terms of the role of income, Sirrine et al. (2010) conducted research in southern Malawi on improving recommendations resulting from on-farm research. Among their findings was that farmers' income levels determined whether or not they would be able to use fertilizers in their gardens. This in turn affected how they would adopt agroforestry trees that enhance soil fertility. This result provided another characteristic of adopters that was examined in the current research, in line with diffusion of innovations theory.

Research in the U.S. was conducted to examine Pennsylvania farmers' perceptions of their innovativeness, and to classify them according to generalizations of innovativeness (Rollins, 1993). The study used the farmer typology proposed in Rogers' (1995) diffusion model, grouping adopter characteristics into three categories: socioeconomic status, personality variables and communication behavior. In defining the groups, Rollins states that socioeconomic generalizations have to do with characteristics

such as age, while personality generalizations are about such traits as empathy, and communication behavior includes frequency of contact with extension agents. The study developed an 'Adopter Characteristics Questionnaire' with 15 variables, five from each of the three categories. A telephone survey was administered with 200 randomly selected participants. Using scores on the questionnaire, the study categorized 11% of the respondents as laggards, 37% as late-majority adopters, 33% as early-majority adopters and 18% as early adopters. None of the respondents was categorized as innovators. Results also showed that three variables explained the largest amount of variability in classifying farmers into the four adoption categories: importance of scientific research, learning about new concepts and ideas, and frequency with which respondents used personnel from agencies other than Cooperative Extension. Additionally, the study confirmed that not all potential adopters of a new technology use one source of information exclusively. Farmers use a multitude of sources of information to inform their adoption decisions. The study recommended that different programs be designed for specific audiences – some to create awareness, and others to generate interest in the new technology.

Another study conducted in Africa on the promotion of Fertilizer Tree Systems (FTS) in Zambia, Malawi, Mozambique, Tanzania and Zimbabwe examined three methods of reaching farmers: training government staff as farmer trainers, facilitating direct farmer-to-farmer training and providing support to national extension programs. Results revealed that the most effective way of reaching farmers was through training government extension staff as farmer trainers. Second, findings showed that small landholding sizes in Malawi determined which and how much of each technology would

be adopted. Also, the study revealed that men in the region control many household decisions including those involving cash transactions and, hence, although women may be using the technology as commonly as men, they may not be benefiting from it as much (Akinnifesi, Ajayi, Sileshi, Chirwa, & Chianu, 2011).

A study in the promotion of bean seed in Malawi showed that informal networks were a viable means of transferring technology information among the rural communities. The study recommended other means of promoting bean varieties such as contract farming, intensive advertising and improvement of seed packaging. However, results also revealed that informal networks played a significant role in technology transfer, wherein participating farmers would sell bean seed to their fellow farmers or give bean seed as gifts. This finding supports Wildavsky's theory of preference formation, in that most adoption decisions were made through social interactions within the farming community (Chirwa & Aggarwal, 2000).

A related study in the U.S. addressed farmers' preferred sources of information (Riesenberg & Gor, 1989). The study was driven by the changing information workforce, where information demand in the U.S. is rapidly increasing and farmers may choose among various sources of information. The objectives of the study were to identify the preferred methods of receiving information on new or innovative farming practices among farmers in Nez Perce County, Idaho, and to identify the differences in farmer characteristics as related to preferences for methods of receiving information on new or innovative farming practices. A self-administered questionnaire was mailed to 386 farmer subjects, resulting in 176 usable responses. The instrument measured farmers' preferences on nine methods of instruction based on a four-point Likert scale with 1

indicating most preferred and 4 indicating least preferred. Results showed that the two methods requiring the most interaction between the sender and receiver of information, on-farm demonstration and tours and field trips, received the highest preference ratings, while the two methods requiring the least interaction between the sender and receiver of information, home study and computer-assisted instruction, received the lowest preference ratings. The study also found that younger farmers tended to prefer computer-assisted instruction, home study, and publications more than older farmers. Farmers managing larger acreages tended to prefer publications as a method of receiving information on new or innovative farming practices more than farmers with smaller acreages (less than 250 acres). Finally, farmers with college of agriculture experience tended to prefer publications, computer-assisted instruction, and home study more than farmers without college of agriculture experience (Riesenberg & Gor, 1989).

The Riesenberg and Gor (1989) study was conducted in the 1980s in a developed country. Farmers' perceptions might have changed due to the dynamics of societies, as well as easier access to the internet and the widespread use of online social networks. The study did not attempt to investigate whether a relationship existed between information preferences of farmers and their motivation to adopt new technologies.

Amudavi et al. (2009) conducted a study in Kenya on the use of lead farmers as a means of technology transfer in smallholder farming systems. The researchers examined the technical efficiency of farmer teachers in the uptake and dissemination of a 'push-pull' technology (PPT) for control of Striga weed and stemborers. The study found evidence for considerable benefits from farmer training that resulted in significant

differences in better understanding and applying of PPT. The use of the farmer teachers was found to have a significant multiplier effect in increasing PPT uptake.

Peacock (2005) studied goat farmers in sub-Saharan Africa, a region that includes Malawi and other countries with similar agricultural patterns. The author reviewed several studies in Kenya, Ethiopia and Rwanda that analyzed the potential for goats to reduce poverty in Africa. The paper described current systems of production, social and economic roles played by goats in food security and income generation, and potential constraints to pro-poor goat development in Africa. One of the major recommendations in all the studies reviewed here was that there is need for good practice in farmer participation in research and extension. The studies also recommended development of farmer organizations such as cooperatives and associations. Other recommendations address service provision, credit, insurance and marketing. Another relevant factor in the studies is the inclusion of the key roles of political and cultural biases in constraining goat development.

A study addressing technology adoption in Ghana was conducted by Conley and Udry (2001). One of the study findings that is common to most African countries is that learning occurs through social networks, such as villages composed largely of farming families. Individual farmers are more likely to learn of a new technology through these networks; however, these networks are often limited in both quantity and quality of information (Brown, 2005; McElreath, 2004). The study revealed that “even with respect to this limited number of direct contacts, information is not always perfect: farmers are more likely to know broad facts” rather than specific technical issues of a particular technology (p. 300).

Studies reviewed here provide useful information on technology adoption and methods of instruction, although few findings are based specifically on rural African settings. The theories selected to guide this research were used to form assumptions about the current agricultural extension system in Malawi.

Summary

According to Wildavsky's theory of cultural preference formation (Wildavsky, 1987), individuals develop preferences through their acceptance and rejection of various ways of life. Farmers' associations with each other as well as with extension service providers influence the development of information source preferences as well as preferences for methods of instruction. The application of diffusion of innovations theory to adoption of goat production technologies provides a typology with which to describe and distinguish adopters and non-adopters. Empirical studies reviewed here show that farmers who adopt technologies differ from those who do not adopt. Distinguishing characteristics may include gender, education level, income level and size of landholding.

CHAPTER 3: METHODOLOGY

This study was designed to identify the characteristics and preferred instructional methods of technology adopters and non-adopters among Malawian goat farmers. A major goal of the research is to make recommendations for existing extension programs to better serve goat farmers in Malawi. This chapter describes the social-scientific procedures used to carry out the study. After reviewing the research objectives, the chapter provides information on the researcher's paradigm, study participants, the instrument, data collection, data analysis and limitations.

Research Objectives

The following research questions were established to help ensure that the project's purpose was accomplished. The study's research questions are as follows:

1. What are the demographic characteristics that describe goat farmers who do, and do not, adopt new animal management technologies in two districts of Malawi?
2. What are goat farmers' preferences for delivery systems and methods of instruction regarding information on new goat production technologies?
3. What are goat farmers' preferences for delivery systems and methods of instruction regarding goat production practices and technologies by those

who have participated in group instruction compared to individual instruction?

4. What are goat farmers' preferences for delivery systems and methods of instruction among those who have adopted innovative goat production practices and technologies compared to non-adopters?

Researcher's Paradigm

Researchers have different epistemologies, or ways they come to know. A researcher's epistemology greatly influences his or her preferred research paradigm. Research paradigms distinguish, among other things, qualitative from quantitative research and the methods associated with each paradigm (Krauss, 2005).

This study was designed to identify preferred instructional methods for adopters and non-adopters, and to explore the differential characteristics that define adopters and non-adopters among Malawian goat farmers. The study was conducted using a quantitative research paradigm, relying on statistical analysis of numerical data to address the study questions.

Livestock farmers constitute a small but significant part of the farming community in Malawi, as the government's emphasis is on increasing the production of corn for national subsistence. An extension system that is not as effective in it educational programming as it should be will be less able to assist Malawi's farmers.

The pluralistic, demand-driven extension system used in Malawi relies heavily on transfer of technologies through the group approach. Farmers belong to committees that demand technological messages from extension service providers, who in turn deliver those messages to farmers in groups. Most agricultural technological messages are

produced in English; yet the local farming communities, being rural and mostly illiterate, usually use the vernacular languages spoken in their local areas.

