EFFECTIVENESS OF GROUP EXTENSION METHODS IN PROMOTING HIGH QUALITY CASSAVA FLOUR PRODUCTION AMONG SMALLHOLDER FARMERS IN APAC DISTRICT, UGANDA

BY

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DECLARATION

This is to declare that this report has not been accepted for any master's degree elsewhere and is being submitted for a master's degree of Kyambogo University. I also declare that this report is a result of my ideas, observations and experiences backed by works from what others have done relevant to my study.

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APPROVAL

This is to approve that this work was carried out under our supervision as university supervisors and is now ready to be submitted for University approval.

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LIST OF ABBREVIATIONS AND ACRONYMS

CAVA	Cassava Adding Value for Africa
CMD	Cassava Mosaic Disease
FHH	Female Headed Households
DANIDA	Danish International Development Association
DFID	Department for International Development
DSIP	Development Strategy and Investment Plan
EAAPP	East African Agricultural Productivity Program
FAO	Food and Agricultural Organization
FGD	Focus Group Discussions
GEM	Group Extension Methods
HQCF	High Quality Cassava Flour
IFAD	International Fund for Agricultural Development
IFRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IPM	Integrated Pest Management.
MT	Metric tonnes
NARCRI	National Root Crops Research Institute
NARO	National Agricultural Research Organization
NDP	National Development Plan
PATA	Pallisa Agri-business Training Association
P'KWI	Popular Knowledge Women's Initiative
SOSPPA	Soroti Sweet Potato Producers and Processors Association
SPSS	Statistical Package of Social Sciences
UNBS	Uganda National Bureau of Standards
UBOS	Uganda Bureau of Statistics
UCA	Uganda Cooperative Alliance

ABSTRACT

Smallholder farmers of Apac District received advice from extension agents on the production of high quality cassava flour from 2009 to 2015. Despite training, production remained low at 4000kg ha^{-1} compared to the expected output of 8000kg ha^{-1}, which called for an investigation conceived to establish the effectiveness of the group extension methods used in training for high output. A cross-sectional survey design was used. Interviews, questionnaires, observations and focused group discussions were used to collect data from a total of 133 respondents consisting of 126 farmers randomly selected from 185 farmers trained. Additionally, seven extension agents completed questionnaires and were interviewed. Using SPSS version 16.0, the data collected was processed to determine frequencies, percentages, cross tabulations and chi-square test. Results show 64% of the farmers participated in demonstrations, 73% in field days and 75% in exchange visits. Cross tabulations showed that demonstrations benefited 59% of the farmers in using clean water for processing; field days benefited 65% of the farmers in practicing timely harvesting and exchange visits benefited only 19% in using recommended varieties at planting. The farmers whose flour was rejected at sale were: 20% for lack of follow up after training, 14% for reduced training hours and 13% for high speed content delivery. Chi-square showed significant association at 0.01α between farmers participation in demonstrations and knowledge in site selection for cassava production. Most farmers acquired more knowledge from group demonstrations, followed by field days and exchange visits respectively. Methods were effective in practices such as site selection, timely harvesting, use of clean water but not effective in post-harvest handling. Trainers of farmers should keep group size to 6 while combining methods for chipping and post-harvest handling. Time duration and frequency of training should be optimum farmers to produce high quality cassava flour.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Cassava (*Manihot esculenta* Crantz) is an essential food crop for over half a billion people in 105 countries in Asia, Africa and Latin America. The crop is a source of livelihoods to millions of farmers, processors and traders worldwide (FAO, 2008). World consumption of cassava is projected to reach 275 million tonnes by 2020 (Westby, 2008). In the tropics, cassava is the third most important source of calories after rice and wheat. In Africa, it is the second largest source of calories. It meets 11% of the continent's total calorie requirements and is dwarfed only by maize which contributes 16% to the total calorie requirements in Africa (Food and Agricultural Organization Statistics [FAOSTAT], 2011).

Cassava is referred to as a "complete crop" according to many communities across Africa because of versatility in its use. Its leaves are high in protein and some essential minerals, and consumed by humans as a vegetable or are fed to livestock as silage. Cassava stems are a useful means of propagation while cassava roots are energy/carbohydrate dense and are used as human food, animal feed and as industrial raw materials for the manufacture of starch, paper and pharmaceuticals (Abass *et al.*, 2013). The crop has a broad ecological adaptability and can produce reasonable yields in marginal environments where most crops fail (Adebayo *et al.*, 2009). It offers a flexible harvesting calendar all year around (Haggblade *et al.*, 2012). It is projected to be one of the crops that will be affected less by climate change (Burns *et al.*, 2010).

Africa contributes 62% to the total world production of cassava (Hillocks, 2002). Uganda is the sixth largest producer of cassava in Africa after Nigeria, the Democratic Republic of Congo, Tanzania, Ghana and Mozambique. National crop yields are 2.9 million metric tonnes of dried chips from 871,000 ha of land (Uganda's Ministry of Agriculture Animal Industries and Fisheries (MAAIF) & UBOS, 2010). Eastern Uganda is the largest producing region of cassava in the country with 1.1 million metric tonnes of national production. It is followed by Northern Uganda (983,000 metric tonnes) and central Uganda with a production of 41,000 metric tonnes (Uganda's Ministry of Agriculture Animal Industry and Fisheries (MAAIF & Uganda Bureau of Statistics (UBOS), 2010).

Currently, cassava production in Uganda is curtailed by a number of challenges namely, use of poor yielding varieties, delayed harvests, logistical challenges in accessing planting materials, poor agronomic practices, small and poorly organized production systems and poor post-harvest handling and processes (Kilimo Trust, 2012). These challenges aggregate into inefficiencies and high costs of production, low prices of products and poorly organized marketing systems culminating into low or non-profitability of the traditional cassava farming system with fresh roots and dried chips as the main products (Abass *et al.*, 2013). If cassava is to contribute to poverty alleviation and income enhancement as anticipated by NDP II, there is need to diversify the cassava product space away from fresh roots and dried cassava chips.

1.2 Production of High Quality Cassava Flour

Among the emerging industrial products of cassava is high quality cassava flour (HQCF) in contrast to traditionally processed flour. Because of its low cyanogenic content, it is less harmful to consumers' especially human beings and also it pays better than the traditionally processed flour (Alaco *et al.*, 2014).

There are currently a number of industrial uses for HQCF such as substitute for wheat; it is used in the manufacture of starch and can be used in the manufacture of plywood.

High quality cassava flour is very white, smooth, unfermented, and has a low fat content. It is not bitter, has a pleasant odour, and a good taste with low cyanogenic content (International Institute of Tropical Agriculture (IITA), 2005). The production process for HQCF starts by selecting the right variety that is sweet with low cyanide content. This is followed by correct site selection where areas should be free from spear grass to avoid injuries on the tubers that can affect quality. This is followed by proper weed management, timely harvest, timely processing and proper post-harvest handling up to storage (Alaco *et al.*, 2014).

In Eastern Uganda, some farmer groups such as SOSPPA, P'KWI and PATA are producing a range of confectionary cassava products and selling them locally to earn income. However, the effectiveness of these groups is still being affected by managerial skills of their leaders, cohesiveness among group members, record keeping and other asset management challenges (Alacho *et al.*, 2014). In addition

they are involved in production and processing of HQCF and HQCC that they sell to end-users in Eastern Uganda and Kampala.

There are a number of emerging industrial uses of cassava such as starch (Baguma *et al.*, 2003), ethanol and biofuels (Jansson *et al.*, 2009) and animal feed supplementation. These uses give cassava the potential to be transformed from a purely subsistence food crop into a commercial crop that can spur industrial development and increase rural incomes (Plucknett *et al.*, 2000).

The most promising market for HQCF is, however, in its use as a replacement for wheat in the bakery sector (Adebayo *et al.*, 2010). Cassava Adding Value for Africa (CAVA, 2010) argues that HQCF had a paramount role in the import substitution strategy of Uganda. It has the potential to replace significant amounts of wheat in the bakery industry.

Adebayo *et al.* (2003) and Adebayo *et al.* (2010) argue that HQCF can contribute to the enhancement of rural incomes because value can be added easily at rural household level and no technological leap is required to kick start its production and the capital requirements for processing of the flour are low. The production process requires strict adherence to good manufacturing practices in order to obtain a final product with desirable qualities. Cassava roots for this process must be of high quality, healthy, without signs of rot and must have been harvested 9–12 months after planting (Dziedzoave *et al.*, 2006). Roots older than 12 months have a reduced flour yield (Apea-Bah *et al.*, 2011) and fail to meet industrial standards for HQCF (Oti *et al.*, 2010).

Through the Cassava Adding Value for Africa (CAVA) project, the African Innovations Institute is supporting value addition of cassava through processing of Cassava into HQCF in Uganda. The underlying argument is that farmers can increase their incomes and hence reduce rural poverty through adoption of HQCF processing technologies which enhance marketing of cassava through reduction of post-harvest deterioration, product diversification beyond fresh and dried tubers and enhances the industrial uses of cassava (CAVA, 2010). Since project inception, a number of activities have taken place including training of farmers, provision of HQCF processing equipment and provision of market, technical and extension support to support adoption of HQCF processing amongst smallholders (CAVA, 2010).

