FACTORS AFFECTING THE ADOPTION OF THE VILLAGE AGENT RETAIL MODEL AMONG SMALLHOLDER FARMERS IN UGANDA

CASE STUDY: LIRA DISTRICT

A dissertation presented to

FACULTY OF BUSINESS ADMINISTRATION AND MANAGEMENT

in partial fulfillment of the requirements for the award of the degree

Master of Science in Development Economics

UGANDA MARTYRS UNIVERSITY

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October 2013

DEDICATION

I dedicate this study to the almighty God for his wisdom, provision and never ending blessings for the success of my research.

ACKNOWLEDGEMENT

I would like to extend my deepest appreciation to friends and family for their prayers and moral support throughout the period of study of my Masters degree; and particularly Barbara for her resourcefulness.

I am particularly grateful to my supervisor, Ms Namanji Stella for her wonderful technical advice and guidance. Her comments immensely helped me during the entire period of my research and enabled me piece together the report in this present form.

I cannot forget the contribution from some of my lecturers at the Uganda Martyrs University-Rubaga campus particularly Mr. Kakungulu Moses; their insights made it possible for me to polish and come up a more solid research.

Last but not least to the Almighty God for his continued provision and protection.

I thank you all.

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ABREVIATIONS

CAADP: Comprehensive Africa Agriculture Development Program

DSIP: Development Strategy and Investment Plan

FAO: Food and Agricultural Organization

GDP: Gross Domestic Product

GoU: Government of Uganda

IFPRI: International Food Policy Research Institute

LEAD: Livelihood Enterprises for Agricultural Development

MAAIF: Ministry of Agriculture Animal Industries and Fisheries

MFPED: Ministry of Finance, Planning and Economic Development

NAADS: National Agricultural Advisory Services

NDP: National Development Plan

NDP: National Development Plan

PMA: Plan for Modernization of Agriculture

UBOS: Uganda Bureau of Statistics

USAID: United States Agency for International Development

USTA: Uganda Seed Trade Association

VARM: Village Agent Retail Model

ABSTRACT

The study examined the factors that affected the adoption of the Village Agent Retail Model in Uganda with Lira district as the case study. The study employed a cross sectional survey design using both quantitative and qualitative research approaches. The target population was the small holder farmers of Lira district, in 3 sub-counties, Ogur, Amach and Aromo. Purposive sampling technique was applied and a self administered questionnaire as the tool of data collection and an ANCOVA binary logistic model was used. SPSS was used for data entry; STATA was used for bivariate analysis and multivariate analysis. The findings indicated a statistically significant impact of farmer group membership (odds ratio = 0.280779, p = 0.010), the impact of agricultural input handouts was not significant (odds ratio = 0.83688, p = 0.822), the results also showed a statistically significant impact of the distance from the farmer's home and the stockist (odds ratio = 0.4063188 p = 0.003) and the impact of farmer capital was found to be statistically not significant (odds ratio = 1.02616, p = 0.694). The study concluded that farmer group membership significantly influenced the adoption of the village agent retail model; existence of projects providing agricultural input handouts no significant impact on the adoption of the model; the distance from the farmer's home to the stockist significantly impacted the adoption of the model and farmer capital had no significant impact on adoption of the village agent retail model. The recommendations involved emphasis being put in promoting the village agent retail model amongst farming communities that are formed into groups; implementation model should be in areas where there is no presence of projects providing agricultural hand-outs and farming communities that are far away from the stockist and there should be deliberate efforts that drive at ensuring that farmers have capital.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This section is an overview of the background of the research, statement of the problem, objectives of the study, scope and justification of the research, and the conceptual framework, definition of key words and organization of the dissertation.

1.2 Background

Worldwide there is a new recognition of the key role agriculture plays in economic growth, development and poverty reduction. The World Bank's 2008 World Development Report states that "it is time to place agriculture afresh at the centre of the development agenda, in a vastly different context of opportunities and challenges". The report is unequivocal that while agriculture alone will not be enough to reduce poverty, it has proven to be uniquely powerful in that task.

This renewed interest in agriculture also comes in the context of recent alarms as regards volatile global food prices and what, if anything, Uganda should seek to do about it. Most of the factors adjudged to contribute to the situation are related to increased global demand for food commodities but supply-side issues (such as the use of food crops for bio fuel production and growing meat consumption in the emerging economies of China and India) and developments in global trade policy and climate change are probably also important. In fact, Uganda's food commodity markets are relatively isolated (and so shielded) from global markets (IFPRI, 2008), but if higher world food prices are sustained, it seems likely that food prices in Uganda will increase, often through

secondary impacts such as high fuel prices. This can be an opportunity as well as a challenge, with new markets opening up for the net sellers of food crops in the country.

1.2.1 Performance of the agricultural sector in Uganda

Agriculture is a key sector of the Ugandan economy; employs 66 percent of the population aged between 14 years and 64years (UBOS Statistical Abstract, 2012).

There are about 3 million smallholder farm households of which 80 percent have below 4 ha of farm land and the hand-hoe is the predominant technology for cultivation, resulting in low productivity. Only tea and sugar are grown on large estates. The main traditional cash crops grown are coffee, cotton, tobacco, tea and sugar cane, while the traditional food crops are mainly maize, beans, cassava, Irish potatoes, sweet potatoes, groundnuts, bananas and finger millet – these are the foods that support Uganda's livelihood. Food crop production dominates the agricultural sector, contributing 63.8 percent of agricultural GDP.

The agricultural sector in Uganda is characterized as semi-subsistence with low input and low productivity and supports the rural population that constitutes 80 percent of Uganda's total population.

Besides, agriculture is the major source of raw materials for industry, and food for the nation. As such, the five-year National Development Plan (NDP) identifies agriculture as the primary growth sector to transform the economy from a peasant to a modern prosperous society (GoU, 2010).

Despite the critical role, the future of Uganda's agriculture remains uncertain. Agricultural growth rate is low and unstable, yet population growth is higher and appears to be on the rise (National Budget, 2006).

Growth of the agricultural sector is much lower than the 5.6 percent annual growth envisaged in the NDP and the 6 percent annual growth target of the African Union under the Comprehensive Africa Agriculture Development Program (CAADP) (African Union, 2003). Low growth in agriculture is blamed on declining productivity and commercialization, as yield of most crops is several times lower than potential and subsistence production that is estimated at about 70 percent of smallholder agriculture is on the rise (MAAIF, 2010).

Limited participation of farmers in the market due to subsistence production implies low income, low saving and investment in productive assets, which is likely to perpetuate the vicious cycle of low improved inputs use, low productivity and low commercialization. Furthermore, limited investment in agricultural production leads to environmental degradation (Pender et al., 2004). All these in turn limit national employment growth, food security, and economic growth, which further aggravate rural poverty.

The challenge facing Uganda is to provide the necessary support services to turn Uganda's widely dispersed extremely small-scale subsistence agriculture into an engine of economic development. The sector has a high potential which can be realized only if improved agricultural practices are made available to and adopted by farmers. The country's estimated population of 33 million, (Uganda Demographics Profile, 2013), with a population growth rate of 3.3 percent per annum, determines the food demand, thus food production should therefore increase at well over 3.4 percent per annum.

Various institutional and policy reforms have been pursued over the past decade. Key among the reforms the Comprehensive African Agricultural Development Program (CAADP, 2008), which calls for 6 percent agricultural growth rates; the Maputo Declaration, which calls for 10 percent of total public spending to be used for agriculture; and the 2006 Abuja Declaration, which calls for a substantial increase in fertilizer use (Ehui and Okike 2007); the restructuring of MAAIF and the establishment of the Plan for Modernization of Agriculture (PMA) in 2000, closely followed by the establishment of the National Agricultural Advisory Services (NAADS) in 2001, (MAAIF and MFPED, 2000; GoU, 2001). The PMA was designed as multi-sectoral policy framework whose main objective was to increase the incomes of poor subsistence farmers through increased productivity and share of marketed output. On the other hand, NAADS was established with the mandate of increasing farmers' access to information, knowledge and improved agricultural technologies through the overhaul of the extension services delivery system from supply-driven to a demand-driven service (MAAIF and MFPED, 2000). Other areas of NAADS intervention to support farmer productivity and participation in the market included support to formation of farmer groups and savings and credit cooperatives (NAADS, 2005).

Despite the establishment of PMA, NAADS and increased government funding to agricultural sector, agricultural productivity remains constant or declined in some subsectors (MAAIF, 2010). The NDP and MAAIF 5-year (2010/11 -2014/15) Development Strategy and Investment Plan (DSIP) highlight a number of binding constraints to increased agricultural production and productivity in Uganda. They include among others: limited access to and use of improved inputs such as high yielding seeds

and fertilizer, and limited access to markets partly due to the subsistence-oriented nature of smallholder production.

1.2.2 Demand and supply of Agricultural inputs

It is widely recognized that the use of modern inputs, particularly that of improved seeds and fertilizers, is closely linked to higher agricultural productivity and food security (Evanson and Gollin 2003; Crawford et al. 2003; Crawford, Jayne and Kelly 2006).

Indirectly, use of fertilizers lead to higher economic growth and poverty reduction through increased agricultural productivity and output (Dethier & Effenberger, 2011). This is particularly more evident in Sub-Saharan Africa (SSA) countries where agriculture is the primary sector and source of livelihood to the majority of the population (World Bank, 2007). Indeed recent empirical evidence from Uganda (such as Senoga & Matovu, 2010) has demonstrated that increasing agricultural output and productivity leads to higher growth of the gross domestic product and accelerates poverty reduction. On the environmental front, agricultural intensification – where a farmer gets more output from the same piece of land by using high yielding inputs including fertilizer, reduces forest cover loss and promotes biodiversity (Smaling et al., 2006).

The irony is, Africa's consumption of modern inputs, particularly fertilizers, is comparatively very low. FAO (2008) projects that the situation will not change much in the short run as Africa will account for less than 3% of world fertilizer consumption by the end of 2012. To understand the current low levels of modern input use in African agriculture one has to take into consideration the developments and factors that drive the demand and supply of these inputs.

The demand and supply of agricultural inputs are influenced largely by changing and often interrelated factors: population and economic growth; agricultural production; prices; and government policy. These changes manifest themselves in the global macro-economic factors, the agricultural context, income growth and dietary change, bio-fuels, additional agricultural land cultivated, and technology. They are the main drivers of both agricultural input demand and supply. In addition, changes in technology are crucial in the supply of agricultural inputs.