The researcher relied heavily on empirical findings gleaned from previous research that support the theories used in this study. Previous studies were used to elaborate how to isolate theory's components, develop appropriate measurement instruments, and adequately discuss the results of the study in line with the theory.

Participants

Participants in this study were from two districts: Salima and Blantyre. Salima district is located in the central region of Malawi along the shores of Lake Malawi. It is about 100 kilometers from Lilongwe, the capital city of Malawi, and covers about 2,196 square kilometers. The population of Salima is 248,214 and is predominantly rural with fishing as the main occupation of the populace. The name ‘Salima’ actually means ‘those who do not till the ground,’ an explanation of the district’s major source of income for the rural households (Figure 3.1).

Figure 3.1 Map of Malawi Showing Location of the Two Study Districts
(Salima is indicated with a blue circle, and Blantyre with a green circle.)

Fish is sold by fishermen to middlemen who sell to consumers and vendors from Lilongwe and elsewhere. Livestock are kept by most households to supplement household food diets and as assets which are sold in lean times. Goats and poultry are the most common livestock species in the district.

Blantyre district is located in the southern region of Malawi, covering a total area of 2,012 square kilometers. The population of Blantyre is 809,397. The capital of the district is Blantyre city, Malawi's second largest city and commercial capital. Although there are white-collar jobs in Blantyre, most of the population is involved in some kind of business, selling clothes, food, household items and agricultural produce.

Urban migration is high, with many youth loitering the streets in search of piece work. The population in peripheral areas of the city is preoccupied with producing for the city market. Hence, crop and animal production is done largely to supply the city markets. Since most youth flock to the cities from rural areas, it is not unusual to see a younger population engaging in agriculture to supply produce and raw materials for the city's industries and markets (Blantyre District Assembly, 2007; United Nations Human Settlements Programme, 2011).

The initial step in the recruitment of farmer-participants was obtaining a letter of authority from the Director of Agricultural Extension Services in the Ministry of Agriculture (Appendix A). Then, separate meetings were held with the AEDOs (Agricultural Extension Development Officers) for the verified sections. The role of the extension worker was simply to provide the database of subjects and to alert the selected subjects of the research using a script provided by the researcher (Appendix B). This is standard procedure for entry into Malawian communities; the extension worker contacts the community first to raise awareness. The extension worker then shared with the village headman the letter of authority. Following, a meeting of goat farmers was called in the village to be interviewed. The farmers who attended these meetings constituted the convenience sample for this study.

Instrument

A three-part questionnaire was used as the instrument for data collection (Appendix C). The questionnaire was developed based on the theories guiding the study, as well as prevailing practice in scientific research (validity and reliability requirements) as guided by the researcher's academic advisors.

The initial section of the questionnaire was developed through a consultative process involving the researcher and members of the research committee, a process spanning three months to ensure face and content validity of the instrument and adherence to standard scientific practice. To ensure face validity, samples of instruments used in previous studies were studied. Literature on formatting and ordering of questionnaires was used to inform the preparation of the instrument (Dillman, Sinclair, & Clark, 1993; Jenkins & Dillman, 1997). The research committee also provided additional guidance on achieving validity, which led to the adjustment of the appearance of questionnaire items. The adjustment included ensuring that responses for each item were on the same line as the question, and adjustments to the ordering of the questionnaire's sections.

Extension workers also provided feedback after they were given the questionnaire for use in making first contact with the respondents. That feedback included minor phrasing adjustments in the vernacular to make the instrument understandable for the specific localities.

The objective of the first part of the questionnaire was to solicit basic information about the participants' goat farming, technology adoption and preferred sources of information. The questionnaire also collected qualitative data on reasons for specific preferences in the method of instruction.

The second part of the questionnaire was guided by Wildavsky's theory of cultural preference formation (1987), where variables of reliability, consistency and availability were constructed to test preference patterns of goat farmers. Wildavsky argued that preferences are developed based on the reliability, consistency and

availability of social interactions through which culture is passed. Also, other preference studies were used to develop the Likert scale used to measure preferences. This section identified farmers' preferred method of instruction from a list that included: extension worker; lead farmer; NGO staff; and, agro-dealer for the technologies. The quantitative questions requested respondents to rate their preferences on a scale of 1 to 4, categorized as follows: 1, strongly disagree; 2, disagree; 3, agree; and 4, strongly agree.

The third and final part of the questionnaire was adapted from the 'Adopter Characteristics Questionnaire' developed and used in a similar study (Rollins, 1993). This section of the instrument collected demographic data for the farmer-participants, including their membership in groups.

Dependent variable

The dependent variable for the study was "Adoption of technologies of goat farmers." Participants were asked if they had adopted stall feeding, improved housing, integrated goat and crop farming, or other technologies in the last two years. Farmers who responded that they had adopted at least one of these technologies were operationally defined in this study as adopters.

Independent variables

Independent variables included farmers' preference for technology disseminators. This preference was determined by measuring perceptions of reliability, availability, and consistency of the various technology disseminators. The researcher measured each independent variable for farmers who belonged to groups and compared the data to those who raised goats individually. The study also analyzed the method of instruction used by the Government Extension worker, lead farmer, NGO worker, and agro-dealer.

Additional variables measured in the context of technology adoption were gender, income level, club membership, and size of landholding.

Institutional Review Board Approval

The research protocol and instrument were approved by the Purdue University Institutional Review Board on September 17, 20112, (IRB# 1208012587). The IRB approval notification is provided in Appendix D.

Data Collection

Data were collected using interview techniques guided by a structured questionnaire. The instrument was administered by a group comprising the principal investigator and four research assistants recruited to carry out the exercise. The four research assistants were graduates of the University of Malawi who were on vacation. They were recruited by the principal investigator through an advertisement posted on the notice board at the Bunda College of Agriculture in Lilongwe, Malawi, along with an email address to which interested persons could respond. Selection was based on proximity of the research assistants to the areas of study and their ability to interact with rural farmers in the vernacular language. After recruitment, the researchers underwent a two-day orientation on the study and data collection methods by the principal investigator.

The orientation included an overview of the study, the study objectives and the instrument. The team was also oriented on how to code participants' responses in the questionnaire with an emphasis on common errors in coding. The research team was reminded that due to the prevailing low literacy levels in the study area, there may be a need to ask follow-up questions and to clarify questionnaire items to ensure that farmer-

participants understood the questions and were giving relevant responses. The research team also reviewed cultural trends in the two areas of study and made preparations so as not to be out of culture. The final review focused on data collection methods and proper completion of the questionnaires. Following the orientation, the research team prepared to collect the data.

In support of study objectives, the questionnaires collected data on farmer preferences regarding technology disseminators of new technologies. Technology disseminators considered were the extension worker, NGO staff, the local agro-dealer and the lead farmer. The questionnaires also collected information to differentiate adopters from non-adopters in an attempt to observe characteristics of each category. This study was designed to explore farmers' technology disseminator preferences in each of the categories.

Study participants were recruited through contacting the Agricultural Extension Development Officer (AEDO) in each of the two selected districts. The AEDO contacted each of the village headmen in the village to acquire permission for the farmers to participate in the study. Finally, a date was set with the AEDO and village headman for the research team to visit the village. When the research team visited the village, the primary researcher met with the research assistants to administer the instrument. In Blantyre, data collection took place on October 4, 2012, and in Salima on October 11, 2012. In each district, the farmers met at a centrally located village determined by the AEDO, where the research team administered the instrument. This meeting place is one designated for such meetings between villagers in that area and all visitors with a development agenda. These sites are also usual venues for village meetings, such that

distance to this venue was not an issue that would contribute to any potential low turn-out. In total, data were collected from 76 farmers who attended the meetings (Blantyre, n = 30; Salima, n = 46).

During data collection, each farmer met with an individual member of the research team to discuss the instrument and answer the questions. The farmer had the option to not respond to any questions. The research team remained in the village from 8 a.m. until 6 p.m. to accommodate all farmers who were willing to participate in the study. The research team interviewed all farmers who showed up on the specified meeting dates.

Data Analysis

After completion of data collection, the data were coded and entered in SPSS software (Version 18) for analysis. Any items for which the participant did not respond were coded as missing data for analysis. The variables representing technology disseminators (Agricultural Extension Development Officer (AEDO), Lead Farmer, Non-governmental Organization (NGO) and Agro-dealer) were subjected to item analysis to test for internal consistency. The resulting Cronbach alpha coefficients, presented in Table 3.1, ranged from 0.88 to 0.96, indicating a high level of internal consistency among the items assessed.