1.3 Agricultural Extension

Extension can be described as the process of assisting farmers to become aware of and adopt improved technology from any source to enhance production efficiency, income and welfare (Nweke *et al.*, 1994). In a broader context, it also involves general farmer education and organization from a development policy perspective and investments in extension services are considered as an important tool for improving agricultural productivity and increasing farmers' incomes (Anderson, 2007).

There are three categories of extension methods for delivering services to farmers, these include; individual methods, group methods and mass methods. Group extension methods include; group demonstrations (method and result

demonstrations), field days, exchange visits, workshops and seminars .The study specifically examined the effectiveness of group extension methods namely group demonstrations, field days and exchange visits in promoting production of HQCF. These three group methods were selected because they were commonly used by the extension agents supported by development partners such as Africa Innovations Institute, National Agricultural Research Organistion (NARO) and International Fertilizer Development Centre (Alacho *et al.,* 2014). The three methods were used to ensure that agricultural information and research results on HQCF reached the targeted farmers. (Belay *et al.,* 2004).

In the delivery of agricultural extension services, farmer groups are increasingly recognized as a transformative force for improving rural livelihoods in Sub Saharan Africa (Place *et al.,* 2004). These groups have been used as important avenues for reaching the very poor at the grassroots level (Bernard *et al.,* 2008; Develtere *et al.,* 2008). Therefore, farmer groups provide an essential entry point for improving agricultural production and income in this region (Nyang *et al.,* 2010). Membership in farmer groups, however, is not sufficient in enhancing sustainable development. These groups should have the capacity to meet their objectives and serve the needs of members (Abaru *et al.,* 2006).

Group extension effectiveness may be determined by the level of awareness of extension services created among the farmers, number of visits paid by the village extension worker, percentage of scheduled meetings held between farmers and extension workers, number of field meetings held, regularity of meetings held (weekly, monthly and quarterly) by village extension worker such as number of

field days organized by village extension worker (weekly, monthly or quarterly), number of demonstrations organized by the village extension worker within specified time frame (weekly, monthly, quarterly, annually). The number of supervisory visits, number and regularity of research-extension linkage workshops and farmer training sessions organized (Agbarevo *et al.,* 2013).

For group extension methods to be effective, the groups should have good leadership, keep good records, attend meetings and be legally registered (Bosc *et al.,* 2001). Groups should have the capacity to deliver relevant services which allows smallholder farmers to participate actively in collective action at the grass root level (Mukindia, 2012. Joy *et al.* 2008) examined the factors that determine group performance as; group cohesion (degree in which members are connected to the group and are motivated to remain in the group). Leadership (ability of team members to interact freely without any formal inhibition), team spirit (willingness of the group members to work together in devotion) and record keeping (regularity in keeping records and their verification which is also an indicator of transparency in group activities).

The effectiveness of group extension methods in this study focused on the extent to which these methods had contributed to building farmers knowledge in HQCF production practices. The effectiveness of group demonstrations depend not only on the number of farmers that receive information but also on how successful the demonstration is and this influences farmers' decision to adopt a given technology such as knowledge, skills and practices required for production of HQCF. (Ricker-Gilbert *et al.*, 2008; Doss, 2006). Given that information is packaged and

presented differently in different ways, there is likelihood of variations on the effects the demonstrations could have on technology adoption (Daberkow and McBride, 2001; Mauceri *et al.,* 2005). A field day is important to improve the cost-effectiveness of cassava demonstration. Field days provide the opportunity for 20 or more farmers to visit a cassava demonstration site, learn about what is being demonstrated, ask questions, and encourage them to try new ideas themselves on their own farms Allah (2016). On the other hand farmer-to-farmer exchange provides another alternative way to effectively promote the learning of new ideas in cassava production practices (Yoder 1991; Pradhan 1994), and exchange visits represent a means to promote such learning.

Although decisions for targeting groups for extension have already been reached based on the "cooperative paradigm" and success of few groups (Bahigwa *et al.,* 2005; Adong *et al.,* 2013), especially the farmer field schools (FFS) that were highly supported by donors (Godtland *et al.,* 2004; Davis *et al.,* 2012). It is necessary to evaluate the achievements of group methods used in relation to the low production of HQCF among smallholder farmers in Apac District.

In regard to the description of the three group extension methods, their effectiveness has not been realized in the following areas namely; lack of accelerated output of HQCF from farmers in Apac District despite trainings, low use of improved inputs due to poor attitudes despite trainings, poor attendance of trainings due to distance to training venues and costs prohibiting going for field days, exchange visits and others unknown. Therefore, those deficiencies encountered in the promotion of HQCF in Apac formed the information gap

which prompted an investigation into the effectiveness of the three group methods. Aldana *et al.* (2007) in a study of 40 farmer groups in India, Uganda and Bolivia found out that the success of a group depends on the acquisition of skill sets such as group organization and management, internal savings and lending, sustainable production, ability to access and apply new technology and market skills.

The empirical literature on the productivity effects of agricultural extension services from a number of studies is not conclusive. For instance, Betz (2009) had noted that previous studies on productivity effects of agricultural extension have varying results because other factors which have positive influence on farm productivity were gender of household head, age, plot size, soil quality, slope of the plot, use of improved seed, amount of inorganic fertilizer, application of compost, ploughing frequency, labour and oxen power. All significant variables have the expected signs. Male-headed households have 5% higher farm productivity than female headed households which result is consistent with literatures that deal with the existence of gender variation in productivity (Pender & Gebremedhin, 2007) and also due to constraints related to labour, resource endowment, access to information and cultural taboo.

1.4 Problem statement

Three group extension methods namely demonstrations (result and method demonstrations), field days and exchange visits have been used since 2009 to help farmers address gaps created by inadequate knowledge, skills and practices

expected to have come from lack of effectiveness of GEMs used in training on HQCF in Apac District. However, the production of HQCF has remained low at 4 tonnes/ha compared to 8 tonnes/ha expected based on research. This eight (8) tonnes would translate to a potential income of Ushs 12,000,000 Ugx shillings/ha per annum at a cost of 1,500 shillings/kilogram which is higher than income accruing from traditionally processed flour (Alaco *et al.*, 2014). This has created doubts on the effectiveness of these methods. Despite the popularity of group extension methods for delivering agricultural education services in developing countries to address rural development challenges (Loevinsohn, *et al.*, 1994; Woomer *et al.,* 2004), challenges still exist on how to improve the effectiveness of group extension methods by enhancing farmer groups' membership, cohesiveness, mandate, resources availability, integrity and members' managerial capacity (Mwaura *et al.*, 2012). HQCF is expected to be free from yeast, moulds, high moisture content, high cyanide level, weevils, discoloration, starch content, fiber content, metal pieces and stones (Abass *et al.*, 2008). Farmers still use poor yielding varieties, traditional practices, poor drying techniques, poor processing techniques and poor storage techniques. In fact, majority (64%) of farmers still use own saved planting materials, while 32% obtain from relatives. Use of fertilizers and agro-chemicals is very low at 3% and 15% respectively. The common types of agro-chemicals used are herbicides (61%) and insecticides (26%) (Kraybill and Kidoido, 2009). These observed gaps prompted an investigation into the effectiveness of group extension methods in promoting production of HQCF in Apac district.

1.5 General objective

The general objective of the study was to determine the effectiveness of group extension methods used in promoting HQCF production among smallholder farmers in Apac District in Northern Uganda.

1.5.1 Specific Objectives

The specific objectives were to.

1. Characterize group extension methods to show their effectiveness in promoting HQCF production among smallholder farmers.
2. Assess what smallholder farmers, targeted for HQCF, have learned from training where group methods have been used.
3. Determine an association between group extension methods and farmers HQCF production practices such as timely planting, harvesting, processing.
4. Determine factors that influence the use of group extension methods in the promotion of HQCF production.

1.6 Research questions

1. What characteristics of group extension methods show their effectiveness in promoting HQCF production among smallholder farmers?
2. What learning outcomes have the smallholder farmers of the targeted groups achieved from group extension methods used to promote HQCF production?

3. What association exists between the group extension methods farmers were exposed to and their knowledge, skills and production practices for HQCF production?
4. What factors influence the use of group extension methods in the promotion of HQCF production?

1.7 Hypotheses

Association between group extension methods farmers were exposed to and their knowledge, skills and production practices for HQCF production attained from the training, null hypotheses was tested at 0.05 level of significance to determine chi-square values which were used to accept or reject the null hypothesis. Chi-square was chosen as the best statistic for testing the associations of the variables studied (Amin 2005; Kothari 2011). The following were the hypotheses postulated and tested.