Macro-factors affecting global demand and supply of agricultural inputs include: the economic context; oil; trade; freight rates; and exchange rates. In the economic context, developing countries and economies in transition continue their strong economic performance, and hence a continued increases in the demand for agricultural commodities and inputs (FAO 2008). High oil prices could depress the use of oil-based agricultural inputs (fertilizers and agro-chemicals) which have been behind much of the increases in farm production during the past half century (FAO 2007). At the micro (farm) level the income of farmers is the most important factor affecting their demand for agricultural inputs.

In light of the above agricultural productivity and food security remain on the low.

1.2.3 Agricultural input subsidies in Sub Saharan Africa

The use of agricultural inputs is fundamental in modern agriculture in developed countries, and they were a primary ingredient in the green revolution that swept through Asia and Latin America during the ‘60s and ‘70s. However, the green revolution largely by-passed SSA, and the use of agricultural inputs remains very low.

In 2002-2003 Sub-Saharan African farmers used on average 9 kg of fertilizers per ha of arable land compared to 100 kg per ha in South Asia, 135 in Southeast Asia and 73 in Latin America (Crawford et al, 2006). While agricultural production and productivity soared in Asia and Latin America during the last four decades, they have largely stagnated in Africa, resulting in a rising dependency on imported grains and an increase in the number of undernourished people (Wiggins and Brooks, 2010; Future Agricultures, 2010).

1.2.3 The level of agricultural input use in Uganda

The use of agricultural inputs directly improves agricultural production and productivity. However, access and use of agricultural inputs in Uganda is still very low. MAAIF, 2010, quotes that Uganda has the lowest fertilizer use in the world. Fertilizer use in Uganda stands at an average of 1kg/ha, compared to 6kg/ha in Tanzania, 32kg/ha in Kenya and 51kg/ha in South Africa.

The 2008 National Service Delivery Survey report indicates that in 2008, only about 14 per cent of households reported use of at least one type of agro-input, while 86 per cent did not use any agro-input.

A report by UBOS (2007) and UNHS 2005/06 showed that at national level, the number of farmers use of improved seed was at 6%, manure at 6.8%, chemical fertilizer at 1%, and use of herbicides, pesticides and fungicides at 3.4%.

This is an illustration of very low use of agricultural inputs, an indication that farmers are not adopting improved agricultural technologies and this partly explains Uganda's low agricultural production and productivity. The major reasons advanced for the very poor or

non-use of inputs includes the high costs of acquiring the inputs and lack of knowledge about the importance of inputs and how to get them. There are also challenges regarding the input quality, which has been deteriorating over the years largely as a result of a failure to enforce standards, something which has led to the proliferation of counterfeits on the market.

1.2.4 Inputs value chain in Uganda

The value chain of inputs to the agricultural sector, namely for seeds and agro-chemicals, is strongest at the level of import of agro-chemicals and production and import of seed and weakest at the retail of inputs to farmers. Large importers of agro-chemicals and seed companies routinely promote their products, especially new items or seed varieties. These companies often conduct field demonstrations for farmers, collaborate with leading retailers, and participate in rural agricultural events and fairs.

Retailers, however, are generally passive store-owners, content to service customers able to reach their shops, but they do not actively seek to develop their markets, whether through promotional efforts, participation in agricultural events, or retail models that would expand their reach to farmers further afield. Owners of the typically small shops may be knowledgeable about their products but staff is generally under-informed and incapable of providing technical advice to farmer-clients. As such, there is generally little active competition between retailers outside of the prices of their products and not on any additional services or customer support that would differentiate them.

The low outreach and technical competence of input retailers (stockists) are partly responsible for the low adoption of agro-chemicals and improved variety seeds by

farmers. The Uganda Seed Traders Association (USTA) estimates that 70% of farmers use home-saved seeds (notably maize) and only 20% use Open Pollinated Varieties (OPV); the remaining 10% routinely use hybrids. Uptake by farmers of seeds and agro-chemicals is also exacerbated by the cost of inputs, the unreliable supply from year-to-year of certain inputs, and the pervasiveness of fake products on the market. Although suppliers of fake products exploit the price sensitivity of farmers, they mainly exploit the unreliable supply of brand products and specific seed varieties, which creates opportunities for placing fake products on the market. These "stock-outs" can, in large part, be attributed to the poor management practices of retailers, their lack of knowledge of customer demand and inability to communicate this to their suppliers, and their lack of access to affordable financing to ensure adequate supplies.

Past support to the inputs sector which has mainly focused on building the technical and management capacity of stockists without commensurate gains in outreach by these retailers. USAID-LEAD sees this as an opportunity to focus its support to the inputs value chain to improve the retail models and promotional and customer service competence of stockists.

1.2.5 The Village Agent Retail Models (VARM)

In 2011, USAID-LEAD project transitioned to implementing USAID/ Uganda's Feed the Future (FtF) strategy and also supporting Uganda's Development Strategy and Investment Plan (DSIP) with focus on maize, coffee and inputs value chain.

USAID-LEAD is currently directly intervening in the coffee, maize and inputs value chains directly in 27 districts, working with traders and addressing one of the biggest

challenges that have prevented small holders from accessing better, stable, and improved markets.

In order to achieve sustainability, USAID-LEAD, is using a facilitative approach to design and implement what would be a holistic perspective of the dynamics in these value chains and identify points of intervention that would drive a process of generating sustainable benefits for smallholder farmers and other actors in the value chain.

In effect, the economies of the districts where USAID-LEAD is currently working are expected to grow leading to increased investments, increased productivity, increased employment, and increased household revenues; hence improved livelihoods.

USAID-LEAD project has been working with a number of input stockists across the country that are building and expanding a retail network to access the underserved market of rural farmers. They have been employing the Village Agent Retail Model (VARM)- recruiting agents in villages that act as intermediaries between stockists and farmers with sole purpose of improving access and use of improved agricultural inputs amongst the farming communities.

The VARM is an innovative approach by USAID-LEAD that requires Input stockists to employ an agent based system to sell inputs to larger number of farmers and promotional strategies to improve outreach to and communication with farmer clientele.

The Input stockists develop and manage networks of village-based agents who operate on behalf of the stockist. The stockist carries out promotional strategies that are aimed at developing and servicing an expanding farmer clientele, have efficient management practices- inventory and financial management. The stockist also identifies agents from the farming communities who will work as coordinators between the stockist and the

farmers; communicates clearly to agents their roles and responsibilities; equips agents with all the necessary information that will enable them to work efficiently and effectively such as providing farmers with knowledge on input products, taking and communicating orders from farmers, recording information on farmers' current and future needs; assesses and evaluates the performance of agents.

1.3 Problem statement

Agriculture is a key sector of the Ugandan economy; employing 66% of the population aged between 14 years and 64 years (UBOS, 2012). It is a direct source of livelihood for many households. However, agricultural productivity has been on the decline due to many factors among which is the lack of use of improved agricultural inputs (like fertilizers, pesticides, and planting materials).

Since early 2011, USAID-LEAD has been running a joint venture with agricultural input stockists and other actors in the industry to assist farmers in adopting better agricultural practices that will maximize production and productivity through use of agro-inputs like improved seed, fertilizer, herbicides; using the Village Agent Retail Model (VARM).

A report released in April 2013 by Afri-Tech Consult Ltd (ATC) for the USAID-LEAD project about the results chain measurement for the input sector with particular focus on small holder level showed that 42% of the farmers were accessing inputs through the agents; 55% of farmers were planting improved maize seed; while 8% were using fertilizer.

However, despite the efforts by USAID-LEAD through VARM to address the problem of accessibility to genuine inputs; there are still considerable proportions (80%) of small

holders that have not benefitted from the interventions. Even in the sub counties where the model was introduced and implemented, the small holders are still complaining of poor seeds, planting materials, fertilizers and agro-chemicals and often have to travel to town at considerable expense to purchase agricultural inputs; they are not assured of product authenticity and availability; there is still a gap in delivery of appropriate technical advice in the proper use of the purchased inputs.

No study has been done to establish the causes of this gap, It is against this background that the research was carried out.

1.4 Objectives of the study

1.4.1 Objective of the study

The overall objective of the study is to assess factors affecting adoption of the Village Agent Retail Model amongst smallholder farmers in Uganda with a case study of Lira district.

1.4.2 Specific objectives of the study

The specific objectives of the study include:

1. To examine the effect of farmer group membership on adoption of the Village Agent Retail Model.
2. To study the effect of agricultural handouts on adoption of the Village Agent Retail Model.
3. To analyze the effect of distance between the farmers' village and the stockist on adoption of the Village Agent Retail Model.

4. To establish the impact of farmers' capital on adoption of the Village Agent Retail Model.

1.5 Research hypotheses

1. Farmer group membership has no significant impact on the adoption of the village agent retail model.
2. Agricultural hand-outs have no significant effect on the adoption of the Village Agent Retail Model.
3. Distances between farmers' homes and stockist have no significant impact on adoption of the Village Agent Retail Model.
4. Farmers' capital has no significant impact on adoption of the Village Agent Retail Model.

1.6 Scope of the study

1.6.1 Geographical scope

The study was conducted in Lira district; it is one of the districts where VARM was implemented by USAID-LEAD. Lira District is bordered by Pader District to the north, Otuke District to the northeast, Alebtong District to the east, Dokolo District to the southeast, Apac District to the southwest and Kole District to the west. Lira District today consists of four (4) counties: Erute North County; Erute South County; Moroto County; and Lira Town Council. It also consists of 9 sub-counties (Ngette, Ogur, Agweng, Aromo, Barr, Amach, Lira, Agali, Adekokwok)

1.6.2 Content scope

The study focused on small holder farmers in Uganda and was concerned with assessing the factors affecting adoption of the Village Agent Retail Model. The study was interested in adoption of the model; the effect of farmer group membership, presence of agricultural hand-outs, availability of farmers' capital and effect of distance between the farmer's home and the stockist on adoption of the model.

Adoption of the model was categorical i.e. yes for adoption and no for non adoption; farmer group membership presence of agricultural hand-outs were categorical with yes for belonging to a group and no for not belonging to any group, yes for receipt of agricultural handouts and no for no receipt of agricultural hand-outs respectively; distance between the farmer's home and the stockist was measured in kilometers a farmer has to cover to reach the stockist, and farmer's capital was measured by the average amount of money spent on purchasing inputs and the farmer's source of money for purchase of inputs

1.6.3 Time scope

The study was carried out in between May and June, 2013, implementation of VARM came to a close during this period.