Table 3.1

Reliability Tests

Preferred Disseminator	Cronbach's Alpha	Mean*	Variance
AEDO	0.91	3.87	0.01
NGO	0.96	1.82	0.01
Agro-dealer	0.88	1.28	0.00
Lead farmer	0.94	3.21	0.01

* Scale = 1 (not at all) to 5 (all the time).

Tests for normality were conducted using the Shapiro-Wilk test. Results showed that the data were not normally distributed, hence, non-parametric analyses were used to determine differences between variables of interest. Table 3.2 summarizes the analysis performed for each research question.

Table 3.2

Analysis Performed for Each Research Question

Research Question	Analysis Tools
1. What are the demographic characteristics that describe goat farmers who do, and do not, adopt new animal management technologies in two districts of Malawi?	• Frequencies for: (1) Overall, and (2) Adopters vs. Non-adopters regarding the following characteristics: a. Gender b. Age c. Education d. Level of Income e. Sources of Income f. Landholding Size g. Level of Adoption
2. What are goat farmers' preferences for delivery systems and methods of instruction regarding information on new goat production technologies?	• Frequencies and means and standard deviations for delivery systems of all farmers, overall • Frequencies for methods of instruction
3. What are goat farmers' preferences for delivery systems and methods of instruction regarding goat production practices and technologies by those who have participated in group instruction compared to individual instruction?	• Frequencies and means and standard deviations for delivery systems by group instruction vs. individual instruction • Kruskal-Wallis and Cohen's d for differences in delivery systems • Frequencies for methods of instruction by group instruction vs. individual instruction
4. What are goat farmers' preferences for delivery systems and methods of instruction among those who have adopted innovative goat production practices and technologies compared to non-adopters?	• Frequencies and means and standard deviations for delivery systems by adopters vs. non-adopters • Kruskal-Wallis and Cohen's d for differences in delivery systems • Frequencies for methods of instruction by adopters vs. non-adopters

Limitations

In carrying out the procedures outlined in this chapter, the researcher encountered limitations that could affect study outcomes. The first limitation concerns the sampling procedure. Due to rural village conventions, it was not possible to draw a random sample from the population of goat farmers. Rather, the researcher recruited farmers who reported to a meeting called by the extension worker in that village. Stratified sampling was thus used for the study using the villages as strata.

The target sample size for the study was set at 120 farmers. However, it was not possible to secure this number of farmer-participants. Ultimately, 76 farmers agreed to participate in the study. The lower number of farmer-participants made it impossible to perform some statistical tests and operations.

A final limitation is the lack of a pilot test for the study, which resulted in at least two coding and measurement errors throughout the interviews. First, due to a miscommunication during their training, the research team coded ‘no’ and non-responses as ‘no.’ This is because for all questions for which respondents offered a response, they answered outright. Other responses were mistakenly coded as ‘no’ for convenience rather than identifying non-responses. Second, during the course of the interviews, when farmers were asked if they preferred NGO workers or extension workers, they routinely differentiated between the two information sources. However, it is important to note that some NGOs depend on extension workers for their field staff. Results from these questionnaire items must be interpreted with caution.

CHAPTER 4: RESULTS

Purpose and Objectives

This study was designed to explore the preferences of Malawi goat farmers regarding the method of instruction by adopters and non-adopters, and to explore the different characteristics that define adopters and non-adopters among this population.

Through this research study, extension would be able to better target the usual adopters and non-adopters alike using relevant methods to improve their farming endeavors. This study was designed with the goal of making recommendations for existing extension programs to better serve goat farmers.

The research questions for the study are as follows:

1. What are the demographic characteristics that describe goat farmers in two districts of Malawi who do, and do not, adopt new animal management technologies?
2. What are goat farmers' preferences for delivery systems and methods of instruction regarding information on new goat production technologies
3. What are goat farmers' preferences for delivery systems and methods of instruction regarding goat production practices and technologies by those who have participated in group instruction compared to individual instruction?

4. What are goat farmers' preferences for delivery systems and methods of instruction among those who have adopted innovative goat production practices and technologies compared to non-adopters?

Results

A total of 76 farmer-participants were interviewed for this research – 30 farmers from Blantyre and 46 farmers from Salima. This section reports the results of data analysis. Data are presented per research question.

Research Question 1:
What are the demographic characteristics that describe goat farmers in two districts of Malawi who do, and do not, adopt new animal management technologies?

Results for this research question are examined in three parts: 1) the overall sample; 2) adopters as a group; and 3) adopters in Blantyre and Salima.

a. Overall Sample

Seventy-six farmers attended the village meetings in which data were collected. The overall sample includes responses from these individuals. Results presented in Table 4.1 show that nearly four out of five (78.9%) of the respondents were female.

Table 4.1

Gender of Respondents (n=76)

Gender	f	Percentage
Male	16	21.1%
Female	60	78.9%
Total	76	100.0%

In terms of age, well over one-third (40.8%) of the respondents were less than 36 years old, while more than one-third (36.8%) were more than 45 years old (Table 4.2).

Table 4.2

Age of Respondents (n=76)

Age	f	Percentage
18 to 25	6	7.9%
26 to 35	25	32.9%
36 to 45	17	22.4%
Over 45	28	36.8%
Total	76	100.0%

Respondents' education levels varied from none (10.5%) to a secondary level of education (14.5%). About three-fourths (75%) of the respondents reported an educational attainment level of elementary school.

Table 4.3

Education Level of Respondents (n=76)

Education Level	f	Percentage
None	8	10.5%
Elementary	57	75.0%
Secondary	11	14.5%
Total	76	100.0%

Respondents were also asked to report their annual total income. Less than one-fourth (21.3%) of the respondents reported an annual income less than MK15,000. The largest category of respondents (38.7%) reported an annual income between MK31,000 and MK100,000. Only 12% of the respondents reported an annual income greater than MK100,000 (Table 4.4).

Table 4.4

Income Level of Respondents (n=75)

Income Level	f	Percentage
Less than K15,000	16	21.3%
K15,000 to K30,000	21	28.0%
K31,000 to K100,000	29	38.7%
More than K100,000	9	12.0%
Total	75	100.0%

For the 74 farmers who reported an income source (Table 4.5), the most common source identified by about half (50.7%) of the respondents was owning a farm. The remaining respondents were nearly equally divided between owning a business (22.7%)

and doing piece work (26.6%). One respondent (1.3%) indicated working for someone else.

Table 4.5

Source of Income (n=74)

Income Level	f	Percentage
I own my own farm	38	50.7%
I own my own business	16	22.7%
I work for someone else	1	1.3%
I do piece work	19	26.6%
Total	74	100.0%

In terms of size of landholdings, all 75 farmers who reported landholdings indicated that their farm was 5 acres or less in size (Table 4.6). The most common farm size was from 1 to 2 acres (60%). Only 12% of the respondents reporting a landholding size of 3 or more acres.

Table 4.6

Landholding Sizes of Respondents (n=75)

Landholding Size	f	Percentage
Less than an acre	21	28.0%
1 to 2 acres	45	60.0%
3 to 5 acres	9	12.0%
Total	75	100.0%

In terms of levels of adoption, well over half (60.5%) of the respondents reported not having adopted any new goat management technology (Table 4.7). The remaining respondents (39.5%) who reported adopting at least one technology were defined as adopters for the purposes of this research.

Table 4.7

Adoption Levels of Respondents (n=76)

Adoption Level	f	Percent
None	46	60.5%
At least one technology	30	39.5%
Total	76	100.0%

b. Characteristics of Adopters

Descriptive statistics were used to describe the demographic characteristics of adopters, who were operationally defined in this research as any farmer who had adopted at least one new goat management technology in the last two years. Results show that 30 (39.5%) of the 76 respondents reported adopting at least one technology. Respondents provided a diversity of reasons for adoption (Appendix E).

An examination of the gender of the adopters, provided in Table 4.8, shows that about 42% of the women and 31% of the men reported adopting at least one new goat management technology.

Table 4.8

Gender of Adopters (n=30)

Gender	Total Sample f	Adopters f	Percentage Adopters
Male	16	5	31.3%
Female	60	25	41.7%
All famers	76	30	39.5%

In terms of age, nearly half (46.7%) of the adopters were more than 45 years old (Table 4.9).

Table 4.9

Age of Adopters (n=30)

Age	f	Percentage
18 to 25	4	13.3%
26 to 35	7	23.3%
36 to 45	5	16.7%
Over 45	14	46.7%
Total	30	100.0%

In terms of adopters' level of education, more than half (56.7%) of the respondents reported an educational attainment of elementary school level. One-fifth (20%) reported having no formal education (Table 4.10).

Table 4.10

Education Level of Adopters (n=30)

Education Level	f	Percentage
None	6	20.0%
Elementary	17	56.7%
Secondary	7	23.3%
Total	30	100.0%

Analysis of adopters' income levels, provided in Table 4.11, shows that the largest category (34.5%) of respondents is in the K15,000 to K30,000 a year income bracket, while nearly one-third (31%) are in the K31,000 to K100,000 a year income bracket.