1. $\mathbf{H_{01}}$: There are no associations between group demonstrations and knowledge, skills and practices in site selection for HQCF production as a result of trainings.
2. $\mathbf{H_{02}}$: There are no associations between the frequencies at which farmers participate in group demonstrations and their knowledge, skills and practices in HQCF production.
3. $\mathbf{H_{03}}$: There are no associations between the factors of education and number years a farmer has been in a group and their knowledge, skills and practices in HQCF production.

1.8 Significance

Results from this study provide empirical evidence on the effectiveness of extension service systems using group methods in sub Saharan Africa such as adoption or non-adoption of HQCF production practices by farmers, increased or decreased incomes amongst small holder farmers engaged in HQCF production. The study also elicited from the farmers' perspectives on the performance/effectiveness of the current group methods in supporting production of HQCF flour in Apac. From the different group extension methods used, farmers are able to make decision on which group extension methods give them more knowledge and skills; which methods can be combined to give them more knowledge and skills. The study identified the existing gaps in the extension methods currently adopted in promoting HQCF production such as frequently changing membership, low frequency of group trainings, inadequate demonstration facilities; isolated extension staff who are not close to farmers, low turn ups for trainings, poor group cohesion of members and leadership challenges amongst groups. The recommendations generated from the study can be exploited by government and development partners to improve HQCF production in Apac District Northern Uganda.

1.9 Delimitations of the study

The study focused on HQCF production groups, sources of extension services available and the group extension methods that they had been using. Physical observation of products and practices helped in verifying information obtained

from respondents on the practices and an understanding of factors affecting HQCF production in Apac District were undertaken. Farmers always received information related to extension from different sources, sometimes from fellow farmers, from churches and retired extension staff, this study confined itself to those sources of knowledge for the farmers.

1.10 Assumptions

The following assumptions were considered for the study; cassava producing groups existed and had received trainings. Smallholder farmers had been receiving trainings in groups on HQCF. Smallholder cassava farmers in Apac District were active and produced with the help of extension staff. Resources were available to accomplish the study and the different respondents for the study cooperated. Road conditions within the study area and the weather conditions during the study period were favorable for the study, and there were no security threats.

1.11 Limitations of the study

Due to resource constraints such as transport and accommodation, the study could not cover all cassava producing areas in Apac District. As a result, the findings were based on 4 sub-counties with their parishes and villages as these were the sub counties with highest HQCF production.

Time and other resources allowed for holding interviews with all the stakeholders working with smallholder cassava producers in Apac District. There were other

factors such as weather which were not easy to control but also affected cassava production in Apac District. These challenges were overcome by comparing information from different tools to see if there were relationships among them.

1.12 Operational Definitions

A group is a collection of individuals who have regular contact and frequent interaction, mutual influence, common feeling of togetherness and work together to achieve a common set of goals (Hiriyappa, 2013).

Descriptive research involves gathering data that describe only events and then organizes, tabulates, depicts, and describes the data collection (Glass & Hopkins, 1984).

Effectiveness of group extension methods is the degree to which group extension methods have contributed to building smallholder farmer's knowledge and skills in HQCF production practices measured by number of farmers who have adopted the recommendations on HQCF production practices from service providers (Dziedzoave *et al.*, 2006;Wojtczak,2002).

Extension is the process of introducing farmers to knowledge, information and technologies that can improve their production, income and welfare (Purcell & Anderson, 1997).

Extension Methods may be defined as the devices used to create situations in which meaningful communication can take place between the instructor and the learners (Mikinay 2011).

Group Extension Methods refers to the process and techniques used by extension agencies to get a task done. Examples include visits by extension agents to a group or a family, demonstration of skills to a group by extension agent and so on (Wayne *et al.*, 2016)

High Quality Cassava Flour refers to cassava flour milled from dried chips got from unfermented cassava roots that are peeled, washed with clean water and chipped (Onabolu *et al.* 1998).

Smallholder Farmers are farmers who own small plots of land usually 1-2 hectares each or slightly more on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour and simple tools by (Elisa 2013).

Training in group extension methods is defined as a planned and systematic effort to modify or develop farmer's knowledge and skills in HQCF production practices or farmers attitude through learning experience, to achieve effective performance in an activity (Ajayi 2008).

Cassava chipping is the physical process of breaking fresh, peeled and washed cassava tubers into fine particles by using machines for easy drying and clean flour, the machines employ scratching mechanisms, the machines can be motorized or hand operated.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The literature for this study was reviewed according to the study objectives and the themes such as effectiveness, group extension methods and farmers' learning satisfaction with group extension methods, farmers' practices in HQCF production, factors affecting adoption of new technologies and factors influencing HQCF production.

2.1 Effectiveness of group extension methods

Effectiveness of agricultural extension methods is the extent to which extension methods have contributed to change in farmers' attitudes towards a technology, increase in levels of production, increase in farmers' incomes and adoption of recommended practices (Agbarevo *et al.*, 2013). Development partners have been using group extension methods to promote HQCF production in Apac district with the aim of achieving increased productions and enhancing smallholder farmers' incomes (Alacho *et al.*, 2014)

Effectiveness of group extension methods in this study refers to the extent to which these methods have contributed to adoption of HQCF production practices among farmers. The methods aimed at farmers adopting practices such as; planting recommended cassava varieties for HQCF, selecting the right site to grow cassava to be processed as HQCF, timely harvesting of cassava within 9 to 12 months from planting, processing cassava within 24 hours after harvest and

following post-harvest handling recommendations to maintain quality for buyers to accept the farmers HQCF and pay better price to improve the farmers income. The effectiveness of these methods was measured by determining the proportion of farmers practicing recommendations on the listed practices in HQCF production chain Hazem (2014).

The effectiveness of group extension methods services is also highly dependent on the ability of extension workers to be competent as the whole extension process is dependent on them to transfer information from extension organization to the clients and extension needs involve farmers themselves in the process of extension. If participation is to become part of extension, it must be clearly interactive and empowering and any pretense to participation will result into little change, allowing farmers just to come to meeting or letting few representatives sit on committees will be insufficient (Antholt, 1994), if farmer groups are to function well.

A condition of effective and sustainable functioning of farmer groups is that the perceived benefits to members substantially outweigh the perceived costs. Benefits are likely to be high where there is production of a high value commodity and where linkages with other stakeholders (private or public sector) are valued by the group (Stringfellow *et al.,* 1997). The effectiveness of the extension approach in enhancing capacity building, technological adoption and ultimately improved agricultural output depends on key factors. These factors relate to (1) extension method used, (ii) governance capacity and management structures of the extension approach, (iii) underlying contextual factors such as

the policy environment, market access, characteristics of beneficiary communities and weather conditions. Quantitative estimates of effectiveness of extension intervention relating to intermediate outcomes such as knowledge acquisition, adoption and diffusion of technologies, and final outcomes such as agricultural yields, household income and poverty status also need to be evaluated (Waddington *et al.*, 2010). As noted by Birner *et al.* (2006), the reasons for effective service delivery were diverse, including the appropriateness of the advisory methods, the capacity and numbers of extension staff, and the management and governance structures of the organisations delivering the services.

As highlighted by participatory models in particular, effectiveness may be also influenced by the degree of feedback and the mechanisms of delivery of information from farmers to the research and extension system, and thus the role of farmers in formulating demand and their ability to exercise voice. This may depend in turn on the degree of decentralization, the ratio of extensionists to farmers, a responsive management approach, and indeed the use of participatory advisory methods.

2.2 Group extension methods in cassava production

As development programmes shift from production-related programmes to market-oriented interventions, there is an increasing interest in collective action, such as farmer groups, to enhance market access (Barham & Chitemi, 2009; De Louw *et al.*, 2008; Kaganzi *et al.*, 2009).

A farmer group is a collection of farmers interacting with one another towards achieving a common goal. Usually, the interaction between the members of the group is more than with those outside the group. Membership of a group varies, and it is advantageous to have a small number of people forming it. A group size of between 20 and 30 is ideal and manageable in order to provide a face-to-face interaction, better communication and the free flow of information (Madukwe, 2006). Some of the methods used to train farmers in recommended agricultural practices include; group demonstrations, field days and exchange visits.

Result demonstration is a method of teaching designed to show by example the practical application of an established fact or group of facts or the result demonstration is one which shows after a period of time what happened after practice is adopted. Method demonstration teaches how to do certain work, it is always interesting to the farmers and especially when the demonstration is concluded by the extension worker, it increases their respect for worker and a method demonstration is to teach a skill. A field day is a group extension event conducted at the site of any type of result demonstration. The outcomes from these trainings are normally affected by some factors such as; education levels of farmers, age, years in farming and other social factors.

A study by Adong *et al.* (2012) reported that education, access to extension services and distance to meeting place had an effect on participation of farmers in groups. Ofuoko *et al.* (2013) reported that marital status, educational level, household size, farm size, farming experience, extension and contact with other farmers had a significant effect on subscription by farmers into groups in Nigeria.

The studies reviewed so far have focused on the effect of socioeconomic characteristics on group participation. However, none or few of the studies on higher yields of maize and banana reported among group members are consistent with results of other studies, where group extension had been associated with superior yields (Godtland *et al.*, 2004).