1.7 Significance of the study

The study serves to establish the underlying factors impeding and favoring the adoption of the Village Agent Retail Model in Lira district. With these factors known, this study will

provide guidance to VARM and other project implementers, and researchers about how to improve effectiveness of the model.

The added knowledge on which factors have the greatest influence on VARM adoption will help administrators make more informed decisions on how to promote VARM adoption.

With the benefits that are associated with VARM and the most appropriate implementation measures established, it is widely expected that the local governments will embrace this innovation and be at the forefront of championing the adoption the Village Agent Retail Model.

For NGOs or projects that intend to have a similar initiative to VARM, the findings of the study will provide them with background information such as the challenges, the considerations put in place before hand and the appropriate implementation strategies.
The study is also widely expected to contribute to the existing knowledge on agricultural inputs as well as be a basis for further research

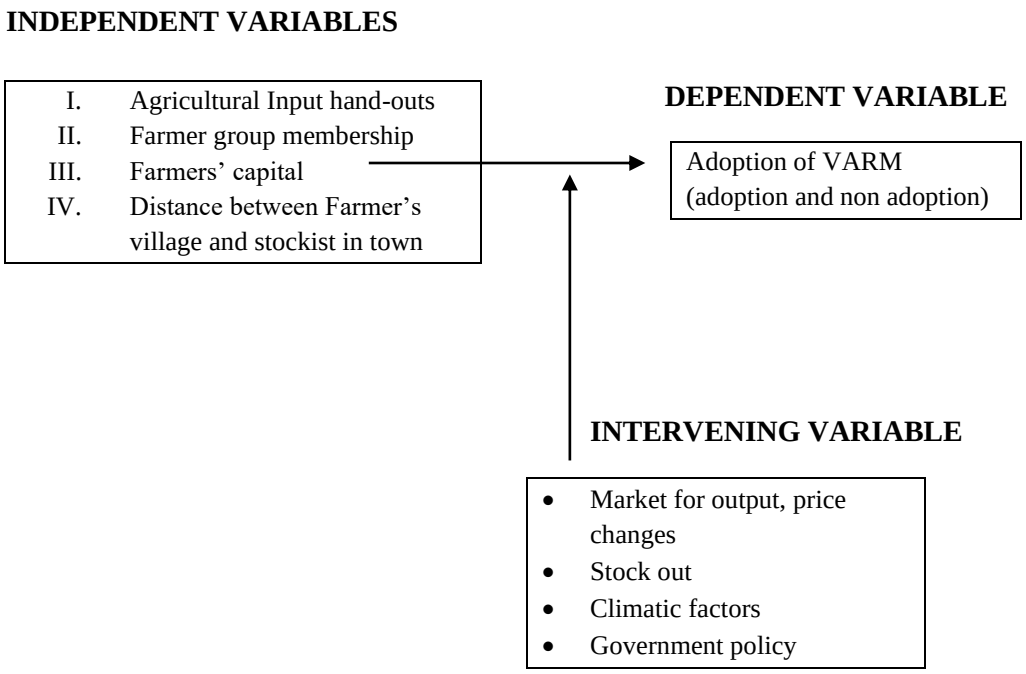
1.8 Definition of key words

a) **Improved agricultural inputs:** This collectively refers to improved seed, agro chemicals (herbicides, pesticides and fungicides) and fertilizers.
b) **Farmer group membership**: This refers to a farmer belonging to an organized group of farmers.

c) **Agricultural handouts:** These are free agricultural inputs that are handed-out by NGOs to some farmers within a community

d) **Farmers' capital:** These are resources that farmers use for purchase of agricultural inputs for the planting season.

1.9 Conceptual framework



1.10 Organization of the dissertation

The dissertation is organized into five chapters as follows; Chapter one of the study has the introduction, and includes the statement of the problem and the objectives of the study, research hypotheses, scope of the study, significance of the study, definition of key terms; Chapter two is the literature review, made up of theoretical literature review effect of farmer groups, agricultural handouts, distance and farmer's capital on adoption of the village agent retail model; Chapter three contains the research design, study population, sample size and selection; data collection methods and instruments, research procedure, validity and reliability of instruments; processing and data analysis and this is proceeded by Chapter four that contains presentation and discussion of the research findings; and Chapter five made up summary of the research findings, conclusions and policy recommendations drawn from the study and areas of further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review provides the researcher and other readers with an understanding of how prior research relates to the current study. The literature highlights studies on the effects of agricultural hand-outs; and the impact of farmer groups on adoption of improved agricultural technologies; Distance of farmer's home from the input markets (stockist); and effect of farmer's capital on adoption of VARM.

2.2 Theoretical literature review

Agent-based spatial model applied to Agriculture

This model is explained based on the following factors

Technical change

The innovation economics literature, as cited in Dosi et al. (1988), regards modern farm production as a typical example of a supplier-dominated sector. Technical improvements are largely incorporated in process innovations such tractors, fertilizers and pesticides, which are generated in the input supplying industry. The focus of this model approach is therefore, placed on the adoption of agricultural innovations by farms. Specific supply factors of technical change are neglected. This simplification can also be justified by the commonly accepted hypothesis that demand factors are largely responsible for the speed of diffusion in agriculture (Griliches, 1957). Technologies that appear to be promising in the near future become available to the farm-households in the simulation runs and diffuse

through the farm sector. Obviously, two extreme scenarios define the 'possibility space' for future technology diffusion in the farm sector.

On one hand, farmers might adjust 'smoothly' to exogenous technical changes as predicted in the standard economic approaches. On the other hand, one might assume conservative farmers who are reluctant to innovate and refuse any technology adoption. Reality will probably lie somewhere between these two boundaries. The model presented here helps to explore the economic potential of new technologies along alternative development paths.

Heterogeneity of behavior

In decision-theoretic terms, two variables affect the behavioral heterogeneity of farmers during the diffusion process of a specific innovation. First, the net benefits from adoption which traditional farm investment analysis can 'objectively' measure. Second, all other costs that relate to the farmer's managerial capacity and are usually referred to as adoption costs. These include information and planning costs, socio-psychological adjustment costs, temporary production losses as well as 'subjective' risk premiums and option values. Metcalfe (1988, p. 564) provides a good illustration of how the diffusion process in the farm sector emerges from the frequency distribution of these two variables. Following his concept, one can classify the farm-households into three groups with regard to their timing of technology adoption: "non-adopters" whose net benefits from adoption of a specific innovation are negative (presumably due to indivisibility or insufficient farm sizes), "potential adopters" who at present face prohibitively high adoption costs and "actual adopters" with positive net benefits after adoptions costs.

Diffusion of the innovation occurs when relative price changes or technical improvements modify the distribution of net benefits and/or adoption costs and hence, more 'potential' adopters become 'actual'.

As Metcalfe (1988) notes, the recognition of 'information contagion' or 'bandwagon effects' distinguishes the following two diffusion models. Equilibrium approaches assume that information sets are given and exogenous, while disequilibrium approaches acknowledge an endogenous chain-reaction type of 'contagion processes. A prominent example of the second approach is Cochrane's (1979) treadmill model in agriculture, which is based on different adoption costs. Farmers with a high management capacity and low individual adoption costs tend to adopt a new technology first; imitators follow when their initially higher adoption costs decrease due to information spillover. Much empirical evidence, as cited by Rogers (1995), supports this concept. At the most critical stages in their adoption decision process, farmers apparently rely on information brought to them by the peers.

Thresholds to adoption

If all farmers eventually adopt an innovation, the outcome of the contagion process over time usually approaches an S-shaped diffusion path. Typically the normal bell-shaped and the cumulative curve are partitioned into five adopter categories using the average time of adoption and the standard deviation.

Along the time path, the farmers behave as if they had thresholds to adoption. For example, the first farmers of the 'early adopter' segment adopt after the 'innovators' segment, which counts for 2.5% of the farm population has. The 'early majority' follows after the innovation has reached 2.5 + 13.5% of the farmers, and so forth. Accordingly, one can interpret these cumulative percentages as 'adoption thresholds' for the farmers of

the subsequent adopter category. If one additionally assumes that relative prices remain constant and no post-innovative technological improvements occur, the following decision rule at the farm level leads to the same time path.

• *Step* 1: Monitor the present adoption level and compare it with the individual threshold.

• *Step* 2: If the threshold is reached, calculate the farm's net benefits from the adoption.

• *Step* 3: If the net benefits are positive, adopt the technology.

Introducing a few more assumptions to this frequency-dependent diffusion mode, make it possible to predict the time path of the adoption of several production technologies simultaneously. The most important of the assumptions listed in Berger (2000) are: no change of thresholds over time; innovations do not differ in their 'primary' attributes (Downs and Mohr, 1976); the existence of a 'natural' time intervals, such as planting seasons when adoption decisions can only be made. As further extensions to this approach, one can (1) consider separate communication networks without information spillover by monitoring only the farmers belonging to the same network and (2) attribute higher weights to external information sources by lowering the above mentioned thresholds.

Empirical estimation of diffusion parameters

Net benefits of different production technologies can be derived from experimental data and easily introduced into the whole farm programming models.

In contrast, the estimation of adoption costs and their changes over time usually poses problems due to poor data availability. Fortunately, network-thresholds have in principal the advantage of a better empirical measurability. As Valente (1995) demonstrates, individual network-thresholds can be straightforwardly computed from the network survey data. Since adoption thresholds contain the same information about the underlying

contagion process as adoption costs, the threshold approach is chosen for the research presented here. However, a complete network survey was not yet available for the Chilean study region and the network-thresholds had to be derived from the data provided by the extension service, an own project survey and in-depth interviews. Based on the intensive empirical work of Stallmeister (1995) and Sauer (1995), two distinct communication networks without information spillover were considered. On one hand, the *campesino* farms network consists of small-scale family holdings between 2.5 and 12.0 ha. On the other hand, the so-called 'commercial' farms network with farm sizes of more than 12.0 ha. Certainly, this network analysis is rather subjective and a follow-up study will have to be conducted to provide more objective empirical network-thresholds.