Table 4.11

Income Level of Adopters (n=29)

Income Level	f	Percentage
Less than K15,000	6	20.7%
K15,000 to K30,000	10	34.5%
K31,000 to K100,000	9	31.0%
More than K100,000	4	13.8%
Total	29	100.0%

Regarding the major source of income, nearly half (48.3%) of the adopters indicated owning their own farm (Table 4.12), while nearly one-third (31%) indicated performing piece work.

Table 4.12

Income Sources of Adopters (n=29)

Income Source	f	Percentage
I own my own farm	14	48.3%
I own my own business	6	20.7%
I do piece work	9	31.0%
Total	29	100.0%

Landholding sizes for adopters are provided in Table 4.13. Results show that about two-thirds (65.5%) of the adopters reported a landholding size of 1 to 2 acres. Nearly one-third (31%) reported a landholding size of less than 1 acre.

Table 4.13

Landholding Sizes of Adopters (n=29)

Landholding size	f	Percentage
Less than an acre	9	31.0%
1 to 2 acres	19	65.5%
3 to 5 acres	1	3.5%
Total	29	100.0%

c. Comparison of Adopter Characteristics Between Blantyre and Salima

Adopter characteristics were compared between the two districts in which the study was conducted. In terms of gender, women constituted 77% of the adopters in Blantyre and 88% of the adopters in Salima.

Age distribution between the districts, provided in Table 4.14, reveals that Salima respondents tended to be older than respondents in Blantyre.

Table 4.14

Age Range for Adopters in Blantyre and Salima (n=30)

	Blantyre		Salima	
Age	f	Percentage	f	Percentage
18 to 25	3	23.1%	1	5.9%
26 to 35	4	30.8%	3	17.6%
36 to 45	2	15.3%	3	17.6%
Over 45	4	30.8%	10	58.9%
Total	13	100.0%	17	100.0%

Education levels compared across the districts indicate that more than half of the adopters in Blantyre (61.5%) and Salima (53%) had completed at least some primary school education (Table 4.15).

Table 4.15

Education Level for Adopters in Blantyre and Salima (n=30)

Education Level	Blantyre		Salima	
	f	Percent	f	Percent
None	2	15.4%	4	23.5%
Some primary school	8	61.5%	9	53.0%
Some secondary school	3	23.1%	4	23.5%
Total	13	100.0%	17	100.0%

Data on district income levels, provided in Table 4.16, suggest slightly higher reported annual incomes for respondents in Salima as compared to those in Blantyre. More than half (58.8%) of Salima respondents reported an annual income of K31,000 or more, compared to just over one-fourth (26%) of Blantyre respondents reporting that income level.

Table 4.16

Income Level for Adopters in Blantyre and Salima (n=29)

Income	Blantyre		Salima	
	f	Percentage	f	Percentage
Less than K15,000	4	33.3%	2	11.8%
K15,000 to K30,000	5	41.7%	5	29.4%
K31,000 to K100,000	2	17.7%	7	41.2%
More than K100,000	1	8.3%	3	17.6%
Total	12	100.0%	17	100.0%

Regarding source of income, no adopters indicated working for someone else as their source of income. The largest category of adopters in both Blantyre (58.4%) and Salima (41.2%) indicated owning their own a farm as a major source of income (Table 4.17).

Table 4.17

Source of Income for Adopters in Blantyre and Salima (n=29)

Income Source	Blantyre		Salima	
	f	Percentage	f	Percentage
I own my own farm	7	58.4%	7	41.2%
I own my own business	1	8.3%	5	29.4%
I do piece work	4	33.3%	5	29.4%
Total	12	100%	17	100.0%

Results on landholding sizes, provided in Table 4.18, show that approximately two-thirds of the adopters in Blantyre (66.7%) and Salima (64.7%) reported landholdings of 1 to 2 acres.

Table 4.18

Landholding Sizes for Adopters in Blantyre and Salima (n=29)

Landholding Size	Blantyre		Salima	
	f	Percentage	f	Percentage
Less than an acre	3	25.0%	6	35.3%
1 to 2 acres	8	66.7%	11	64.7%
3 to 5 acres	1	8.3%	0	0.0%
Total	12	100.0%	17	100.0%

Research question 2:
What are goat farmers' preferences for delivery systems and methods of instruction regarding information on new goat production technologies?

The second research question investigated participants' preferences for delivery systems and methods of instruction. Analyses were done on actual delivery systems used and those preferred by the respondents. Results are presented for all respondents and comparisons between the two study districts.

Table 4.19 provides mean scores for each technology disseminator among AEDO, NGO staff, agro-dealer and lead farmers. Results show that AEDOs have the highest mean scores, followed by lead farmers. The mean score for AEDOs is significantly higher ($p < .05$) than the mean score for NGO disseminators, but not statistically different from any others. However, the Cohen's *d* statistic does indicate an effect size difference in each comparison, with the greatest effect size between the AEDO and the agro-dealer, and the smallest effect size between the AEDO and the lead farmer.

Table 4.19

Comparison of Mean Scores for Preference of Technology Disseminators Reported as Means and Effect Size

Preferred technology disseminator	Mean Variable 1	Mean Variable 2	Cohen's d
AEDO x NGO	3.76^{a}±1.32	1.75^{b}±1.15	1.62_{L}
AEDO x Agro-dealer	3.76±1.32	1.28±.52	2.47_{L}
AEDO x Lead farmer	3.76±1.32	3.19±1.95	$.34_{S}$
NGO x Agro-dealer	1.75±1.15	1.28±.52	$.53_{M}$
NGO x Lead farmer	1.75±1.15	3.19±1.95	$.90_{L}$
Agro-dealer x Lead farmer	1.28±.52	3.19±1.95	1.34_{L}

Note. Items with different superscripts differ at statistical significance $p < .05$. Subscript S=small effect size, M=medium effect size, L=large effect size.

Participants were asked to indicate the methods of instruction used by extension service providers. On-farm demonstrations, leaflets and lectures were the most commonly identified methods used in the Blantyre and Salima districts. About half (50.8%) of the respondents identified on-farm demonstrations as the method of instruction used by extension service providers in the districts, while over one-third (36.1%) identified lectures (Table 4.20).

Table 4.20

Actual Method of Instruction Used in Farmer Contact (n=61)

Method of Instruction	f	Percentage
Demonstration	31	50.8%
Leaflets	1	1.6%
Lectures	22	36.1%
Others	7	11.5%
Total	61	100.0%

Participants were also asked which method of instruction they would prefer when receiving messages about new technologies. Well over half (60.9%) identified on-farm demonstrations as their preferred instructional method (Table 4.21).

Table 4.21

Preferred Method of Instruction (n=69)

Method of Instruction	f	Percentage
Demonstration	42	60.9%
Leaflets	5	7.2%
Lectures	19	27.5%
Others	3	4.4%
Total	69	100.0%

A comparison of instructional-method preferences in Blantyre and Salima is provided in Table 4.22. On-farm demonstrations were the most common instructional methodology identified in both districts, followed by lectures.

Table 4.22

Actual Method of Instruction in Blantyre and Salima (n=60)

Method of Instruction	Blantyre		Salima	
	f	Percentage	f	Percentage
Demonstration	13	56.6%	18	48.7%
Leaflets	1	4.3%	0	0%
Lectures	7	30.4%	14	37.8%
Others	2	8.7%	5	13.5%
Total	23	100.0%	37	100.0%

Preferences for method of instruction were also compared between the two districts, with results displayed in Table 4.23. On-farm demonstrations were the most

preferred methodology in both the Blantyre and Salima districts, with lectures a distant second most preferred.

Table 4.23

Preferred Method of Instruction in Blantyre and Salima (n=68)

Method of Instruction	Blantyre		Salima	
	f	Percentage	f	Percentage
Demonstration	18	66.7%	23	56.1%
Leaflets	3	11.1%	2	4.9%
Lectures	5	18.5%	14	34.1%
Others	1	3.7%	2	4.9%
Total	27	100%	41	100%

Research question 3:
What are goat farmers' preferences for delivery systems and methods of instruction regarding goat production practices and technologies for those who participated in group instruction compared to individual instruction?

The third research question examined if differences existed in preferences between farmers in groups and individual farmers for delivery systems and methods of instruction among the four categories (demonstrations, leaflets, lectures and others).

Preferences were rated on a scale of 1 to 5 with 1 being least preferred and 5 being most preferred. Examination of means for the preferences between farmers in groups and individual farmers for delivery systems showed that AEDOs had the highest mean score for both group members and individual farmers (Table 4.24). The mean difference was significant only when comparing preferences between AEDOs and NGO staff members for group members. There were no differences between members of groups and individuals in their preference of delivery systems, although there was a small

effect size difference between mean scores for AEDOs and NGOs between group and individual farmers.