One major benefit of the group extension methods is that it enables farmers to support each other to learn and adopt, thus farmer-to-farmer extension is amplified by making farmers support each other, rather than simply be agents for technologies imposed from outside. The extension agents are expected to become catalysts, mobilizing farmers to experiment on an identified need/ solution, recognizing local innovations and helping to assess and encourage them. Experienced farmers thus become the best discussion partners for other farmers. A farmers' network of communication operates on a sustainable basis since it is perpetuated continually for a number of human generations (Madukwe, 2006).

2.3 Learning from group extension methods by smallholder farmers of targeted groups for HQCF production in Apac District

Farmer's decision on group extension method that gave them good knowledge in this study was based on the extension methods that farmers perceived to have acquired more knowledge and skills from, the method that made farmers improve HQCF quality and quantity with increased incomes. Raboka (2006) defined satisfaction as the fulfillment of certain prior expectations related to a product or service. Farmers' satisfaction with the group extension methods in this study had

been linked with the values that farmers attached to these methods such as; methods that gave them more knowledge and skills on processing, the methods that helped them increase production, convenience to the farmer, the method that resulted into increased incomes, a method that left a reminding effect to the farmer and how frequent the method is applied.

According to Bonger *et al.* (2004), although many farmers seem to have adopted the packages promoted by the extension service, up to one third of the farmers who have tried a package had discontinued its use. Indeed Bonger *et al.* (2004) also found that poor extension services were ranked as the top reason for non-adoption. Moreover, Elias *et al.* (2013) observed that the effect of extension program participation on farm productivity is marginal. According to Flores and Sarandón (2004), farmers' satisfaction is considered to be an important indicator of sustainability which had become the leading target of scientific research and policy agenda.

Older farmers are more satisfied with the services provided by extension than younger farmers which may be related to their farm experience (Lavis and Blackburn 1990, Terry and Israel 2004). On the contrary, older farmers are often viewed as less flexible, and less willing to engage in a new or innovative activity due to fear of risk (Elias *et al.,* 2013). Hence the influence of age on farmers' satisfaction is ambiguous. Education increases the person's resources and the capacity to achieve goals but also it expands one's awareness of alternatives and farmers to mitigate labour shortage, incomplete credit, insurance markets (Zerfu & Larsony, 2011) and to implement extension advice effectively.

According to Wilson *et al.* (1996), external factors such as scheme features, amount of premium, degree of fitting of the contract to the farm organization, social context and 'internal factors' such as farm structural features, and finally farmers' specific characteristics, like motivations, attitudes and level of information are equally important. Wynn *et al.* (2001) proposed the following classification of factors in order to explain farmer entry into the Environmentally Sensitive Area Scheme in Scotland: i) physical farm factors; ii) farmer characteristics; iii) business factors and iv) situational factors.

According to Sadati *et al.* (2010), all farmers' attitudes have an impact on the acceptance of sustainable agriculture as a new technique to cultivate crops and rear livestock. Previously, Allport (1935) defined attitude as a mental readiness, ordered through long experience, and also stimulate in one direction or dynamics influence upon the individual's response to all objects with which it is related.

Furthermore, farmers' characteristics also play a role in determining their agro-environmental responses. Age had been assumed by most of the cited studies as a significant variable to the extent that young farmers are deemed to be more willing to take risks and are therefore more open to change. This hypothesis had been confirmed by the findings of (Wynn *et al.*, (2001) and Bonnieux *et al.*, 1998). However, family life cycle – meant as having a successor – had not provided meaningful indications (Wynn *et al.*, 2001; Vanslembrouck *et al.*, 2002). Education, as a critical indicator of the quality of human factors, generally encourages participation (Wilson, 1996; Delvaux *et al.*, 1999 and Dupraz *et al.*, 2002).

2.4 Determine an association between group extension methods and farmers HQCF production practices such as timely planting, harvesting, processing

The behavioral change process in farmers begins with a state of awareness and ideally culminates with full adoption. Perceptions and knowledge play an important role in moving people forward once they have chosen to aspire towards the "new" objective. Perceptions, knowledge and aspirations are considered the primary intermediaries towards change. Unlearning (discarding) present (and often proven) practices and/or ideas could prove to be more difficult (for individuals) than learning new ones (Habtemariam & Düvel, 2003). Letting go of the old in favor of the new feels risky (insecure) resulting in many preferring not to change. One is at times faced with institutional or other changes that require personal adaptations (for which there are no perceived alternatives).

Even though extension services are offered to farmers, regardless of the size of their farm land, they thought them to be inadequate, because of not meeting their specific needs. Inadequacy of the provided services accounted for the reluctance of farmers to seek extension services (Umeta *et al.*, 2011; Siddiqui and Mirani, 2012; Benjamin, 2013)

HQCF is not expected to be contaminated with mycotoxin if it is produced efficiently as explained in quality control manual by IITA (Onabolu *et al.*, 1998), this is because extensive mould growth cannot occur if the product is dried within the specified period to moisture content of less than 10% and stored properly. However, some mycotoxin detected in fermented cassava chips includes: stergmatocyatin, patulin, cyclopiazonic acid, penicillic acid and tenuazonic acid

(Wareing, 2001). HQCF is defined as fine flour produced from wholesome freshly harvested and rapidly processed cassava roots based on the method developed by IITA (Onabolu *et al.*, 1998).

The product had been found to be suitable for making a variety of pastries, whole or in the composite forms (cakes, cookies, doughnuts and breads) and convenience foods for example: It is also an acceptable raw material for the manufacture of industrial items such as textiles, plywood and paper. (Dziedzoave *et al.*, 2006). The processing of cassava roots into HQCF as a primary industrial raw material had the potential to jump-start rural industrialization, increase market value of cassava and improved farmers' earnings and their livelihoods.

Processing of HQCF from harvesting fresh cassava up to final drying is done rapidly, within 24 hours (Onabolu *et al.*, 2008). Starch is extracted from peeled and washed fresh roots, grating or rasping is followed by diluting with water and sifting out the starch with muslin cloth. The extracted starch milk is allowed to sediment; the water is decanted to collect the wet starch which is dried and milled before bagging. Previous studies showed that end-users in West Africa used some quality criteria for the purchase and use of HQCF in various food products (Abass *et al.*, 1998). In Tanzania small milling companies report sales to supermarkets in tonnes of HQCF daily (Abass, 2008, 8).

2.5 Factors that affect production of HQCF in Apac District

This study focused on factors that originated from service providers, personal and socio-economic characteristics of cassava farmers. These included frequency of

trainings by service providers, number of GEMs that farmers were exposed to, time allocated for trainings, costs of inputs, education levels of farmers, extent of follow ups done after training, cost of inputs, labour availability at household levels, age of the farmers and number of years that a farmer had spent in farming were some of the factors identified to be affecting promotion of HQCF.

An inadequate number of agricultural training/extension officers, therefore, may hinder the number of training packages they could take per time as well as the quality of time spent with the farmers during the training sessions. Okwu and Ejembi (2005) refer to farmers' trainings as an intensive learning activity for farmers to understand the skills required for the adoption of agricultural technologies.

Studies indicate that shortage in farm labour supply results in low farm productivity which eventually culminates in poverty among rural farming communities. This situation has been considered a major problem especially in developing countries like Nigeria (Gebremedhin & Switon, 2001).

Hazell and Hojjati (1995) as well as Chavas *et al.* (2005), among others, have also reported that given the very weak capital market in most developing countries, many farm households often resort to off-farm work to raise cash with a view to relaxing their cash flow and liquidity constraints. This view is supported by evidences in Stampini and Davis (2009) as well as Pfeiffer *et al.* (2009) that reported that households engaged in off-farm activities were able to spend significantly more on seeds, services, hired labour, and livestock inputs, which

confirms that off-farm income relaxes credit constraints in agriculture. In a stylized story of green revolutions, improvements in agricultural technology are achieved through the introduction of improved land management techniques and improved inputs, including germplasm and fertilizer, all of which boost yields and labor productivity (Murgai, 2001, Restuccia *et al.*, 2008).

In a research conducted on 141 villages consisting of rice farmers within Bangladesh, it was found out that schooling has positive effects on agriculture. This was found to be due to the skills of literacy and numeracy that give the farmers better understanding into agricultural issues (Asadullah & Rahman, 2005).

The processors of HQCF have indicated challenges on quality of chips in regards to cleanliness, starch and fiber content which determines the price to offer on the chips. Constraints faced by processors include cassava seasonal availability, low quality cassava chips, high costs of operation, poor quality processing equipment to meet demand, poor quality control, chips' impurities such as metal pieces, stones, hard peels and fibers (Alaco *et al.*, 2014).

While both male and female smallholders lack sufficient access to agricultural resources, women generally have much less access to resources than men. Worldwide, women have insufficient access to land, membership in rural organization, credit, agricultural inputs and technology, training and extension and marketing services (FAO, 1998). The female headed households (FHHs) access and cultivate less land, have poor access to credit services and capital and

do not give consideration to output prices offered in the market, probably due to low traded volume of agricultural outputs (Auma, 2008).