2.3 Farmer groups and adoption of VARM

Oladele and Wakatsuki, 2006 stressed that in both developing and developed countries, social networks and peer effects are an important determinant of individual behavior in a variety of settings. At the farmer level, although there were many factors that influenced adoption and use of these technologies, studies have shown that rural communities that are characterized by strong social dynamics have faster rates of technology diffusion and improved environmental management.

Social capital manifested in community-based organizations or in personalized social networks has been found to play an important role in the adoption of crop technologies (Isham, 2000; Katungi, 2007).

Organizations may generate externalities such as information about new technologies (Colliers, 1998) that may facilitate adoption decisions. The externalities generated by local organizations may vary as a function of the characteristics and functioning of these

organizations. He hypothesized that the density of household participation influenced its capacity to acquire information from the social network and the extent to which a household decisions are influenced by the decisions of other households.

A study done by Katungi and Akankwasa, 2005, discusses the effect of community-based organizations on adoption decisions. Overall the results indicated that the density of participation in organizations and socio-demographic homogeneity are important in the adoption decisions of corm paring. The index capturing trust in other members of organizations positively influences the probability that a banana producer will adopt corm-paring technology. Farmers who participate more in community-based organizations are likely to engage in social learning about the technology, raising the likelihood that they adopt new technologies.

(Narayan, 1997) points out that the aspect of organization also influenced the use of banana production technology directly since it measured participation in organizations that deal with economic activities, which may reduce expenditure constraints on labor use. He also expected social interactions within organizations that were guided by participatory decision-making norms to positively influence adoption of corm paring because this aspect of organizations facilitated cooperation, opening up and hence the sharing of tacit information among members.

The internal composition of the group influenced the way people interacted and shared information. It is not immediately obvious whether a high degree of internal heterogeneity is a positive or negative factor from the point of view of the social capital embodied in local organizations. One can argue that internally homogenous organizations will make it easier for members to trust each other and to share information (Rogers, 1995; Isham,

2000), but members may also have similar information so that less is gained from exchanging information.

According to (Yli Renko et al., 2002), trust enhanced the sharing of tacit information among members. This means that organizations formed among members of the same ethnic homogeneity living in the same neighborhood are more likely to encourage adoption of new technologies through their influence on trust and sharing of information.

Ethnic homogeneity is associated with same beliefs and social norms that regulate interaction, which may facilitate communication between two people (Rogers, 1995, 1983). Controlling for this effect, results show that spillover effects to non-members do not depend on the number of organizations in a community. A non-member in a community with many organizations is equally less likely to adopt as one in a community with few organizations.

2.4 The effects of agricultural hand-outs on the adoption of agricultural technologies

Subsidized input supply systems are usually justified where governments embark on deliberate efforts to support agricultural recovery of vulnerable farmers and to ensure food self-sufficiency and food security. Natural disasters, harsh economic environments or discriminatory policies; war insurgency as is the case with Northern Uganda, can create vulnerability among certain groups of farmers such as the resource-constrained new small holder farmers. In addition, private sector participation may not be profitable in marginal areas or for minor crops where economies of scale cannot be achieved.

However, massive government participation in input distribution programs is not sustainable due to limited government budgets, the disruption of the growth of the private

sector as well as inherent inefficiencies that lead to input distribution delays, limited choice of inputs, lack of quality assurance and the misallocation of scarce resources due to poor targeting and leakages.

Many donor agencies have assisted farmers to recover from seasons of natural disasters and farmers have benefited from new technologies. However, questions have been raised on the role of donor aid in disrupting local input markets and creating the donor syndrome.

In a study done by Govere et al, 2009 revealed that agricultural handouts had created a deep rooted dependency syndrome among Zimbabwean farmers. The concomitant problem was that when government distribution was late in the season, even the well-off farmers were also affected because they had become so used to receiving and not buying agricultural inputs.

CPRC (2011) a common argument against social assistance, generally put forward by elite and some middle-class circles, is that it breeds 'dependency' among beneficiaries, undermining people's self-sufficiency and motivation to climb out of poverty through their own efforts. Some neo-liberal economists argue that recipients of predictable, free social transfers are discouraged from working. Opponents of social assistance claim that beneficiaries will lose the incentive to save, accumulate assets, invest in diversification and business development, and to participate in the labor-force. In other words, it is assumed that social assistance breeds 'laziness' and a permanent 'dependency' on 'handouts'. There is also an associated assumption that if poor people are given social assistance – particularly cash transfers – they will inevitably 'waste' it on alcohol or spend it in other unproductive ways, as opposed to using it constructively.

The issue of responsibility also informs debates around social assistance and dependency. The argument here is that individuals have sole responsibility for taking action to lift themselves out of poverty – 'to pull themselves up by the bootstraps' – and social assistance can ameliorate, rather than encourage, this responsibility.

(Sperling, 2002), also highlighted the dangers of on seed aid. Amongst farmers questioned in her study, most were initially satisfied with the content of formal seed aid. However, over ten seasons, many farmers had received seed aid repeatedly and expected seasonal seed distributions to continue as the norm. Most of the farmers sampled continued to suffer acute or chronic drought stress, and their inability to produce or procure seed elsewhere was exacerbated by more profound factors than those addressed by the aid intervention, such as lack of water, suitably adapted crop varieties, soil erosion and access to markets.

Impact evaluations on humanitarian agricultural aid have verified that the distribution of agricultural inputs has often been inappropriate or has undermined the local economy, and in this case, seed distribution.

2.5 Distance of farmer's home from the input markets (stockist)

In a study by Beshir et al, 2012 about the effect of distance of farmer's home from the nearest input market showed that the coefficient of distance to market had the expected negative sign and significant effect on the probability and intensity of adoption of inorganic fertilizer.

The negative sign indicated the importance of proximity to a regular markets leading to better access, lower transport cost, and timely delivery of inputs and disposal of output

and better output price for farmers. The market is used to buy required input and sell surplus output.

Thus the closer distances of a farmer's home to the market enabled and facilitated marketing of inputs and outputs.

Gbegeh and Akubuilo, 2012, in their study hypothesized that distance from market had significant effect on the adoption of crossbred dairy cows in the area as indicated by Bulale (2000) and Yenealem (2006) that had shown that market distance is negatively and significantly related to adoption decision.

In their findings, distance to and fro the market had a negative and significant effect on the adoption of yam minisett technologies. This agreed with their prior expectation. Poor access to information has a negative effect on the adoption of yam minisett technologies.

They go on and conclude that greater distance to market and services decreased the odds of adoption perhaps distance adds to costs odds of a new innovation and reduces potential net benefits. With respect to the infrastructure it is assumed that farmers' access to farm inputs, information and marketing facilities depends on the distance of their farm to the places of supply.

They contend that distance to market is very important determining factor that negatively influences adoption of the selected technologies. One way forward to increase market access of rural people is to improve the physical infrastructure of the institutions to facilitate linkage and frequent visits. This would be possible by allowing niche markets and small businesses to flourish very close to or in the villages which ultimately could develop to local market or well developed market places where farmers can easily and with lower transaction costs exchange their outputs and inputs. The other possible way

out, but capital intensive decision would be, to increase the number of dry and all weather roads in the areas to close average distance gap and as a result transportation and vehicles could be easily accessible so that rural people visit to nearby local market more frequently.

2.6 Farmer's capital and adoption of VARM

A study done by Diiro, 2012 investigated the possibility of productivity gains from investing off-farm income in better maize technologies by examining the technical efficiency of maize farmers. Following Aigner et al. (1977), Battese (1992) and Rahman (2003), she specified the stochastic production function for a given farmer as:

$Q = f(X; \beta) + v - u$

Where Q, X, and β are vectors of maize output (in kilograms), input levels used in maize production and estimated parameters, respectively. The inputs include land (in hectares), labor (hours) and capital (in Uganda shillings). The term v is a two-sided ($-\infty < v < \infty$) normally distributed random error that captures the stochastic effects outside the farmer's control, measurement errors, and other statistical noise. The term u is a one-sided ($u \geq 0$) efficiency component that captures the technical inefficiency of the farmer. Thus, u measures the shortfall in output from its maximum value given by the stochastic frontier. She assumes that u follows a half-normal distribution. The two components v and u are also assumed to be independent of each other. In both cases vi and ui cause actual production to deviate from the frontier.

The results showed a positive and significant effect (at 10 percent level) of household off-farm income on adoption of improved maize varieties. A one percent increase in off-farm income earned increased the probability of adopting improved maize varieties by about

0.4 percent. The intensity of adoption is about 0.003, implying that the number of hectares planted with improved seed increased by about 0.3 percent due to a one percent increase in off-farm income among the adopters.

The positive effect of off-farm income suggested that off-farm earnings may induce technology adoption by providing farmers with capital for purchasing the improved maize technologies. She concluded that promoting off-farm income generating activities in the rural areas could thus be an important policy strategy that can be used to encourage increased uptake of yield enhancing technologies.

Jorge et al, 2007, found that the relationship between the adoption of herbicide-tolerant (HT) soybeans and *off-farm* household income was positive and statistically significant. The elasticity of off-farm household income with respect to the probability of adoption of HT soybeans (calculated at the mean) was +1.59. That is, after controlling other factors, a 15.9% increase in off-farm household income was associated with a 10% increase in the probability of adopting herbicide tolerant soybeans. The adoption of herbicide tolerant soybeans was also positively and significantly associated with total household income (from off-farm and on-farm sources).

A 9.7% increase in total household income was associated with a 10% increase in the probability of adopting of herbicide tolerant soybeans; while on the other hand, adoption of herbicide tolerant soybeans did not have a significant relationship with household income from farming.

2.7 Limitations to the adoption of the improved agricultural technologies

According to (Agricultural Development Strategy and Investment Plan: 2010/11-2014/15); input markets in Uganda have been difficult to develop for a number of reasons. To begin with, demand for agricultural inputs is highly variable in time and space. The demand for seed is highest when farmers are growing hybrids, whose seed must be replaced regularly. It is lowest when farmers are growing varieties whose seed can be saved from the harvest and replanted for several cropping seasons. In addition, the quality of seed in the market may be unknown as quality cannot be determined through visual inspection. The low demand for fertilizer follows much the same reasoning: lack of knowledge, information asymmetries, liquidity constraints, risk and uncertainty, and high opportunity costs.

The IFPRI, 2004 study also found that, among households who were aware of modern inputs or technologies and had received advice on their use, adoption rates were significantly higher than households who were also aware of these inputs or technologies but had not received advice on their proper usage. This is a significant finding in that appropriate advisory services, not only on enterprise selection but also on input use, can have a significant productivity impact.