Table 4.24

Means for Preferred Extension Delivery Systems for Groups Compared To Those Not In Groups (n=68)

Group membership		AEDO	NGO	Agro-dealer	Lead farmer
Yes	f	37	37	37	37
	Mean	3.97[a]	1.91[b]	1.31	3.32
	Std deviation	1.20	1.18	.55	1.69
No	f	31	31	31	31
	Mean	3.51	1.57	1.24	3.03
	Std deviation	1.43	1.11	.48	2.24
Total	f	68	68	68	68
	Cohen's d	$.27_S$	$.30_S$	.14	.15

Note. Items with different superscripts differ at statistical significance $p < .10$. Subscript S=small effect size, M=medium effect size, L=large effect size.

Delivery system preferences within groups was further examined to determine if there was an effect size difference between different delivery systems (Table 4.25). The only preference with a statistically significant difference was between AEDOs and NGOs. However, the Cohen's *d* statistic revealed a large effect size preference for lead farmers over agro-dealers and NGOs; a large effect size preference for AEDOs over agro-dealers and NGOs; a medium effect size preference for NGOs over agro-dealers; and a small effect size preference for AEDOs over lead farmers.

Table 4.25

Effect Size of Preferred Extension Delivery Systems for Groups (n=72)

Preferred Delivery system	Mean Variable 1	Mean Variable 2	Cohen's d
AEDO x NGO	3.97^{a}±1.20	1.91^{b}±1.18	1.73_{L}
AEDO x Agro-dealer	3.97±1.20	1.31±.55	2.85_{L}
AEDO x Lead farmer	3.97±1.20	3.32±1.69	$.44_{S}$
NGO x Agro-dealer	1.91±1.18	1.31±.55	$.65_{M}$
NGO x Lead farmer	1.91±1.18	3.32±1.69	$.96_{L}$
Agro-dealer x Lead farmer	1.31±.55	3.32±1.69	1.11_{L}

Note. Items with different superscripts differ at statistical significance $p < .10$. Subscript S=small effect size, M=medium effect size, L=large effect size.

Data for instructional method preferences for group and individual farmers are presented in Table 4.26. Results reveal that on-farm demonstrations were the most preferred methodology for both group (55.6%) and individual (66.7%) farmers.

Table 4.26

Preferred Methods of Instruction for Groups and Individuals (n=69)

Preferred Delivery system	Groups		Individuals	
	f	Percentage	f	Percentage
Demonstration	20	55.6%	22	66.7%
Leaflets	4	11.1%	1	3.0%
Lectures	11	30.5%	8	24.2%
Others	1	2.8%	2	6.1%
Total	36	100.0%	33	100.0%

Data for instructional method preferences for group and individual farmers in Blantyre and Salima districts are provided in Table 4.27. On-farm demonstrations were the most preferred method by group and individual farmers in both districts.

Table 4.27

Group and Individual Preference for Method of Instruction by District (n=68)

Area of study	Preferred Delivery system	Groups		Individuals	
		f	Percentage	f	Percentage
Blantyre	Demonstration	8	61.5%	10	71.5%
	Leaflets	2	15.4%	1	7.1%
	Lectures	3	23.1%	2	14.3%
	Others	0	0%	1	7.1%
	Total	13	100%	14	100%
Salima	Demonstration	11	50%	12	63.2%
	Leaflets	2	9.1%	0	0%
	Lectures	8	36.4%	6	31.6%
	Others	1	4.5%	1	5.3%
	Total	22	100%	19	100%

Research question 4:
What are goat farmers' preferences for delivery systems and methods of instruction among those who had adopted innovative goat production practices and technologies compared to non-adopters?

The final research question assessed preferences for delivery systems and methods of instruction between adopters and non-adopters. Results are presented below, followed by a comparison of Blantyre and Salima districts.

Data analysis was conducted to determine if differences existed in the preference for technology disseminators between adopters and non-adopters. Preference was measured on a 5-point scale with 1 being least preferred to 5 being most preferred. Table 4.28 shows that AEDOs were the most preferred delivery system among the items assessed, with a mean of 4.04 for adopters and a mean of 3.39 for non-adopters. Lead farmers were the second most-preferred with means of 3.37 for adopters and 2.94 for non-adopters.

Table 4.28

Means for Preferred Extension Delivery Systems for Adopters and Non-Adopters (n=68)

Adoption Level		AEDO	NGO	Agro-dealer	Lead Farmer
Adopters	f	39	39	39	39
	Mean	4.04[a]	1.54[b]	1.26	3.37
	Std deviation	1.08	1.02	.56	2.04
Non-adopters	f	29	29	29	29
	Mean	3.39	2.04	1.30	2.94
	Std deviation	1.54	1.27	.46	1.82
Total	f	68	68	68	68
	Mean	3.76	1.75	1.28	3.19
	Std deviation	1.32	1.15	.52	1.95

Note. Items with different superscripts differ at statistical significance $p < .10$.

Adopters and non-adopters were asked to select their preferred method of instruction. Results showed that more than half (51.7%) of the adopters and about two-thirds (67.5%) of non-adopters preferred on-farm demonstrations as an instructional method (Table 4.29).

Table 4.29

Preferred Method of Instruction for Adopters and Non-Adopters (n=69)

Preferred	Adopters		Non-adopters	
Delivery system	f	Percent	f	Percent
Demonstration	15	51.7%	27	67.5%
Leaflets	4	13.8%	1	2.5%
Lectures	8	27.6%	11	27.5%
Others	2	6.9%	1	2.5%
Total	29	100.0%	40	100.0%

Instructional method preferences of adopters and non-adopters were analyzed for both Blantyre and Salima districts. In Blantyre, more than half (53.8%) of the adopters and more than three-fourths (78.6%) of non-adopters indicated on-farm demonstrations as their preferred method of instruction (Table 4.30). While on-farm demonstrations were also the preferred methodology in Salima (Table 4.31), the percentages identifying demonstrations were slightly lower for adopters (50%) and non-adopters (60%) compared to famers in Blantyre.

Table 4.30

Preferred Method of Instruction for Adopters and Non-Adopters in Blantyre (n=27)

Preferred	Adopters		Non-Adopters	
Delivery System	f	Percentage	f	Percentage
Demonstration	7	53.8%	11	78.6%
Leaflets	2	15.4%	1	7.1%
Lectures	3	23.1%	2	14.3%
Others	1	7.7%	0	0.0%
Total	13	100.0%	14	100.0%

Table 4.31

Preferred Method of Instruction for Adopters and Non-Adopters in Salima (n=41)

Preferred	Adopters		Non-Adopters	
Delivery system	f	Percentage	f	Percentage
Demonstration	8	50.0%	15	60.0%
Leaflets	2	12.5%	0	0.0%
Lectures	5	31.3%	9	36.0%
Others	1	6.2%	1	4.0%
Total	16	100.0%	25	100.0%

CHAPTER 5: DISCUSSION

This chapter summarizes and discusses results of the study based on the research questions identified in Chapter 1. The discussion covers demographic characteristics, comparisons between districts, adopters and non-adopters, and group membership. The chapter concludes with recommendations for improving extension programs to better serve Malawian goat farmers.

Characteristics of Adopters

Gender

In terms of technology adoption, 40% of the respondents in this study adopted at least one new goat management technology in the last two years. These individuals were operationally defined as ‘adopters’ in this study.

The results showed a greater percentage of women than men adopted technologies. Women constituted 76.9% of the adopters in Blantyre and 88.2% of adopters in Salima.

Research reviewed here (Blatner et al., 2000; Masangano & Miles, 2004) found that women are more likely than men to adopt new technologies. Given the fact that more women are engaged in agricultural activities than men, it is logical to target women with new technologies in agriculture. However, it is important to point out that most family decisions in Malawi regarding the farm are dominated by male heads of households,

though the woman is often the one specifically engaged in farming. Results from this research underscore the importance of determining what type of messages to target at the female goat-raising population while taking into account unique family-level and cultural circumstances.

Age

Results from this research show that 47% of the adopters were over 45 years old. In the Salima district alone, those over 45 years constituted 59% of the adopters compared to those within the 18- to 25-year-old age group who constituted 6% of the adopters. The smallest age group for adopters in Blantyre is the 36- to 45-year-old group, while those over 45 were still in majority, constituting 31% of the adopters.

Educational Background

Most adopters had some education, with more than half (56%) having some primary school education. Twenty percent of the adopters had no formal education. Literacy – being able to read and write – continues to play a major role in the adoption of technologies. Goat management technologies included in this study were the most basic ones, which would not require extensive education to comprehend. The technologies addressed were as follows:

- Modern goat housing with raised floors
- Stall feeding
- Integrated crop and livestock production, where manure from livestock is used to produce crops, and crop residues are turned into goat feed

Results reported here show that assumptions of literacy should not be made by educators and others introducing new technologies. Although practicing farmers would be expected to have a certain amount of understanding, literacy levels still play a major role in the decision-making process to adopt or not recommended technologies. New technologies are often released and described in publications using scientific language that cannot be deciphered by the average farmer. Extension can play a crucial role by interpreting this language and transferring technology to farmers using methodologies that farmers can easily understand and use on their own.