The main method for processing cassava had been through sun drying. Although cheap, the quality of sun dried products is variable. It can get contaminated with extraneous matter, production is weather dependent and good quality products are best produced during dry season. The processing capacity is extremely limited unless many drying centers are used, which makes controlling quality much more difficult. Difficulties associated with sun drying are eliminated by the use of artificial dryers. However, the setback of artificial dryers is that they are more costly, both in terms of capital expenditure and operating costs (Alaco *et al.*, 2014).

Davies and Hodge (2006) also summarized earlier research in which adoption decisions hinged on the 'goodness of fit' between a farmer's own management plan (based on available resources and personal preferences). This also included package of incentives and restrictions inherent in a particular scheme design.

However, as noted by Slee *et al.* (2006), there is a core of farmers labeled variously 'productivist,' 'conservative' and 'traditional,' who are uninterested by optional-entry environmental schemes, even where material gain may be made from such engagement. Adopting some environmental behaviors is simply not possible within certain farm environments; for example, the practice may require a particular farm type, or a specific geographic location (Burton *et al.*, 2006). Farmers are influenced by the behavior of their peer group. The literature shows

that proficiently carrying out skilled farming improves both how farmers perceive themselves and how other farmers view them (Burton *et al.*, 2004).

Ahnstrom *et al.* (2008) suggested that for environmental schemes to be successful, they must enable farmers to enact and display skilled behavior. Farmers who are innovators or early adopters of technology also have the potential to influence their more cautious peers, so it would be useful to know more about the factors influencing adoption behavior.

Research by Diederen *et al.* (2003) analyzed the choice of a farmer to be an innovator, an early (or late) adopter and a non-adopter. The research found that structural characteristics explain much of the difference between types of farmer, and factors such as age, and farm size and type may dictate whether and when adoption is a viable proposition at all. The existing literature relating to the influence of other family members is summarized by Burton *et al.* (2006). The evidence suggests that, in larger complex farm businesses in particular, decision making is spread around family (and even non-family) members. The authors found that differences in opinion usually arose when young people wished to try new methods, while senior farmers wanted to stick to old ways (Taylor *et al.*, 1998).

Further, Msuya and Bengesi (2005) found that farmers with higher income were able to purchase required inputs as compared to those with low income and this facilitates knowledge transfer to them. Equally, a study by Rogers (2003) in US

on diffusion of innovations found that farmers with large farm size tended to be earlier adopters compared to those with small sized unity.

2.6 Theoretical Framework

Extension can be described as the process of assisting farmers to become aware of and adopt improved technology from any source to enhance production efficiency, income and welfare (World Bank, 2001). According to Liberio (2012), extension agent is the key person to train farmers on issues related to farming including dissemination of new technologies.

In most cases change agents seek to secure the adoption of improved technology, they do receive the knowledge from research centers and pass it to farmers (Liberio, 2012). An extension service can have an important function in increasing the rate of adoption by being directly involved in increasing awareness, facilitating skill acquisition and assisting in understanding of improved cassava technologies and its relevance to farmer circumstances (Neil *et al.,* 2001).

It also has an important role in feedback information on farmer constraints, potentials and farmers' experiences with new technology to the research system, as well as in working with farmers and researchers in developing and spreading indigenous solutions to problems (Neil *et al.,* 2001). Agricultural extension agent helps to educate farmers and assist to solve their own problems and thereby adopt improved cassava farming technologies and increase production (Belay *et al.,* 2004).

Agriculture extension is used to improve food security in rural development programmes in many developing countries (Rivera and Quamar, 2003). Extension can help to enhance the productivity of food as well as the quality of rural life by way of community development (Rivera and Quamar, 2003). Pattanayak *et al.* (2003) pointed that access to extension services, other stakeholders and Non-Governmental Organization have an influence in farmers' adoption of cassava improved technologies. The argument was that farmers who usually meet extension officers and have done demonstration on the proposed technology have a high chance of adopting technology

Adoption of agricultural technologies, such as the high yielding varieties could lead to significant increases in agricultural productivity and stimulate the transition from low productivity subsistence agriculture to a high productivity agro-industrial economy (Ojo and Ogunyemi, 2014).

The rate of adoption of technology by the farming population will depend on the characteristics of the production circumstances of the individuals, the characteristics of the technology itself, the socio-cultural characteristics of the individual farmers, how rapidly the population is made aware of the technology and its application to local production systems (Anderson, 2007; Anandajayasekeram *et al.*, 2008; Davis, 2008).

One reason that farmers cite for not adopting the new technologies is the lack of information regarding how to apply the improved inputs (Morris *et al.*, 2007).

2.7 Conceptual framework

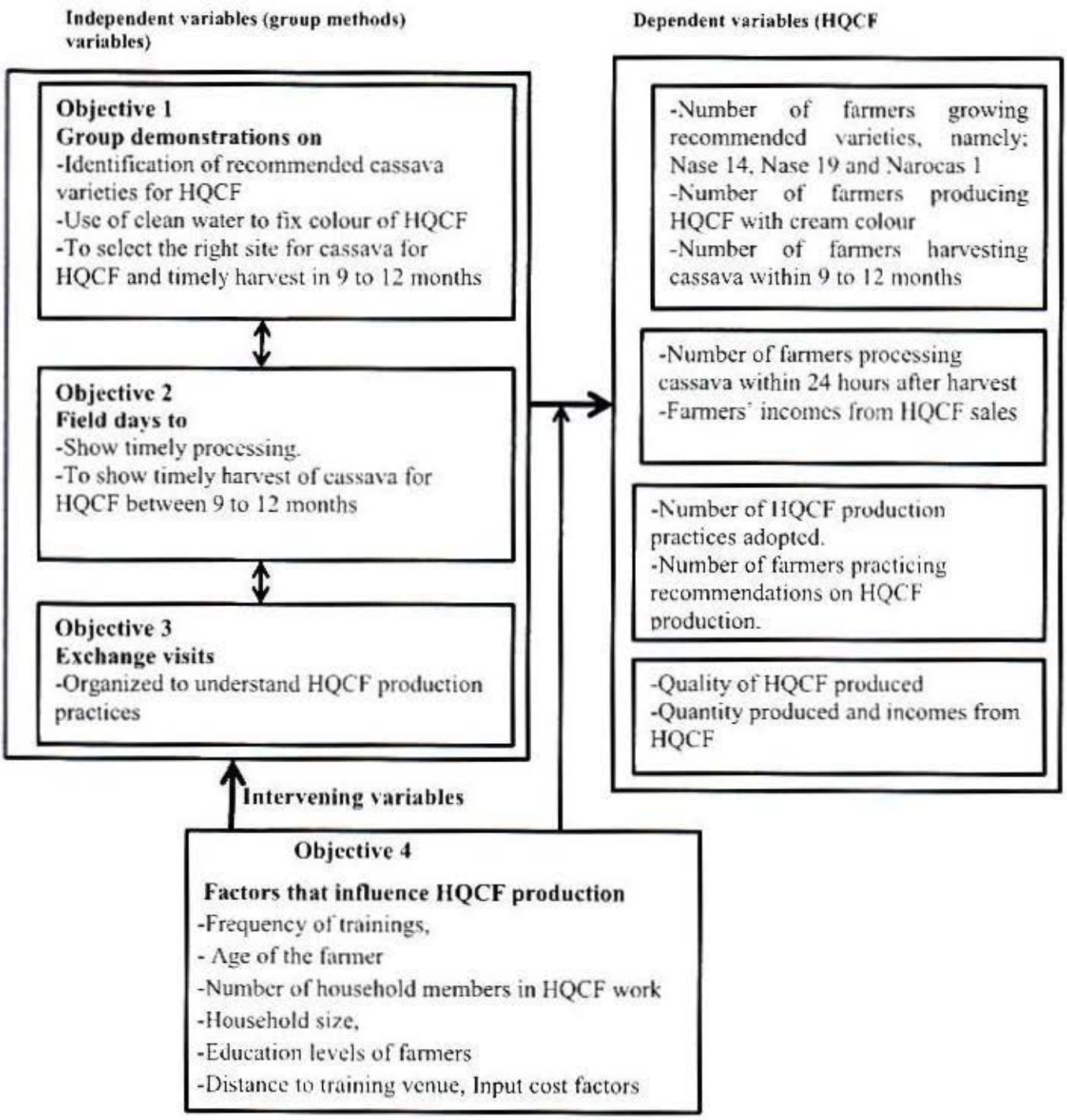

Fig 2.1: Conceptual framework of relationship between and among variables for effectiveness of group extension methods in High Quality Cassava Flour production (Abel, G.M. 2008).