2.8 Summary of literature review

The related literature provides tentative information on the likely state of events concerning the use of improved agricultural inputs in Uganda that implementation of VARM needs to put into consideration without necessarily working in isolation. An insight into probable factors that may enlist or limit success of VARM are provided by the related literature such the effect of agricultural handouts and impact of farmer groups on the adoption of improved agricultural technologies.

However, it is not clear from the literature whether these factors are a reflection of the limitations or success of VARM amongst small holder farmers in Lira district; the research is intended to assess the factors affecting adoption the Village Agent Retail Model amongst small holder farmers in Uganda with Lira district as the case study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter focused on the scientific method that was used in the study. This section dealt with the following subsections: the research design, study population, sample size and selection; data collection methods and instruments, research procedure, validity and reliability of instruments; processing and data analysis, limitations and delimitations.

3.2 Research design

The study employed a cross sectional survey design using both quantitative and qualitative research approaches with semi-structured questionnaire as a tool for data collection.

3.3 Study population

For purposes of the study, the target population was the small holder households of Lira district. The Village Agent Retail Model was implemented in 3 sub-counties i.e. Ogur, Amach and Aromo.

The population of small holder households of Aromo Sub County was 5,841 households, Ogur Sub County is 8,889 households, and Amach Sub County was 8,625 households; the total target population of the 3 sub-counties was 23,355 households (Uganda population and Housing census, 2002)

3.4 Sample size determination and sampling techniques

3.4.1 Sampling techniques

The study used purposive sampling to select the sub county, parishes and villages so as to draw responses from the areas within which the model was implemented. Purposive sampling was used because the respondents chosen were likely to give the best picture of the phenomenon under investigation.

3.4.2 Sample size determination

The sample size was determined using the formula by R. V. Krejic and D.W. Morgan (1970) below.

$s = X^2 NP(1-P) \div d^2 (N-1) + X^2 P(1-P)$.

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

$s = 3.841^2 \times 11 \times 0.50 (1-0.50) / 0.05^2 (11-1) + 3.841^2 \times 0.50 (1-0.50)$

s= 10.9 approximately 11 farmers

The researcher interviewed 11 respondents from at least 3 villages from at least 1 parish in each of the 3 sub counties. Purposive sampling was applied.

Therefore, approximate sample size for the area under study was 99 small holder farmers + 1 extra smallholder farmer, thus a total of 100 respondents as the sample size.

3.5 Data collection methods and instruments

Data for the research was obtained from primary sources using self administered questionnaires.

The self administered questionnaires had both open and close ended questions that were administered by the Researcher and Research Assistant; bearing in mind the low literacy levels of the households. The close ended questions had restricted choices of responses; while the open ended questions gave the respondent the liberty to respond freely.

3.6 Validity and reliability of research instruments

3.6.1 Validity

According to Joppe (2000), validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to 'hit the bull's eye' of your research object.

3.6.2 Reliability

Joppe (2000) defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if identical results of the study can be reproduced under a similar methodology, then the research instrument is considered to be reliable.

To ensure accuracy of the data that were collected; and its consistency, the questionnaires were subjected to pre tests using a proxy sample population with similar characteristics to the actual population under study. This was done to enable re-designing of the questionnaire so as to improve quality of data collected in case of any inconsistencies. A total of 25 proxy respondents were used. The questionnaires were administered in one of the parishes were the Village Agent Retail Model was implemented but the parish chosen was excluded from the actual research. For the questions that were not generating the desired responses, these were redesigned and the questionnaire tested again.

3.7 Data management and processing

This task involved editing, coding and tabulation using SPSS. This was done by the researcher after data collection. The editing was at the initial stage of processing; the responses obtained from the interviews were thoroughly checked for any errors. The coding was intended to classify responses to questions into meaningful categories in order to bring about essential patterns. The coding was done during and after data collection. The coded responses were then entered into SPSS data editor.

3.8 Data analysis

The questionnaires were inputted using SPSS as well as generating descriptive analysis; STATA was used for bivariate analysis and to run the multivariate regression.

3.8.1 Univariate analysis

The analysis was carried out with the description of each variable in the study one at a time. The variables under consideration included the dependent variable (adoption of VARM) and each of the independent variables (farmer group membership, reliance on agricultural hand-outs, distance between the farmers' village and the stockist and farmers' capital). The univariate data was presented in form of frequency distribution of each variable, use of tables, pie charts and bar graphs.

3.8.2 Bivariate analysis

This analysis was carried out between two variables to determine the empirical relationship between them. The variables under study involved the dependent variable (adoption of VARM) and each of the independent variables (farmer group membership and reliance on agricultural hand-outs, distance between the farmers' village and the stockist and farmers' capital). This analysis was carried out by using chi-square method to establish the association between categorical variables and spearman's rank correlation to ascertain the association between categorical and continuous variables.

3.8.3 Multivariate analysis

This analysis was used to determine the extent of the impact for each independent variable on the adoption of Village Agent Retail Model.

3.8.4 Specification of the model

An ANCOVA binary logistic regression model was used. This is due to the fact that the dependent variable (adoption of the model) and the independent variables i.e. Farmer group membership and reliance on agricultural input handouts had a binary outcome. The model takes the form as it is illustrated below.

$Log\left(\frac{P_i}{1-P_i}\right) = b_0 + b_1FG + b_2HO + b_3Dis + b_4FC + \mu$

Where P_i = Probability of adopting the model

$1 - P_i$= Probability of not adopting the model

b_i = Unknown coefficients to be determined

FG = Farmer group membership

HO = Agricultural input handout

Dis = distance between the farmers' village and the stockist

FC = Capital size of the farmer

μ = Error term

Farmer group membership was measured based on whether the respondent belonged to a farmer's group or did not belong to a farmer's group; agricultural handouts variable was measured on the basis whether the respondent had received or not received agricultural handouts. Thus farmer group membership and agricultural handout were categorical. The variable, distance was measured based on the distance in kilometers between the farmer's home and the stockist and farmer's capital was measured on the basis of how much a farmer spends on purchase of agricultural inputs.

3.9 Ethical considerations

A letter of introduction was obtained from Uganda Martyrs University; this was given to the Local Council in the area to avert any misguided suspicions and to create a good rapport with the community.

The questionnaires were then be administered by the Researcher and his Research Assistant to the households (either male or female) with the help of the Village agents of the targeted areas.

The Research Assistants obtained informed consent at all times from the respondents used in the study and ensured that the respondents' participation was voluntarily.

3.10 Limitations and delimitations of the study

One of the problems faced while doing my research was the difficulty is accessing studies done by previous researchers in relation to my topic of study for the purposes of developing the literature review section.

However, the researcher was fortunate to come across websites that had open access educational resources for some books and journals; this was provided by a friend, this enabled me to find the literature that I needed.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESEARCH FINDINGS

4.1 Introduction

The study examined the factors affecting adoption of the Village Agent Retail Model amongst smallholder farmers in Uganda with particular focus of the study on Lira district. The empirical findings of the study are presented in three levels of analyses; Univariate analysis were description properties of each unit of analysis are established in the form of frequency tables and charts; at bivariate level, the relationship between the dependent variable and each independent variable is established; and at multivariate analysis; a logistic regression model was used to ascertain the magnitude of the effect of the independent variables on the adoption the Village Agent Retail Model (VARM) in Lira district. The results are presented in logical order according to objectives of the study.

4.2 Response evaluation

Respondents for this study were from 3 sub-counties (Ogur, Amach and Aromo sub-counties) where the Village Agent Retail Model was implemented by USAID-LEAD project. The sample respondents were selected from the villages where the model operates. A total of 100 questionnaires were administered to the study sample, the factor of cost and time being put into consideration. At the end of field work, 100 questionnaires (100%) had been filled and returned, out of which all completed questionnaires were valid. This represents a response rate of 100%. Reasons for lack of invalidity in the responses were due to deploying well trained Researcher and his

Assistant in the field of research and also due to close supervision by the Researcher during data collection.

4.3 Demographic characteristics of respondents

This section presents the characteristics of the respondents, including gender of the respondent, gender of the household head, age of the household head, educational levels of the respondents and size of the land.

4.3.1 Gender distribution among the respondents

Table 4.1: Gender distribution among the respondents

Gender	Frequency	Percent
Male	54	54
Female	46	46
Total	**100**	**100**

Source: Research data, 2013

As illustrated in table 4.1 above, out of the 100 responses, 54% were male while 46% were female showing that more male respondents were involved in the study than female respondents.

4.3.2 Gender of the household heads

Table 4.2: Gender of the household heads

Gender	Frequency	Percent
Female	10	10
Male	90	90
Total	**100**	**100**

Source: Research data, 2013

From the above table, the findings showed that 90% of the household were headed by males while 10% were headed by females.

4.3.3 Age of the household head

Table 4.3: Age of the household head

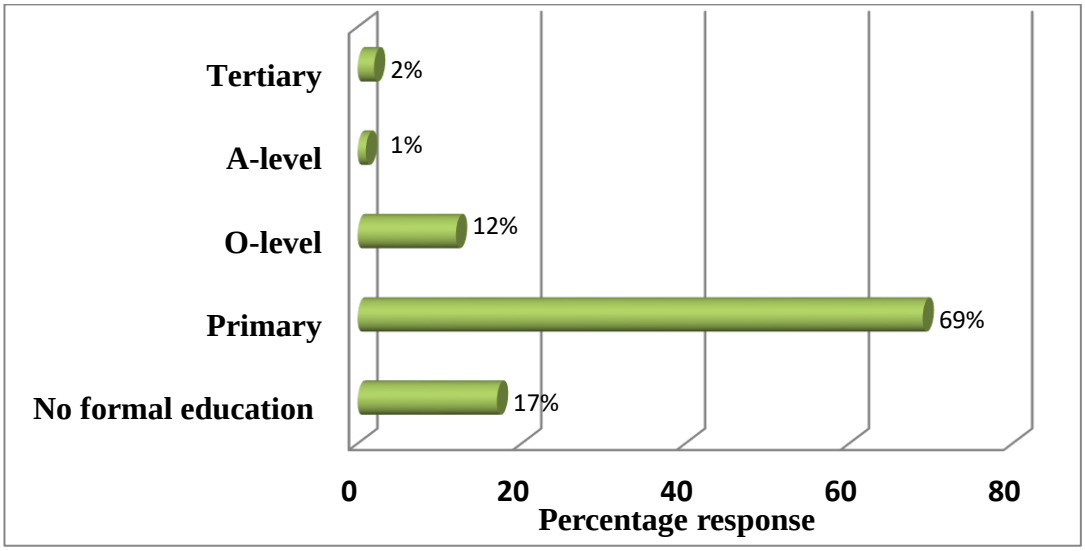
	Frequency	Percent
20-29	26	26
30-39	19	19
40-49	23	23
50-59	17	17
60 and above	15	15
Total	**100**	**100**

Source: Research data, 2013

From the table above, 26% of the small holder farmers were in the age category of 20-29, 23% in the category of 40-49, 19% in category of 30-39, 17% in the category of 50-59, and 15% of the small holder farmers were above 60 years.