There were more respondents without any educational background in Salima district than in Blantyre. This may be due to the fact that the fishing industry in Salima has such an attraction that people believe they can make a living without going to school. Most fishermen start very young and grow with the trade. It should also be pointed out that there are more elementary schools in Blantyre than in Salima (Chimombo, 2009). As a major city in Malawi, Blantyre offers more opportunities for education, as government efforts usually start in the cities and spread to the rural districts.

Income

Adopters are closely divided between two categories: farmers who make K15,000 to K30,000 (35% of adopters) and those who make K30,000 to K100,000 (31% of adopters) annually. Adopters, therefore, tend to fall within a homogeneous income group of rural farmers who live on less than a dollar a day. In Blantyre, 75% of the adopters reported earning between K15,000 and K30,000 per annum, while in Salima, 60% of the adopters earn between K31,000 and K100,000 a year.

This finding suggests that adopters in Salima may benefit more from the fish industry than Blantyre adopters benefit from various enterprises. An interesting factor is that the majority who make less in Blantyre are adopters, and the majority who make more in Salima are adopters. Because Blantyre is a commercial city, it can be argued that if the adopters made more money in Blantyre, raising goats could become a very attractive venture in that city. However, other factors could be contributing to the smaller incomes of Blantyre adopters than the attraction of raising goats alone. These factors would include urban migration, which usually leads to many urban dwellers being either unemployed or in stuck in very low-paying jobs.

The major source of income for 48% of adopters in this research is farm income. Doing piece work was the second major source of income, consistent with the overall sample. Doing business is the other source of income; however, only 21% of the adopters own their own businesses. In Salima, 29% of the adopters own their own businesses compared to 8% of the adopters in Blantyre. Logically, one would expect more adopters to own businesses in Blantyre. The argument here, however, is that those engaged in business enterprises in Blantyre have neither the land nor the time to raise goats. Farmers in Salima are more settled, and their businesses supplement their farming endeavors. In short, in Blantyre, those who do business tend not to farm, while in Salima, it is not unusual to find farmers who are also are engaged in business. Respondents mentioned basket weaving, making mats, and fishing as some of the businesses in which they were engaged. These businesses are unique to Salima because of its lakeshore proximity and because of tourists and vacationers coming to the lake, an advantage conspicuously missing in Blantyre.

On the farm, the largest income source is selling crop produce, as indicated by 69% of the adopters. Salima is one of the largest cotton-growing districts in Malawi, and most farmers supplement their fish industry by selling cotton (MMoA, 2006). Most farmers in Blantyre also grow various crops, especially legumes, for sale to companies and industries within the city (Blantyre District Assembly, 2007). Most farmers also sell some of their crop produce to meet household requirements. So even in the case of farmers who do adopt goat farming technologies, goats are not the primary source of farm income.

During times of great financial need, the most common asset that is easily sold is livestock. Selling livestock is indicated by 24% of the adopters as a major source of farm income. Most respondents stated that they would sell off some of their goats to pay school fees for their charges. There is also a growing trend among Malawian farmers to sell livestock and buy food for the home as part of the support systems in times of maize food shortages (Chinsinga, 2004).

A comparison of farm income sources for the Blantyre and Salima districts shows interesting results. The majority of adopters in both districts indicated selling crops as the major source of farm income. However, none of the adopters in Blantyre indicated that livestock sales were the major farm income source, compared to 41% of the adopters in Salima. Salima boasts a famous market for goats, which offers an incentive for farmers to sell their livestock (Kaumbata, 2009). This also supports the notion that most farmers in Salima keep goats for sale.

The reverse occurs on doing piece work as the major source of farm income. When asked if doing piece work was a major source of income, 17% of the adopters in

Blantyre agreed compared to none in Salima. This could be attributed to the fact that piece work is more available and is more rewarding in Blantyre because of city social dynamics. Future research could investigate whether piece work earns more in Blantyre than in Salima.

Although some critics have described piece work as exploitive (Chinsinga, 2004), farmers consider it as one of the major sources of farm income. They would sell their labor on other people's farms for activities such as garden preparation, weeding and harvesting. For about 7% of the adopters in this study, piece work is a major source of farm income. This means that these farmers would even leave their fields and sell their labor in other people's fields just to make money. Further research could investigate whether these adopters work on their fields first before engaging in piece work elsewhere.

Landholding Size

An overwhelming 97% of the adopters own 2 acres of land or less. Small landholding size is one of the major characteristics of the Malawian smallholder farmer. Landholding sizes have notably been decreasing since 1997, with close to half of the rural population cultivating less than half a hectare (Nakhumwa & Hassan, 2003). In this regard, the adopters in the current research are therefore no different from other rural farmers in Malawi. There was also no significant difference between adopters and non-adopters as far as landholding sizes were concerned.

In Blantyre, 8% of the adopters owned 3 to 5 acres of land while there were no adopters with such landholdings in Salima. The majority of adopters cultivate 1 to 2 acres of land (67% and 65% of the adopters in Blantyre and Salima, respectively). Landholding

sizes continue to decrease as the country's population increases. Because a significant portion of Salima is occupied by Lake Malawi, the remaining land is divided among the district's entire population.

Household Heads

Most residents of Blantyre city migrated there in search of jobs and other opportunities. As a result, families are made up of a male household head who works in town while the rest of the household is occupied on the farm. Results of this study show that 62% of adopters' households in Blantyre are male headed. There are more female-headed households among adopters in Salima than in Blantyre.

Although not directly addressed in the current research, it should be pointed out that the existence of child-headed households in both districts is evidence of an unavoidable phenomenon escalated by HIV and AIDS. In cases where the elderly are available, orphans are left in the care of their grandparents. This also explains why there are more households among the adopters headed by the elderly in Salima – 10 percent more than those in Blantyre. There is evidence of more HIV/AIDS incidences along the lakeshore districts of Malawi than in the rest of the country (Allison & Seeley, 2004).

Preferences for Method of Instruction

This research question summarized all study participants' general preferences for method of instruction as used in delivery of technical messages. The study looked at two dimensions:

a. The actual method of instruction used in delivery of extension
b. The preferred method of instruction of the participants

Results revealed the three most common methods of instruction used in the study communities, as follows:

a. On-farm demonstrations
b. Leaflets
c. Lectures

Of the three methods, 51% of the respondents identified on-farm demonstrations as the most common method of instruction used in extension, followed by lectures. A comparison of Blantyre and Salima shows a similar pattern, with demonstrations being more popular in Blantyre (57% of the respondents). Participants from Salima, however, incorrectly indicated that leaflets were not used as a method of instruction; coaching was indicated as another method of instruction used in technology delivery.

The popularity of on-farm demonstrations comes as no surprise. In a country with low literacy levels, the Malawi government decided to use on-farm demonstrations as a means of reaching farmers with messages on new technologies. Because illiteracy is common, farmers rely on the extension service provider to take them step-by-step through the new technology on a small part of their farm where they can compare results with their own traditional practice. Thus, demonstrations have been the government's method of instruction for over 10 years. This instructional method is popular among government staff and NGOs.

Farmer-participants also indicated their preferred method of instruction among the three methods indicated earlier. In total, 61% of the respondents indicated on-farm demonstrations as their preferred method of instruction. This finding may be due to

familiarity with the method coupled with its success through the years. Lectures were the second most preferred method indicated by 28% of the respondents. Leaflets were indicated by 8% of the respondents.

Of the respondents from Salima district, 56% indicated demonstrations while 34% preferred lectures as the method of instruction. In Blantyre, 67% opted for demonstrations while 19% chose lectures. There were no significant differences in preference for method of instruction between Blantyre and Salima districts.

Further research should investigate reasons for farmers' choice of lectures as a method of instruction. Logically, the choice of demonstrations makes more sense; lectures are usually given in an environment where there is limited opportunity to ask questions and seek clarification. Research should therefore examine why farmers prefer lectures as an instructional method, especially for new technologies which may require hands-on demonstration. Because lectures are a preferred method of instruction, further research should examine whether lectures are preferred independently of demonstrations, or whether the two methods should be used together.

Group and Individual Farmer Preferences

The final research question examined differences in preferences for method of instruction between individual farmers and those belonging to groups. Results showed that 61.5% and 76.5% of the adopters in Blantyre and Salima, respectively, belong to a farmer organization of some sort.

Participants varied in their memberships. Results showed that 92.3% of the adopters in Salima belonged to a cooperative, while none belonged to an association.