Figure 2.1. shows the interrelations that exist between the variables that determine the effectiveness of group extension methods in promoting High Quality Cassava Flour among smallholder farmers. Farmers exposed to group extension methods namely; group demonstrations, field days and exchange visits were expected to adopt practices such as good site selection for cassava, planting recommended cassava varieties such as Nase 14, 19 and Narocas 1, use clean water to process HQCF, harvest cassava between 9 to 12 months, process cassava within 24 hours after harvest and follow other post-harvest handling techniques to achieve better quality flour which gives better price for the farmers. However the impact of these trainings on farmers knowledge and skills can be affected by factors such as farmers education levels, lack of access to inputs, distance to training venues and farmers years of experience in farming.

The effects of frequency at which farmers attend extension trainings, the number of group extension methods a farmer is exposed to, the period the farmer had attended trainings in terms of days, weeks, months with their perceptions towards these methods all had an effect on their acquisition of knowledge and skills in HQCF production practices. The adoption of HQCF production technologies by farmers is affected by socio-economic factors, institutional and intervening factors. Socio-economic factors include, age of the potential adopters, education level, farming experience and labour availability. Institutional factors include market availability, access to credit facilities, extension service delivery mechanism and training of cassava production technologies (Anderson and Fedder, 2004).

Group extension methods have been used to educate farmers and assist in solving their problems, thereby adopt improved cassava farming technologies hence increased HQCF production. However, the services are affected by frequency of interaction between farmers and the agents and inadequacy of working facilities. Lack of transport for extension agents to reach farmers in remote areas affects delivery and adoption of technologies. Minten and Barret (2008) found that communities with higher rates of adoption of improved agricultural technologies had higher crop yields and lower level of food insecurity. For instance, farmer with high level of income may be less risk averse than low income farmers (Ogunlana, 2004). Moreover, the number of people in a household may influence the adoption of the technology, the bigger the size of the family in a household the higher the chance of adoption also as labour accessibility increases (Asmelash, 2014).

The perceptions of farmer groups about group extension methods also determined the number of recommendations adopted and practiced in HQCF production. In Kenya for example, Khan *et al.* (1984) established that exposure to a variety of extension methods significantly influenced likelihood of adoption. Extension contact alone may not promote adoption if information dissemination pathway being used is ineffective or inappropriate (Agbamu, 1995). Furthermore, knowledge may be an important variable, but how farmers receive information from different sources had a more significant effect on adoption than just mere knowledge acquisition (Mauceri *et al.*, 2005). Large farmers are assumed to be of less risk averse and therefore able to adopt new technologies, or they could be under less pressure for alternative ways to improve their income via new technologies, while small farmers adopt

labor intensive technologies as they use relatively more family labor which had low opportunity cost (Genius *et al.*, 2006)

Lahai *et al.* (2000) have found a direct relationship between farmers' frequency of contact with extension agents and their levels of participation in extension. In their view, frequent contact of farmers with extension agents helps them to internalize well the extension education they receive as issues can be clarified whenever the contact occurs. Different authors have also argued that farmers' frequency of contact with extension agents had a direct relationship with effectiveness of extension -the more the frequency of contact of farmers with extension agents the better the effectiveness of the extension service (Aphunu & Otoikhian, 2008).

Several studies have shown the impact of different information sources on farmers' probability of adopting a particular technology. For example, information from crop consultants had the largest impact on adoption of precision farming than media sources in the United States (McBride *et al.*, 1999; Daberkow and McBride, 2001), while farmer field schools had the greatest impact on adoption of integrated pest management (IPM) than field days and media in Ecuador and Bangladesh, respectively (Mauceri *et al.*, 2005; Ricker-Gilbert *et al.*, 2008). Furthermore, knowledge may be an important variable, but how farmers receive information from different sources had a more significant effect on adoption than just mere knowledge acquisition (Mauceri *et al.*, 2005). Ajayi (2008) defined training as a planned and systematic effort to modify or develop knowledge, skills or attitude through learning experience, to achieve effective performance in an activity.

2.8 Summary of Literature Review

Extension is a key element for enabling farmers to obtain information and technologies to improve their livelihoods. The theory of group dynamics by Child (1986) contended that social interaction and imitation of parents, famous people in a group encouraged adoption of innovation. In the same way, Voh (1982) supported the view by stating that education, age, peer group and availability of resources were some of the factors that influenced adoption and diffusion of innovations.

Although decisions for targeting groups for extension have already been reached based on the "cooperative paradigm" and success of few groups (Bahigwa *et al.*, 2005; Adong *et al.*, 2013), especially the farmer field schools (FFS) that were highly supported by donors (Godtland *et al.*, 2004; Davis *et al.*, 2012). It is necessary to evaluate the achievements of group extension methods considering the deteriorating agricultural performance.

The difficulty of tracing the causal relationship between extension input and its impact was appreciated by various authors (Anderson, 2007; Anandajayasekeram *et al.*, 2008; Davis, 2008). One reason that farmers cite for not adopting the new technologies is the lack of information regarding how to apply the improved inputs (Morris *et al.*, 2007).

A study by Adong *et al.* (2012) reported that education, access to extension services and distance from farmers' home to the main road had an effect on participation in farmer groups. Ofuoko *et al.* (2013) reported that marital status, educational level, household size, farm size, farming experience, extension and contact with other farmers had a significant effect on

subscription into groups in Nigeria. The studies reviewed focused on the effect of socioeconomic characteristics on group participation. However, none or few of the studies on higher yields of maize and banana reported among group members were consistent with results of other studies, where group extension had been associated with superior yields (Godtland *et al.*, 2004).

Adebayo *et al.*, (2003) and Adebayo *et al.*, (2010) argue that HQCF can contribute to the enhancement of rural incomes because value can be added easily at rural household level and no technological leap is required to kick start its production and the capital requirements for processing of the flour are low.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

Figure two shows the map of Apac district showing the locations of sub counties where farmers have been trained on HQCF production practices by use of group extension methods. The summary of number of farmers trained per Sub County has also been given in the key.

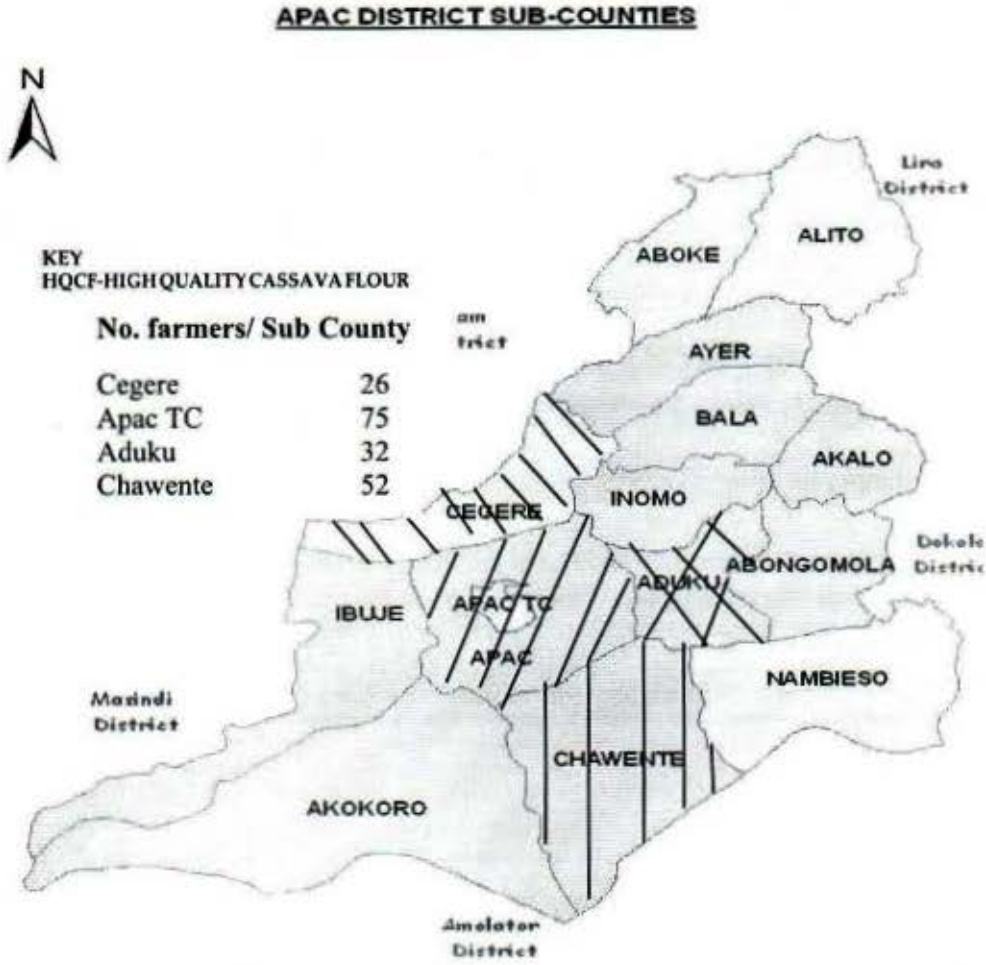

Figure 3.1. Map of Apac District showing sub counties of high quality cassava flour production (Apac District 5 years development plan)

3.1 Description of Study Area

Apac District is found in the Lango sub-region of Northern Uganda. The district lies between longitudes 32°E and 34°E and latitudes 2°N and 3°N. Apac is bordered by Oyam in the North, Lira in the East, Kiryandongo in the West and Amolatar district in the South. The district has a total area of 3,908 km^2 of which 9 % is under open swamps & water while 15% is under forests, leaving 2,970 for human settlement.