4.3.4 Education level of the respondents

Figure 1: Education level of the respondents



Source: Research data, 2013

Findings of the study showed that majority (69%) of the respondents' attained education up to primary level, 17% never went to school, 11% studied up to Ordinary Level while 2% had completed Advanced Level of education and only 1% of the respondents had completed Tertiary education, as illustrated in figure 1 above. This could be attributed to the level of insurgency as result of LRA rebels which affected normal pattern of social growth and stability.

4.3.5 Household land ownership in acres

Table 4.4: Size of land acreage

N	100
Mean	3.795
Minimum	0.5
Maximum	50

Source: Research data, 2013

On average the small holder farmers owned 3.75 acres of land, while on the extreme, a household owned 50 acres as the largest and 0.5 acres as the smallest.

4.4 Adoption of the Village Agent Retail Model (VARM)

This section presents the findings about the existence of the model in the communities selected for study, the accessibility of Agricultural inputs by the famers from the agent and the types of inputs accessed by the farmers from the agent.

4.4.1 Awareness of the existence of Village Agent Retail Model

Table 4.5: Awareness of the existence of Village agent

Awareness of the existence of the Village agent	Frequency	Percent
Aware	40	40
Not aware	60	60
Total	**100**	**100**

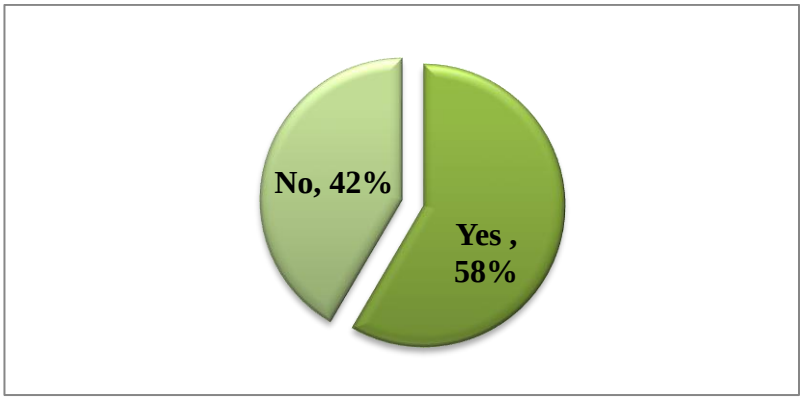
Source: Research data, 2013

Evidence in table 4.5, reveals that majority (60%) of the farmers are not aware about the existence of Village Agent Retail Model in their communities whereas 40% of the farmers are aware about the existence of VARM in their communities. Out of the 40% of the farmers who are aware about the existence of the model, 38.61% got to know about it through listening to the radio, 30.69% through farmer groups, 20.79% through the village selected agent and 9.9% got the information about the model from sub-county headquarters. This finding suggested a low level of sensitization about the existence and

operation of the VARM in the communities in which it is implemented. This suggests that there was a lack of effort in promotion of the model.

4.4.2 Accessibility of Agricultural inputs by the farmers from Village agent

Figure 2: Proportion of farmers who access Agro inputs from VARM agent



Source: Research data, 2013

The study findings in figure 2 reveal that, out of 40% of the farmers who are knowledgeable about the existence of the village agent in the community, 58% accessed Agricultural inputs from the agent; the remaining 40% did not access any Agro inputs from the agent.

4.4.3 Type of agricultural inputs purchased by farmers from village agent

Table 4.6: Type of Agricultural inputs purchased by farmers from village agent

Type of inputs	Frequency	Percent
Improved seeds	46	79.31
Fertilizers	2	3.45
Agro chemicals	10	17.24
Total	**58**	**100**

Source: Research data, 2013

In table 4.6 above findings showed that out of 58% of the farmers, who accessed agro inputs from the village agent, majority (79.31%) of the farmers purchased improved seeds from the agent, 17.24% purchased Agro chemicals and only 3.45% of the farmers purchased fertilizers from the village agent. Improved seeds are the mostly commonly used agricultural inputs used by the farmers because they are more affordable as compared to agrochemicals and fertilizers.

4.4.4. The reasons why farmers purchase agricultural inputs through the village agent

Table 4.7: Reasons for buying Agricultural inputs from village agent

Reasons for buying inputs from village agent	Frequency	Percent
Because of good quality seeds	20	20
Because they sale high quality chemicals	39	39
The agents are trust worthy and knowledgeable	31	31
The inputs are readily availed to the farmers	7	7
The prices of inputs are relatively low	3	3
Total	**100**	**100**

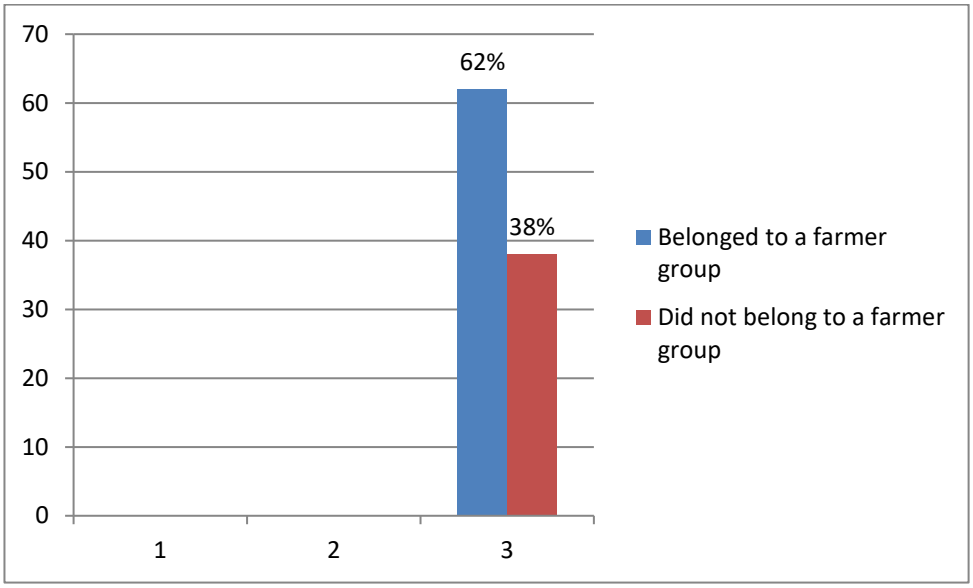
Source: Research data, 2013

The data in table 4.7 above, showed that 39% of the famers purchased Agro inputs from the village agent because they sale high quality Agro chemical sprays, 31% purchase from the village agent because the agent is trustworthy and knowledgeable about what they sale, 20% accessed Agro inputs from the agent because they sale high quality seeds, the rest of the farmers (7%) and 3% purchase Agro inputs from the agent because Agro inputs

are readily availed to them and the prices of their inputs are relatively low as compared to other suppliers respectively.

4.5 Farmer group membership

Figure 3: Farmer group membership



Source: Reseach data, 2013

Most of the farmers (62%) belonged to a farmers' group and 38% of the farmers did not belong to any farmers' group. This is attributed to the fact that there is a deliberate effort to encourage farmers to join farming groups.

4.5.1 The importance of being in farmers' group

Table 4.8: Importance of being in farmer group

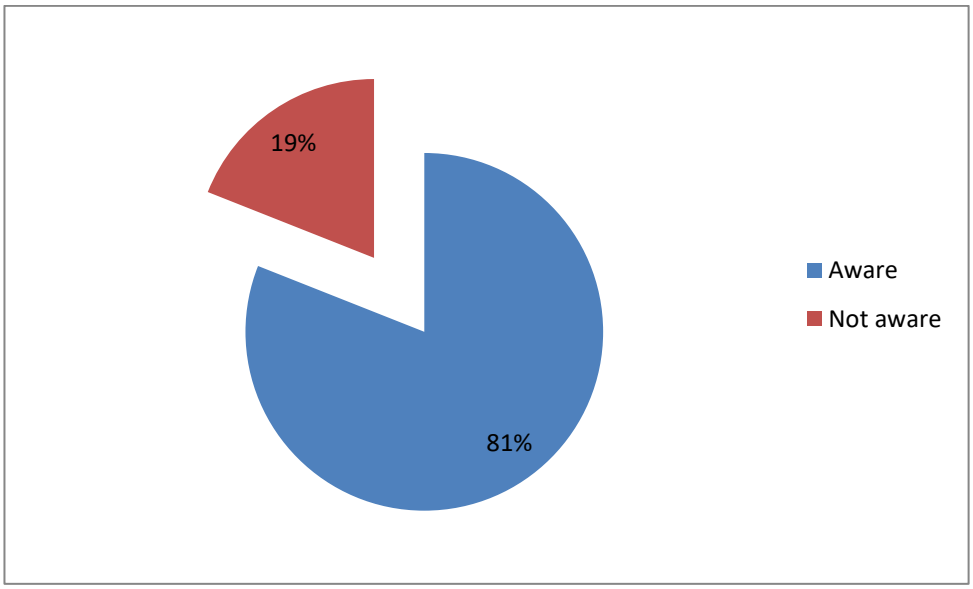
Importance of being in a farmer group	Frequency	Percent
Borrow money from the group to purchase inputs	44	67.69
Agent mainly targets farmers who are in groups	6	9.23
Generate sufficient capital through joint selling of produce	7	10.77
Farmer group make it easy to create good relationship with the agent	8	12.31
Total	**65**	**100**

Source: Research data, 2013

Farmers were required to state the importance of being in farmers' group to the access of inputs; results in table 4.8 above showed that 67.69% of the farmers stated that being in farmer's group has enabled them to borrow money from the group to purchase Agro inputs from the agent, 12.31% said being in farmer's group had made it easy for them to create good relationship with the agent, 10.77% of the farmers noted that being in farmers' group had made them to generate sufficient capital through joint selling of their produce and part of this capital is used to purchase Agro inputs from the agent while 9.23% of the farmers are in farmers' group because the agent mainly targets the farmers who are in groups.