However, preferences for the various methods of instruction followed similar patterns, with the majority of individuals and group members choosing on-farm demonstrations as their choice method of instruction.

This trend has several implications. First, the Malawi government's strategy to use the group approach rather than the individual approach would seem to be working, as over half of the adopters in Blantyre and Salima belonged to a group of some sort. This finding would support the current extension system that emphasizes utilization of farmer committees at various levels, from villages to the district level. Second, the workload of the government extension worker would be greatly reduced due to increased reliance on farmer-to-farmer extension, where farmers in groups share various technologies.

It must be stated, however, that further research should examine if this increased group participation is due to self-interest or possibly coerced because of the government's strategy to use the group approach. Research should determine if farmers join groups to avoid being left out of the farmer extension service.

Differences in Preferences between Adopters and Non-Adopters

This research question was included in the study to compare preference patterns for the method of instruction between adopters and non-adopters of new goat management technologies.

Results show that on-farm demonstrations were the preferred method of instruction for 52% of adopters and 68% of non-adopters. There were no significant differences in preferences between adopters and non-adopters. On-farm demonstrations as a method of instruction were popular regardless of the farmer's adoption status. Based

on findings from this research, a relationship cannot be claimed between adoption of new technologies and the preferred method of instruction.

Comparing the two areas of study, 54% of adopters and 79% of non-adopters in Blantyre indicated that they preferred demonstrations as a method of instruction. This method of instruction was also selected by half of the adopters and 60% of non-adopters in Salima.

Conclusions and Recommendations

The following conclusions and recommendations are based on analysis of the empirical data from this research:

a. Research Question 1: There were no major differences in characteristics of goat farmers from the two districts who adopt or do not adopt new technologies. One difference is that adopters tend to belong to a farmer organization of some sort, while most non-adopters tend to be individual farmers.

b. Research Question 2: Government extension workers (AEDOs) are the preferred deliverers of extension services for goat farmers in the two districts, followed by lead farmers. Agro-dealers are almost non-existent in extension service delivery in the two districts of the study.

c. Research Question 3: Groups and individual farmers have similar preferences in delivery systems and methods of instruction; Salima district has more farmers belonging to groups than Blantyre. On-farm demonstrations are the preferred method of instruction by farmers in groups and as individuals.

d. Research Question 4: Adopters and non-adopters do not differ in their preferences for extension delivery systems and methods of instruction. Both

groups prefer AEDOs for extension service delivery and on-farm demonstrations for the method of instruction.

Additional conclusions, based on the empirical data from this research, may be drawn about adopters and preferences for methods of instruction.

a. Adopters of goat production technologies are farmers who are nearing middle age and have some elementary school. Most are women who make between K15,000 and K30,000 per year. Most of this income is from their own farm, where they primarily sell crop produce and livestock. Their farms are small areas of land between 1 and 2 acres in size.
b. Comparing the two areas of study, there were more women farmers in Salima, and more farmers over 45 years old. Over half of the adopters from the two districts belong to farmer organizations, and more adopters in Salima belong to cooperatives. Other demographic characteristics were not different for adopters from the two districts.
c. AEDOs and lead farmers are the preferred goat management technology disseminators in both Blantyre and Salima. On-farm demonstrations are the preferred method of instruction in both districts. There are no differences in preference for technology disseminators and methods of instruction between adopters and non-adopters, or between farmers who belong to groups and those who do not.

The study results suggest several implications. First, women must be deliberately targeted with information on goat technologies, as they tend to be the ones, rather than men, who raise goats in their communities. Information systems must be designed so that

women are reached with information at times more convenient to them by technology disseminators of their choice.

In addition, results suggest that NGOs and agro-dealers could possibly use their resources more efficiently by investing their efforts in activities other than extension service provision in the two areas of study. Goat farmers in Blantyre and Salima were shown to prefer government extension workers to any other technology disseminator. NGOs and agro-dealers were the least preferred, with the latter receiving no preference by any respondent in the study. Although some NGOs provide goats for farmers in their areas of operation, increased collaboration between NGOs and government field workers is needed so that the latter can provide required extension messages to the beneficiaries.

Another implication from this research is the urgent need to develop and disseminate new goat management technologies that are suitable for farmers with small landholding sizes. Land size determines the number of goats kept and the feeding technologies used. Landholding sizes revealed through this study were much smaller than the reported national average. An implication for further research is to re-assess landholding sizes, suspected as declining, so as to design relevant interventions for goat farmers.

Wildavsky (1987) writes about preference formation in a social setting. This concept helps explain why preferences may not differ between adopters and non-adopters in a local setting or community. Such individuals live in one society and are exposed to the same extension delivery systems and methods of instruction. The results of this study are therefore not surprising in this regard. Given the rural setting of the areas of study, farmers live in villages where government services are channeled through administrative

institutions and officers designated for this purpose. These services do not differ significantly from village to village, or from one group or association to another.

Because the Malawian extension system uses the group approach, this study would recommend a differentiated extension delivery system for villages and specific farmer organizations such as associations and cooperatives. These farmer organizations have specific technological and information needs that are unique to them and are quite unlike those of the individual farmer. For example, most rural farmers are subsistence farmers, unlike farmers belonging to cooperatives, whose target is the market. The needs for these two categories of farmers differ, and so must extension delivery systems and methods of instruction.

Rogers' (1995) theory of innovation classifies adopters and non-adopters into different categories with different characteristics. Results from this study, however, showed minor differences in characteristics between adopters and non-adopters. This might be due to the homogenous nature of characteristics of the rural Malawian farmer. These characteristics might be prevalent to both adopters and non-adopters, rendering any attempts at differentiation difficult. Further studies should examine whether differences between adopters and non-adopters exist at the national level, or from one geographical region to another. A more comprehensive study should also explore differences in characteristics and resource access and availability between adopters and non-adopters at the national level.

Although Rogers (1995) characterizes early adopters as using their own initiative to implement new innovations, these initiatives may be limited in a society that has few alternatives in extension service provision. Although pluralistic extension services exist

in some parts of the country, some rural areas such as the study areas still have limited extension service providers, ranging from the government agent who rarely visits them to the resident lead farmer who may not be preferred to the government agent. NGOs need to spread out to more districts and reach more farmers to provide variety in service provision. Agro-dealers need to engage more in extension as well, advertising and explaining their merchandise to the end-users either one-on-one methods or through leaflets or electronic media.

The lead farmer concept appears to have gained popularity in Malawi in a relatively short period of time. With prevailing challenges of declining numbers of government extension staff, lead farmers provide a viable alternative in extension service provision, as they reside within the farmers' vicinity and offer their services to their fellow farmers from a farmer's perspective. Results of this study have shown that they are well-preferred after the government extension worker, surpassing NGO extension staff and agro-dealers as extension service delivery systems. An extensive, nationwide evaluation of the effectiveness of using lead farmers in technology message dissemination is recommended. With results from this study, it would seem rational for the Malawi government to invest more in recruiting and training lead farmers to assist in extension service delivery. Further, the lead farmer concept should be modified so as to make lead farmers' areas of expertise more comprehensive than they are at the time of this study; that is to say, one lead farmer could look at more livestock enterprises than goats alone.

On-farm demonstrations are the most preferred method of instruction. The Malawi government should continue using this method alongside other methods such as

lectures. These methods do not only provide information on new technologies, but they also ensure that farmers get used to practicing the correct method of implementing each particular technology through hands-on training.

The most farm income comes from selling crop produce, then selling livestock (W. Chirwa, 2002). Piece work (selling labor) is indicated as another source of farm income. Livestock are usually kept as assets and sold only in times of dire need. Further research should look at the numbers of goat farmers who simply keep goats for sale, and how many of such farmers survive only on this enterprise.

The results reported in this study give a limited indication of the current status of the goat industry in Malawi. A more detailed study addressing the whole country should be conducted. Only through additional research and educational innovation can extension fulfill its mission of serving the needs of smallholder farmers, who are the largest contributors to Malawi’s agricultural production capacity.

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APPENDICES

Appendix A: Letter of Authority

Tel : 01755 522
Fax : 01750 384

Director of Agriculture
Extension Services
P.O. Box 30145
Lilongwe 3

Ref. No. 30/13/15

15th August, 2012

TO WHOM IT MAY CONCERN

PERMISSION TO CARRY OUT RESEARCH ON PERCEPTIONS OF GOAT FARMERS ON METHOD OF INSTRUCTION AND CHARACTERISTICS OF ADOPTERS

I am writing to authorize Mr. Roy Kwelepeta to carry out research with the farmers in your area on the above-mentioned topic.

Mr. Roy Kwelepeta is an employee of the Ministry of Agriculture and Food Security and works as a Chief Agriculture Extension Officer in Blantyre Agricultural Development Division. He is currently pursuing his Masters' Degree at Purdue University in USA. As part of his Masters program, he is expected to carry out research with farmers in your area.