The district has 3 counties, spread over 14 rural sub-counties and one Town council. The rural sub-counties and the Town council share among themselves 101 parishes/wards and 1,184 villages/cells. The district had a population of 527,155 (257,646 males and 269,509 females) in 2013 and is approximately 300 km from Kampala. According to Uganda census of agriculture 2008/2009, Apac District was the biggest producer of cassava in the country with an annual production of 240,000 metric tonnes from 43,000 hectares of land (MAAIF & UBOS, 2010). Development partners such as NARO, Africa Innovations Institute and Sasakawa Global have been involved in development of cassava value chains in the district. With consultations of these partners and the local authorities in the area, Apac district emerged the study area.

The study was conducted in the sub counties of Aduku, Apac Town, Cegere and Chawente in Apac District The selection of sub counties, parishes and villages was done in consultations with development partners in the study area and leaders of Agency for food security network which is the biggest umbrella group working on HQCF value chain in the district. These sub counties, parishes and villages were purposively selected because the Agency for food

security network had its members spread in these sub counties. The group had been receiving trainings on HQCF from a number of organizations. The group was made up of 185 members divided into 9 clusters with average membership of 20 to 25 per cluster and each cluster provided 14 respondents for the study. The groups received an order to supply 600 tonnes of HQCF to a factory in Kenya for year 2016. However, despite trainings, the group continued to face challenges of failing to meeting quality and quantity demands for HQCF.

3.2 Research Design

A cross-sectional survey is a study design that is used to collect data in different locations at the same time (Cherry *et al.,* 2012). This design was selected because the district where the study was done had 14 sub counties and 4 were needed for the study. This design prevents respondents from exchanging information about the content of the instruments to develop attitudes which could have led to responses that would not support the study. Using this design, the study focused on exploring the reasons for the gaps in knowledge, skills and practices needed in HQCF production among smallholder farmers in Apac (Abel, 2008).

3.3 Sampling and Sample Size

According to Cochran (1977), if a sample is taken from a population, a formula must be used to take into account confidence levels and margins of error. When taking statistical samples, sometimes a lot is known about a population, sometimes a little may be known and sometimes nothing is known at all. There may be no information about how a population will behave. According to Cochran (1977), use Slovin's formula when nothing is known about the behavior of a population as shown.

$$n = \frac{N}{1+N\,(e)^2}$$

Where n is the sample size, N is the population and e is the degree of freedom assuming 95% confidence level.

$$n = \frac{185}{1+185\,(.05)^2} = 126$$

From the computation, the sample size of 126 farmers was used from the total population of 185 farmers who were on the project for HQCF in Apac, distribution of farmers per sub counties after consultation is shown in Table 3.1.

Table 3.1 Farmer group distribution by sub counties and parishes (n=185)

Sub county	No. of Parishes	No. of Project Farmers	Av. No. of Farmers/ Parish selected
Aduku	3	32	10
Apac	6	75	12
Cegere	3	26	08
Chawente	1	52	52
Total	**13**	**185**	**14**

From Table 3.1, four sub counties were selected, out of which 13 parishes were sampled across boundaries of sub counties and parishes because of the nature of the project which oversampled farmers in some sub counties. The total number of farmers from the 13 parishes was 185. Slovins formula which was used to compute the sample size of 126 took into account confidence levels and margins of error.

The study adopted multi stage sampling techniques based on local administrative units of 14 sub counties in Apac District. The first stage was consulting the District Agricultural Officer who advised that there were 4 sub counties in which production of HQCF was taking place under the project run by NAADS and Africa Innovations Institute as a partner. These were the sub counties which were high performing in the production of cassava in Apac. The four sub counties were; Cegere, Aduku, Chawente and Apac Town Council. This was followed by a visit to the sub counties where the sub county production officers advised to make contacts with leaders of HQCF farmer groups in the parishes. Contacts were made with 14 group leaders whose groups were selected and are distributed within 13 parishes based on the production performance of HQCF in these parishes. The parishes were distributed per sub county thus; 3 in Cegere, 6 in Apac Town Council, 1 in Chawente and 3 in Aduku Sub County. However the selection of the groups was not based on the boundaries of parishes and villages as a group had members drawn across parishes and villages based on members' performance. On talking to the 14 group leaders including the leader of the umbrella group which had oversight over all the other groups, they provided information on their group activities and list of farmers. Therefore a total 14 lists of farmers was the sampling frame for 126 farmers in different groups, parishes and sub counties.

Simple random sampling was then performed at group level to ensure all the farmers had an equal chance of participating in the study so as to minimize selection bias (Nasir, 2017). Simple random sampling by use of ballots was used, in which the 14 group members were assigned numbers written on pieces of paper,

put in a box and mixed thoroughly, without looking into the box, one number was picked at a time and recorded and returned to the box for all the members to have an equal chance of being picked and this was done until all the 9 respondents per group were got from 14 groups in the district producing HQCF.

Seven (7) key informants who were extension agents of the study area were included in the sample to give a sample of 133 persons. They were interviewed using structured questionnaire since they had been involved in providing extension services on cassava production to smallholder farmers. This sample size was used because it represented the population of HQCF producers and service providers in the district.

3.4 Instruments

3.4.1 Questionnaire for cassava farmers

Questionnaire for cassava farmers in Appendix III was used to obtain information on; number and frequency of demonstrations, exchange visits, and workshops, period a farmer had been in group, production, incomes of farmer, and farmers' attitudes towards group trainings, the knowledge of the farmers on best practices in HQCF production and factors that affect group extension methods in promoting HQCF production. The questionnaire also generated information on; training methods used, farmer's knowledge, skills and practices for HQCF production and challenges faced by farmers with implementation of group extension methods by service providers. This information was in line with the objectives of the study and the corresponding hypotheses to be tested and it formed primary data which was the main basis for the study.

3.4.2 Observation Guide

Observations were held using the observation guide found in Appendix IV and generated information on production practices such as; cassava varieties planted, methods of harvesting, peeling methods, type of knife used , cleanliness of chipping machine, colour and number of tarpaulins, inputs used, drying environment and storage facilities. These helped to gather data on; resources that farmers owned for HQCF production, farmers knowledge, skills and practices for HQCF production and farmers attitudes towards group extension methods used.

3.4.3 Focus group discussion

Focus group discussions consist of interviews with small, relatively homogeneous groups of people with similar backgrounds and experience. The main purpose is to bring out ideas, insights, and experiences in a social context in which people stimulate one another and consider their own views along with the views of others. Five (5) focus group discussions were held using FGDS guide in Appendix V with average membership was 12 in three parishes and was used to triangulate information obtained from interview guides for farmers. Focus group discussions generated information on; proportion of group members of HQCF groups who had attended training where trainers used group extension methods namely, demonstrations, exchange visits and field days. It also provided information on group attitudes towards the different group extension methods, production levels of members, incomes from HQCF production and practices on which farmers had knowledge.

3.4.4 Key informant interviews

Key informant interviews were held with extension agents using a guide in Appendix VI to generate information on gaps that existed in extension service delivery. The responses from the key informants provided more insight into the responses from the farmers. It focused on variables such as group extension methods that were suitable for training farmers on HQCF production practices and farmers' attitudes towards these methods, practices commonly adopted by farmers and factors that affected knowledge acquisition from group extension methods on HQCF production. This was used to support answers from questionnaire for cassava farmers.

3.5 Validity and Reliability of instruments

According to DeVellis, (1991), reliability is the proportion of variance attributable to the true measurement of a variable and estimates the consistency of such measurement over time. In other words, it is a measure of the degree to which research instrument would yield the same results or data after repeated trials. Reliability in research is influenced by random error. Validity is the truthfulness or correctness of the measurements as planned or intended. Seale (2004) gives seven (7) threats to internal validity namely, history, maturation, instability and regression, testing, instrumentation, selection and experimental mortality. Reliability concerns the consistency with which research procedures deliver their results (Seale 2004). It also relates to the repeatability of the findings under similar conditions. To test the validity of the instruments, they were piloted with 10 selected farmers to assess the relevance of the questions asked. The reliability of the piloted questionnaires was determined using SPSS for 10 piloted questionnaires which indicated

some correlation between these variables giving reliability of 0.7 as shown by the Table 3.2.