4.6 Knowledge Existence of projects or NGOs providing Agricultural handout inputs

Figure 4: Knowledge of existence of NGOs or projects providing agricultural hand-outs.



Source: Research data, 2013

The study findings revealed that majority (81%) of the farmers are not aware of the existence of NGOs or projects that provide free Agricultural inputs to the farmers, 19%of the famers knew about the existence of NGOs or projects that provided agricultural input hand-outs to the farmers.

4.6.1Proportion of farmers that received agricultural hand-outs

Table 4.9: Proportion of farmers who received agricultural hand-outs

Receipt of agricultural hand-outs	Frequency	Percent
Receipt of agricultural hand-outs	17	89.47
Non receipt of agricultural hand-outs	2	10.53
Total	**19**	**100**

Source: Research data, 2013

In the table 4.9 above, 89.47% of the farmers had received agricultural handouts; only 10.53% did not receive agricultural handouts.

4.7 Location of the stockist

Table 4.10: Location of Stockist

Location of stockist	Frequency	Percent
Within the village	63	63
Lira town	37	37
Total	**100**	**100**

Source: Research data, 2013

Most of the farmers (63%) said the stockist was located within their villages, the remaining 37% indicated that the stockist was located in Lira town. This implied that most of the farmers could purchase agricultural inputs directly from the stockist, hence there was no need of having a Village agent within the community.

4.7.1 Distance travelled in kilometers to the nearest stockist

Table 4.11: Distance (km) travelled by farmers to reach the Stockist

Mean	Minimum	Maximum
5.468182	Less than 1km	19

Source: Research data, 2013

The farmers were requested to estimate the distance they travel to the nearest stockist, it was found out that on average farmers travel for about 5.47km to the nearest stockist and the nearest stockist was estimated to be located less than a kilometer while the most distant stockist is located 19km away. This implies that farmers that have a stockist more distant from them were likely to adopt VARM as opposed to farmers who had a stockist nearer to them, and could therefore afford to purchase the inputs directly from the stockist.

4.7.2 Costs incurred by farmers in order to reach the stockist

Table 4.12: Proportion of farmers who incurred costs on transport to reach the stockist

Proportion of farmers that incurred costs on transport	Frequency	Percent
Incurred costs	46	46
Did not incur costs	54	54
Total	**100**	**100**

Source: Research data, 2013

Findings in table 12 above, showed that less than half (46%) of the farmers incurred transport costs in order to reach the stockist and the majority (54%) of the farmers did not incur any cost on transport in order to reach the stockist.

4.7.3 The amount of money spent by farmers on transport

Table 4.13: Cost (Shs) incured by farmers on transport to reach the stockist

Mean	Minimum	Maximum
4493.478	1000	25000

Source: Research data, 2013

In table 4.13, the farmers who incurred costs on transport indicated that on average they spent 4,493.478 Ug shs on transport to reach the stockist, the minimum cost of transport spent by farmers was 1,000 Ug shs while the maximum transport spent by famers to reach the stockist was 25,000 Ug shs.

The farmers who incurred the highest transport costs probably had not adopted VARM, or did not appreciate the benefits that the model brought, and therefore would still travel the long distances to town to purchase the agricultural inputs

4.8 Farmer's capital spent on purchasing Agricultural inputs

Table 4.14: Farmer's capital spent on Agricultural inputs

Mean	Minimum	Maximum
104992.1	5000	399000

Source: Research data, 2013

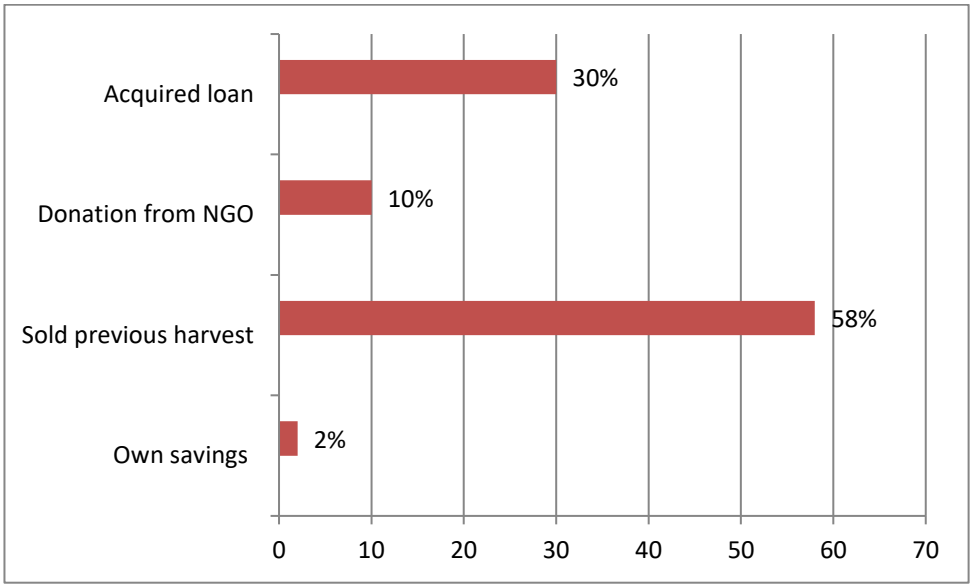
The results from the study reveal that, on average farmers spent 104,992.1 Ug Shs in each season on the purchase of agricultural inputs. The least amount spent by the farmers was

5000 Ug Shs while the maximum amount spent by the farmers in each season was 399,000 Ug Shs.

This is an illustration that farmers are spending money to purchase agricultural inputs and show the potential of VARM adoption to succeed.

4.8.1 Source of capital for purchase of agricultural inputs

Figure 5: Sources of capital for the farmers for purchasing agricultural inputs



Source: Research data, 2013

Famers were requested to indicate the sources of capital they spent on agricultural inputs, and from the data in figure 5 above more than half (58%) of the farmers raised capital by selling the previous harvest, 30% of the farmers acquired a loan, 10 % received donation from NGOs while 2% of the farmers raised capital through their own savings. This also highlights the potential of VARM because farmers are will to spend some money in purchase of agricultural inputs.

4.9 Bivariate analysis

The analysis was carried between the dependent variable (adoption of VARM) and each of the independent variables (farmer group membership, existence of agricultural hand-outs, distance between the farmers' village and the stockist and farmers' capital that is spent on buying agricultural inputs) in order to establish whether empirical relationship exists. Since there are two types of variables that is, categorical and continuous variables, chi-square test was used to determine the association between categorical dependent and categorical independent variables and spearman's rank correlations was used to determine the association between categorical dependent variable and continuous independent variables.

Table 4.15: Chi square test.

		Farmer groups	Handout
Adoption of the model	Chi square	9.000	36.00
	df	1	1
	Sig.	.003	.000

Source: Research data, 2013

The study revealed a positive and significant relationship between adoption of the model and farmers' group membership (χ^2 = 9.000, Sig = 0.003). This implies that farmer group membership has got a positive influence on the adoption of the model when farmers belonged to groups, it increases the chances of adopting the model because; the village agent mainly targets farmer groups, and makes it easy to sensitize farmers who are groups than individual farmers.

Evidence from the study indicated a positive and significant relationship (χ^2 = 36.00, Sig = 0.000) between Agricultural handouts and the adoption of the model. This implies that access to Agricultural input handouts from NGOs or project had a significant impact on the adoption of the model.

Table 4.16: Spearman's correlation

		Adoption of the model	Distance	Farmers' capital
Adoption of the model	Spearman's Correlation	1	-.418	.201
	Sig.(2-tailed)		.000	.045
	N		100	100

Source: Research data, 2013

Findings of the study showed a negative and significant relationship between the distance from the farmer's home to the stockist and adoption of the model (r = -0.418, Sig = 0.000). This indicates that the distance between the farmer's home and the stockist is vital in influencing the adoption of the model that is, the longer the distance between the farmer's home and the stockist the higher the chances of the adopting the model.

The study findings revealed a positive and significant relationship between farmers' capital and adoption of the village agent retail model (r = 0.201, p = 0.045). This implies that increase in farmers' capital does not significantly increase the chances of adopting the model.

4.10 Multivariate analysis

The study used a binary multiple logistic model to ascertain the magnitude of the impact of the independent variables (Farmer groups, Agricultural handouts, distance between farmers' homes and stockist and the farmer's capital) on the dependent variable (adoption of VARM). The results are demonstrated in the table.

Table 4.17: Results of the binary logistic model: Dependent variable: Adoption of the model

Number of obs		100
LR chi2(4)	=	27.29
Prob > chi2	=	0.000
Pseudo R2	=	0.1973

Log likelihood -55.491394

Adoption	**Coefficients**	**Odds ratio**	**Std.**	**z**	**P>z**
Farmer group	-1.2701	0.28078	0.4907	-2.59	0.005
Agricultural handouts	-0.1780	0.83688	0.7917	-0.22	0.822
Distance	-0.900	0.40632	0.3023	-2.98	0.003
Farmers capital	0.0258	1.02616	0.0657	0.39	0.694

Source: Research data, 2013: The model was estimated at 5% level of significance.

4.11 Discussion of the research findings

Results of the fitted model above, indicate a statistically significant impact of farmer group membership on adoption of the village agent retail model (odds ratio = 0.280779, p = 0.010). This implies that for a farmer belonging to a farmer group, the odds of adopting the model reduced by 0.280779 times.

This finding is in agreement with the findings of Yli Renko et al. (2002) who found out that, organizations formed among members of the same ethnic homogeneity living in the same neighborhood are more likely to encourage adoption of new technologies through their influence on trust and sharing of information. In the same light, Isham, (2000) and Katungi, (2007) argue that Social capital manifested in community-based organizations or in personalized social networks has been found to play an important role in the adoption of crop technologies.

The impact of agricultural input handouts on adoption of the village agent retail model is not significant (odds ratio = 0.83688, p = 0.822). This means that, agricultural handouts provided to farmers do not have a significant impact on the adoption of the village agent retail model. Therefore, for a farmer that received agricultural handouts, odds of adopting the village agent retail model reduced by 0.83688 times.