Your cooperation and assistance will be highly appreciated as the findings from the research will help the Ministry in addressing some of the problems that farmers meet in adopting technologies.

Ms. S. Kamkwamba

DIRECTOR OF AGRICULTURAL EXTENSION SERVICES

Appendix B: Recruitment Script

PERCEPTIONS OF GOAT FARMERS REGARDING EFFECTIVENESS OF METHOD OF INSTRUCTION AND CHARACTERISTICS OF TECHNOLOGY ADOPTERS

Hello,

You have been selected to participate in a research study titled 'Perceptions of goat farmers regarding effectiveness of method of instruction and characteristics of adopters'. The study aims to examine the preferred method of instruction by goat farmers in your area so as to improve the delivery of extension messages.

Participation in the study is voluntary. You must be 18 years or older to participate. Should you wish to participate, a questionnaire will be administered to you by a research assistant. You may choose to answer only those questions that you are comfortable with, and you may opt out of the study at any time of your choice.

It will take you about 30 minutes to complete the questionnaire. Everything you say will be kept in the utmost confidentiality. Your name will NOT appear anywhere on the questionnaire. Your responses will not be used in any way other than for the intended research purposes.

If you have any questions, please ask the extension officer before the study begins.

Your participation is highly appreciated!

Appendix C: Instrument

Questionnaire on technology adoption and preferences of information sources

Instructions

This questionnaire is designed to collect information on how you have adopted technologies on goat farming over the past three years. There are also some questions on what method of instruction you prefer in learning about goat production. Please circle one choice per item unless otherwise stated.

Section 1: Technology adoption

ITEM	RESPONSE			
	1	2	3	4
1. Are you a lead farmer?	Yes	No		
2. If yes, how many farmers have you worked with in the past 12 months?	1-9	10-19	20-29	30 above
3. Do you raise goats?	Yes	No		
4. If yes, how many goats do you raise?	1-9	10-19	20-29	Over 30
5. How many years have you raised goats?	Less than a year	1-2 years	2-3 years	Over 3 years
6. What goat production technologies have you adopted the last two years? Check all that apply.	Stall feeding	Improved housing	Integrated goat and crop farming	Others
7. Why did you adopt these technologies?				
8. Through which means do you get information to help you make farming decisions? Check all that apply.	Government Extension worker	NGO staff	Agro-dealer	Lead Farmer
9. If you could get more information to help you make farming decisions, which source would you prefer?	Government Extension worker	NGO staff	Agro-dealer	Lead Farmer
10. What methods of instruction do these information sources use?	Demonstrations	Leaflets	Lectures	Other (specify)

11. Which method of instruction do you prefer?	Demonstrations	Leaflets	Lectures	Other (specify)
12. Which method of instruction is used by each of the sources of information?	Government Extension worker	NGO staff	Agro-dealer	Lead Farmer

Section 2: Preferences of Communications of Farming Information

ITEM	Not at all	A little bit	Some	Quite a bit	All the time
1. I prefer government agricultural extension workers as my source of information on new technologies.					
2. I prefer NGO staff as my source of information on new technologies.					
3. I prefer local agro-dealers as my source of information on new technologies. 4. I prefer lead farmers as my source of information on new technologies.					
5. I find government agricultural extension workers to be most easily available as a source of information.					
6. I find NGO staff to be most easily available as a source of information.					
7. I find local agro-dealers to be most easily available as a source of information.					
8. I find lead farmers to be most easily available as a source of information.					

9. I find government agricultural extension workers to be most reliable as a source of information.				
10. I find NGO staff to be most reliable as a source of information.				
11. I find local agro-dealers to be most reliable as a source of information.				
12. I find lead farmers to be most reliable as a source of information.				
13. I consider government extension workers the most consistent source of information.				
14. I consider NGO staff the most consistent source of information.				
15. I consider local agro-dealers the most consistent source of information.				
16. I consider lead farmers the most consistent source of information.				

Section 3: General Characteristics

ITEM	1	2	3	4
1. I am of the following Gender	Female	Male		
2. My age is	15 to 25	26 to 35	36 to 45	Over 45
3. How much money do you make in a year?	Less than MK15,000	MK15,000 to MK30,000	MK30,000 to MK100,000	Over MK100,000
4. What is your major source of income?	I own my own farm	I own my own Business	I work for someone else (person or organization)	I do Piece work
5. What is your major source of farm income?	Selling Crop produce	Selling livestock	Hiring out farm machinery	Selling labour
6. What is the size of your farm?	Less than 0.4 ha	0.4 to 2 ha	2 to 5 ha	Over 5 ha
7. Are you a member of any farmer club or group?	Yes	No		
8. If "yes", which one?	Group	Club	Association	Cooperative
9. What structures do you have on your farm? Choose all that apply.	Live-in houses	Grain storage	Livestock sheds	None
10. Who provides for your household?	Male	Female	Child	Elderly
11. How far did you go with education?	None	Some Primary education	Some Secondary education	Some college

Appendix D: IRB Approval Notification

PURDUE UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	COLLEEN BRADY AGAD 219
From:	JEANNIE DICLEMENTI, Chair Social Science IRB
Date:	09/17/2012
Committee Action:	**Exemption Granted**
IRB Action Date:	09/17/2012
IRB Protocol #:	1208012587
Study Title:	PERCEPTIONS OF MALAWI GOAT FARMERS REGARDING EFFECTIVENESS OF METHOD OI CHARACTERISTICS OF TECHNOLOGY ADOPTERS

The Institutional Review Board (IRB) has reviewed the above-referenced study application and has determined that it meets the criteria for exemption under 45 CFR 46.101(b)(1) .

If you wish to make changes to this study, please refer to our guidance **"Minor Changes Not Requiring Review"** located on our website at http://www.irb.purdue.edu/policies.php. For changes requiring IRB review, please submit an **Amendment to Approved Study** form or **Personnel Amendment to Study** form, whichever is applicable, located on the forms page of our website www.irb.purdue.edu/forms.php. Please contact our office if you have any questions.

Below is a list of best practices that we request you use when conducting your research. The list contains both general items as well as those specific to the different exemption categories.

General

- To recruit from Purdue University classrooms, the instructor and all others associated with conduct of the course (e.g., teaching assistants) must not be present during announcement of the research opportunity or any recruitment activity. This may be accomplished by announcing, in advance, that class will either start later than usual or end earlier than usual so this activity may occur. It should be emphasized that attendance at the announcement and recruitment are voluntary and the student's attendance and enrollment decision will not be shared with those administering the course.
- If students earn extra credit towards their course grade through participation in a research project conducted by someone other than the course instructor(s), such as in the example above, the students participation should only be shared with the course instructor(s) at the end of the semester. Additionally, instructors who allow extra credit to be earned through participation in research must also provide an opportunity for students to earn comparable extra credit through a non-research activity requiring an amount of time and effort comparable to the research option.
- When conducting human subjects research at a non-Purdue college/university, investigators are urged to contact that institution's IRB to determine requirements for conducting research at that institution.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not

submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Category 1

- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Categories 2 and 3

- Surveys and questionnaires should indicate
  - only participants 18 years of age and over are eligible to participate in the research; and
  - that participation is voluntary; and
  - that any questions may be skipped; and
  - include the investigator's name and contact information.
- Investigators should explain to participants the amount of time required to participate. Additionally, they should explain to participants how confidentiality will be maintained or if it will not be maintained.
- When conducting focus group research, investigators cannot guarantee that all participants in the focus group will maintain the confidentiality of other group participants. The investigator should make participants aware of this potential for breach of confidentiality.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Category 6

- Surveys and data collection instruments should note that participation is voluntary.
- Surveys and data collection instruments should note that participants may skip any questions.
- When taste testing foods which are highly allergenic (e.g., peanuts, milk, etc.) investigators should disclose the possibility of a reaction to potential subjects.

Appendix E: Subjects' Reasons for Technology Adoption

SUBJECTS' REASONS FOR GOAT MANAGEMENT TECHNOLOGY ADOPTION

a. Animal health

Some respondents indicated that they adopted new housing and feeding technologies for the sake of the health of their animals. These respondents said the new technologies would improve the goats' health, as previous management practices had led to various goat illnesses.

b. Security

Some respondents who adopted new housing technologies indicated that the improved elevated goat house provided security to the animals from predators like hyenas. Thieves would also find it harder to steal a goat from these houses without making a lot of noise.

c. Manure

Collection of manure was cited as a reason for adoption of new management technologies such as the elevated goat house and stall feeding.

d. Food

Some respondents adopted these technologies simply to improve their animal so that it could provide more meat for food.

e. Small landholding

Small landholding sizes led some respondents to adopt technologies such as improved housing and stall feeding.

f. Copied from friends

One respondent indicated adopting these technologies after observing that friends had adopted the technologies and their herd improved.