This study finding are in agreement with the conclusions made in a study done by Govere et al, 2009 who revealed that agricultural handouts had created a deep rooted dependency syndrome among Zimbabwean farmers to the point that when government distribution

was late in the season, even the well-off farmers were also affected because they had become so used to receiving and not buying agricultural inputs.

The findings also agree with (Sperling, 2002), who highlighted the dangers of on seed aid. Amongst farmers questioned in her study, most were initially satisfied with the content of formal seed aid. However, over ten seasons, many farmers had received seed aid repeatedly and expected seasonal seed distributions to continue as the norm. Most of the farmers sampled continued to suffer acute or chronic drought stress, and their inability to produce or procure seed elsewhere was exacerbated by more profound factors than those addressed by the aid intervention, such as lack of water, suitably adapted crop varieties, soil erosion and access to markets.

The results show a statistically significant impact of the distance from the farmer's home and the stockist (odds ratio = 0.4063188, p = 0.003) indicating that a unit increase in the distance between the farmer and the stockist reduces the odds of adopting the model by 0.4063188 times.

This is similar to the findings by Beshir et al (2012) who carried out a study about the effect of distance from farmer's home to the nearest input market and found the coefficient of distance to market to be negative and significant on the probability and had effect on the adoption of inorganic fertilizer.

The findings of the study also agree with the findings of Gbegeh and Akubuilo, 2012, where distance to and fro the market had a negative and significant effect on the adoption of yam minisett technologies.

In their conclusion, they asserted that greater distance to market and services decreased the odds of adoption perhaps distance adding to costs odds of a new innovation and reducing potential net benefits, however from the research findings, greater distance from the market increased the odds of adopting the village agent retail model.

The impact of farmer capital was found to be statistically not significant (odds ratio = 1.02616, p = 0.694). Meaning that 1 shilling increase in farmers' capital increases the odds of adopting the model by 1.02616 times.

The findings of this study did agree with the findings of Diiro, 2000 who investigated the possibility of productivity gains from investing off-farm income in better maize technologies. His results showed a positive and significant effect (at 10% level of significance) of household off-farm income on adoption of improved maize varieties. The positive effect of off-farm income suggested that off-farm earnings may induce technology adoption by providing farmers with capital for purchasing the improved maize technologies.

The findings were also in agreement with Jorge et al, 2007, who found that the relationship between the adoption of herbicide-tolerant soybeans and *off-farm* household income was positive and statistically significant. Their studies showed that after controlling other factors, a 15.9% increase in off-farm household income was associated with a 10% increase in the probability of adopting herbicide-tolerant soybeans. The adoption of herbicide-tolerant soybeans was also positively and significantly associated with total household income (from off-farm and on-farm sources).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of research findings. It also gives the conclusions and policy recommendations and areas for further research.

5.2 Summary of research findings

At bivariate analysis, the study findings revealed a positive and significant relationship between adoption of the model and farmers' group membership (χ^2 = 9.000, Sig = 0.003). This implied that farmer group membership had a positive influence on the adoption of the model when farmers belonged to groups; it increased the chances of adopting the model.

A positive and significant relationship (χ^2 = 36.00, Sig = 0.000) between agricultural handouts and the adoption of the model. This implied that access to agricultural input handouts from NGOs or project had a significant impact on the adoption of the model.

A negative and significant relationship between the distance from the farmer's home to the stockist and adoption of the model (r = -0.418, Sig = 0.000). This indicated that the distance between the farmer's home and the stockist was vital in influencing the adoption of the model, the longer the distance between the farmer's home and the stockist the higher the chances of the adopting the model.

A positive and significant relationship between farmers' capital and adoption of the village agent retail model (r = 0.201, p = 0.045). This implied that increase in farmers' capital did not significantly increase the chances of adopting the model.

At multivariate analysis, the findings indicated a statistically significant impact of farmer group membership on adoption of the village agent retail model (odds ratio = 0.280779, p = 0.010). This implies that for a farmer belonging to a farmer group, the odds of adopting the model reduced by 0.280779 times. Therefore the hypothesis that farmer group membership has no significant impact on the adoption of the village agent retail model is rejected.

The impact of agricultural input handouts is not significant (odds ratio = 0.83688, p = 0.822). This meant that, agricultural handouts provided to farmers did not have a significant impact on the adoption of the village agent retail model. Therefore, for a farmer that received agricultural input handouts the odds of adopting the model reduced by 0.83688 times. Therefore, failure to reject the hypothesis that agricultural hand-outs have no significant impact on the adoption of the village agent retail model.

The results showed a statistically significant impact of the distance from the farmer's home and the stockist (odds ratio = 0.4063188 p = 0.003) indicating that a unitincrease in the distance between the farmer and the stockist decreases the odds of adopting the model by 0.4063188 times. Therefore the hypothesis that distance has no significant impact on the adoption of the village agent retail model is rejected.

The impact of farmer capital was found to be statistically not significant (odds ratio = 1.02616, p = 0.694). Meaning that 1 shilling increase in farmers' capital increases the

odds of adopting the model by 1.02616. Therefore we fail to reject the null hypothesis that farmer's capital has no significant impact on the adoption of the village agent retail model.

5.3 Conclusions of the study

In regard to the findings of this study at both multivariate analyses, evidence showed a farmer group membership significantly influenced the adoption of the village agent retail model.

Evidence from the study indicated that the existence of projects providing agricultural input handouts had no significant impact on the adoption of the village agent retail model.

Based on the findings of the study, the distance from the farmer's home to the stockist significantly impacted the adoption of the model.

The study also showed that farmer capital had no significant impact on adoption of the village agent retail model.

5.4 Recommendations of the study

For effectiveness of VARM, the implementation of the model, emphasis should be put in promoting the village agent retail model amongst farming communities that are formed into groups. Farmers who are into groups are easier to reach, sensitize, and each one can influence another to adopt new agricultural technologies.

The implementation of the village agent retail model should be in areas where there is no presence of projects providing agricultural hand-outs.

The implementation of the village agent retail model should be done in areas where farming communities are far away from the stockist. There is an incentive for such farmers that do not access inputs easily to adopt the model because they the stockist is far away to as opposed to farmers who have easy access to the input suppliers.

The success of village agent retail model also depends on the farmer's capital, therefore efforts that drive at ensuring that farmers have capital such as VSLA, savings from sale of previous harvests should be encouraged and promoted so as to empower farmers financially.

5.5 Suggestions for further research

As with any research, this study had limitations, the following have been suggested for the benefit of future research.

This study was applied as a case study of one district; it is recommended that a study be carried out in the future covering all other districts where the village agent retail model was implemented.

Due to limitations of time and costs, the sample size of the study was much smaller, with availability of resources in the future

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APPENDICES.

Appendix 1: Questionnaire

I am……a Masters student of Uganda Martyrs University – Nkozi; doing a research on the factors affecting adoption of the Village Agent Retail Model in Uganda; and Lira district is of the districts that has been chosen. Your household has been purposely chosen. The purpose of this introduction is to fully inform and kindly request you to offer your cooperation during the research.

The information you disclose will be treated with high level of confidentiality and will only be used for research purposes.

Section A: Background information

1. District……Subcounty……..Village……..
2. Gender of the respondent (1=Male, 2=Female)
3. Are you the household head? (1=Yes, 2=No)
4. Gender of the household head (1=Male, 2=Female) (if not respondent)
5. Age of the household head…….
6. Education of the household head (0=never attended school, 1=Primary, 2= O-level, 3= A-level, 4=Tertiary)……
7. How much land acreage do you have……..(acres)

Section B: Adoption of the village agent retail model

8. Is there a village agent in this village through who you can buy inputs from? (1=Yes, 2=No)
9. Where did you hear about the village agent?

1=The village selected the agent 2=through the radio 3=from the farmers group 4=other specify……

10. Have you been buying inputs previously through the village agent? (1=Yes, 2=No)

11. If yes, why have you been buying inputs from the village agent?

……

……

……

……

……

12. Which is the most important reason as to why you buy inputs through the agent?

……

……

13. If no, why have you not been buying inputs from the village agent?

……

……

……

……

14. Which of these inputs have you been buying through the agent?

1) Improved seed…….
2) Fertilizers…….
3) Agro chemicals……
4) Other farm inputs (specify)…….

Section C: Farmer group membership

15. Do you belong to a farmer group? (1=Yes, 2=No)……..

16. How has being in the farmers group helped you in access of inputs?

……

.....

……

17. Does your farmer group access inputs through the agent? (1=Yes, 2=No)……..

18. On what basis do you access in puts?

1. On cash basis 2. On credit 3. Other (specify)…….

Section D: Existence of agricultural handouts in the community

19. Is there a project or NGO giving out free agricultural inputs in this area? (1=Yes, 2=No)…..
20. Did you receive some of the free inputs in the last year? (1=Yes, 2=No)……..

Section E: Distance between the farmer's home and the stockit

22. What is the distance between your village and the nearest stockist?.....(km)
23. Where is the stockist located?

1. Within the village 2. In Lira town 3. Other (specify)

24. Do you incur any cost on transport to purchase agricultural inputs? (1=Yes, 2=No)……..
25. If yes, how much do you spend on transport?.....(Ugx)

Section F: The effect of farmers' capital on adoption of the model

26. On average how much do you spend on purchase of inputs in a season?.....(Ugx)
27. Where did you get the money to purchase the inputs?
    1. Acquired a loan
    2. Sold previous harvest
    3. Donation from an NGO (specify)……
    4. Others (specify)

Uganda Martyrs University

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FACULTY OF SCIENCE
OFFICE OF THE DEAN

Ref: Assistance for Research

Date: 13th March 2013

To _____

_____

_____

_____

Dear Sir/Madam,

Greetings from Uganda Martyrs University.

This is to introduce to you **ORUKA Patrick (2009-M112-20013)** who is an MScDE student of this University. He is carrying out a research on the topic FACTORS AFFECTING ADOPTION OF THE VILLAGE AGENT RETAIL MODEL AMONG SMALLHOLDER FARMERS – A CASE STUDY OF LIRA DISTRICT as part of the requirements for the award of Master of Science Degree of this University, for the submission of a dissertation paper.

I kindly, request you to render the student such assistance as may be necessary for the research.

Thanking you in anticipation.

Yours sincerely,

Dr William Kaggwa
Dean

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