Table 3.2: Reliability test results (n=10)

Case	N	%
Valid	10	100.0
Excluded(a)	0	.0
Total	10	100.0

Reliability Statistics

Cronbach's Alpha	Number of items
0.7	10

3.6 Data Collection Procedures

Three enumerators were first trained on how to administer the questionnaire and the observation guide by involving them in the piloting process. The piloting was done to increase the effectiveness and scope of questionnaires to capture all the required information. An introduction letter was obtained from the Head of department Agriculture from Kyambogo University to introduce the researcher to the Local Authorities of Apac District as attached in appendix I page 101. There were 126 individual farmers from 9 cassava farmer groups who received extension training on HQCF production. They were interviewed to obtain information on their practices and how the trainings were provided to give knowledge on HQCF production. There were 5 FGDs of 12 members each conducted to confirm information from other methods. Seven key informants who had experience of working with farmers in promoting HQCF production were consulted to obtain their comments on farmer's perceptions towards recommendations for HQCF production. Field observations and in depth interviews were conducted to triangulate the data obtained in the field, backed by informal interactions with cassava farmers to

obtain information on their practices which formed qualitative data to support the responses on the structured questionnaires. The data collection exercise took 7 months and 2 months for analysis.

3.7 Data analysis

Primary data collected from questionnaire for cassava farmers was entered, edited, cleaned and coded in the SPSS statistical package which was used for the analysis to ensure accuracy, uniformity and consistence. The comments from key informants and focus group discussions were included in the presentation of results, comments from key informants and from FDGS that agreed with findings from questionnaire for cassava farmers were also acknowledged in the presentation of results and the stated hypotheses were tested. A hypothesis is an assumption, belief or opinion which may or may not be true (Nasir, 2017). The testing of statistical hypothesis is the process by which this opinion is tested by statistical means. This means the testing of hypothesis is the procedure which enables us to decide on the basis of information obtained from sample data whether to accept or reject a statement or an assumption about the value of a population parameter. A null hypothesis, generally denoted by the symbol H0, is any hypothesis that is to be tested for possible rejection or nullification under the assumption that it is true. The chi-square is frequently used as test-statistic in testing hypothesis concerning the difference of a sample and corresponding set of expected or theoretical frequencies (Nasir, 2017). In order to answer the declared objectives, the following null hypotheses were tested.

3.7.1 Characterize group extension methods to show their effectiveness in promoting HQCF production among smallholder farmers.

Descriptive statistics was used to obtain the proportion of the respondents who received trainings from the different group extension methods. The views of the respondents on combination of group extension methods to enhance learning were also determined. Cross tabulations were used to establish relationships between farmer's participations in group extension methods and their knowledge, skills and practices for HQCF production. Chi-square test was conducted to test for an association between group demonstrations and farmer's knowledge, skills and practices for HQCF production.

3.7.2 Assess what smallholder farmers, targeted for HQCF, have learned from training where group methods have been used.

Farmers learning was linked with the group extension methods that they thought gave them more knowledge. Using frequency analysis, the method that farmers thought gave them more knowledge, skills and practices for HQCF production was determined, the method that farmers preferred most was also determined. Cross tabulation was used determine the relationship between the frequency at which farmers participated in group demonstrations on timely harvesting of cassava and farmers practices in this. Chi-square was used to test for an association between the frequency at which farmers participated in group demonstrations and their knowledge, skills and practices in timely processing of cassava.

3.7.3 Determine an association between group extension methods and farmers HQCF production practices such as timely planting, harvesting, processing.

Through chi-square tests, the association between group extension methods that farmers were exposed to and their knowledge, skills and practices in HQCF production practices was tested to establish if any significant association existed between the variables.

3.7.4 Determine factors that affect the use of group extension methods in the promotion of HQCF production.

Through frequencies, the percentage of respondents with access to recommended inputs was determined. Cross tabulations were used to determine relationships between training related factors, the years of a farmers experience and farmer's knowledge, skills and practices for HQCF production. Chi-square test was used to determine an association between farmer's education levels, years in farming and their knowledge, skills and practices for HQCF production.

Table 3.3: Summary of the data analysis

Objectives	Hypothesis	Independent variables	Dependent variables	Relationship	Analysis
Characterize group extension methods to show their effectiveness in promoting HQCF production among smallholder farmers.	H_{01}: There are no associations between group demonstrations and knowledge, skills and practices in site selection for HQCF production as a result of trainings.	Group demonstrations on Recommended variety identification Use of clean water to determine colour of HQCF. Site selection for cassava Field days to show Importance of timely harvesting of cassava for HQCF.	Number of farmers growing recommended cassava varieties for HQCF; namely Nase 14, Nase 19, NAROCAS 1. Number of farmers producing clean HQCF with cream colour. Number of farmers harvesting cassava within 9-12 months for HQCF. Number of farmers who can select the right site for cassava	Association	Chi-squares, Frequencies and percentages
Assess what smallholder farmers, targeted for HQCF, have learned from training where group methods have been used.		Frequency of group demonstrations To show correct processing on chipping and drying procedures Frequency of field days to show practices to give good product	Number of farmers processing cassava within 24 hours as HQCF Quantity produced Quality produced Income from sales of HQCF	Correlation	Cross tabulations. Chi-squares, frequencies and percentages
What association exists between the group extension methods farmers were exposed to and their knowledge, skills and production practices for HQCF production?	H_{02}: There are no associations between the frequencies at which farmers participate in group demonstrations and their knowledge, skills and practices in HQCF production.	Number of group demonstrations organized for farmers To understand production practices Education level of farmers that facilitated use of practices	Number of HQCF production practices adopted, Number of farmers practicing recommendations on HQCF production, quantity of HQCF produced, Quality of HQCF produces	Association, correlations	Cross tabulations, frequencies and percentages
Determine factors that affect the use of group extension methods in the promotion of HQCF production	H_{03}: There are no associations between the factors of education and number years a farmer has been in a group and their knowledge, skills and practices in HQCF production.	Frequency of trainings Input access factors	Quantity produced, Income from sales of HQCF.	Association Correlation	

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Socioeconomic background of the respondents

Out of the 126 smallholder farmers who participated in the study, 64.3% were males while 35.7% were females. Table 4.1 shows that of the respondents 64.3% were from male headed households and 35.7% were from female headed households. Twenty four percent (24%) of the household members were aged between 15-30 years, 52.7% were aged between 31-45 years, 17.1% were aged between 46-60 years and 6.2% were above 60 years of age. Majority of the members of households were aged between 31-45, about 10.1% of the household members were not married, married were 78.3%, divorced were 6.2%, widowed were 3.9% and child headed 1.6%. About 17.1% of the respondents stopped in lower primary, 48.8% of the respondents in upper primary, 27.1% in secondary and 7% reached tertiary institutions. On family size, 36.4% of the households had 1-3 members participating in HQCF activities, 38.8% had 4-6 members involved in HQCF work, 17.1% had 7-9 members involved in HQCF work and 7.8% had at least over 10 members participating in HQCF work. Of the seven (7) service providers interviewed, four (4) were aged between 46 and 60, two (2) were aged between 31 and 45 while one (1) was aged between 15 and 30. On trainings, four (4) of whom had qualifications at degree level while (2) were holding diplomas, one (1) was holding certificate in crop production. Four (4) had working experience of over 10 years and three (3) had worked for less than 10 years.

Table 4.1: Gender and marital status of household heads (n=126)

Variable	Percentage
Gender	
Male	64.3
Female	35.7
Marital status	
Single	10.1
Married	78.3
Separated	6.2
Widowed	3.9
Children	1.6

4.2. Research question 1. What characteristics of group extension methods show their effectiveness in promoting HQCF production among smallholder farmers?

In order to answer research question number one, objective number one that states Characterize group extension methods to show their effectiveness in promoting HQCF production among smallholder farmers. Smallholder cassava farmers in Apac District had received trainings in High Quality Cassava Flour production from extension service providers who were from government production departments, National Agricultural Research Organization and Non-Governmental Organizations. The service providers used group extension methods namely, group demonstrations; exchange visits and field days. By using descriptive statistics with frequency analysis, the findings from 126 farmers revealed that 64% of the respondents had participated in group demonstrations for HQCF, 60% were exposed in exchange visits to their counter parts in other

districts and 73% participated in field days to share experiences on the success and failures in HQCF production. The study also found that out of the seven (7) service providers, six (6) confirmed to have used group demonstrations, exchange visits and field days for training farmers while one (1) had used demonstrations only for training farmers in HQCF production. This finding was in line with responses from FGDS as shown in Table 4.2.

Table 4.2: Farmers' responses on participation in group trainings (n=126)

Group method	Participated	Percentage	Never participated	Percentage
Demonstrations	81	64	45	36
Exchange visits	75	75	51	25
Field Days	93	73	33	27

In order to determine the association between farmer's exposure to group demonstrations and their knowledge and skills in site selection for cassava, a null hypothesis was formulated and testes. The hypothesis states; $\mathbf{H_{01}}$: There are no associations between group demonstration trainings and knowledge, skills and practices in site selection for HQCF production as a result of trainings.

Table 4.3; Chi-square tests for association between farmers participation in group demonstrations and their knowledge in site selection (n=126)

Response of farmers	Observed N	Expected N	Residual		Demonstration participant
Good site selection	106	63.0	43.0	Chi-Square(a,b)	77.000
Poor site selection	20	63.0	-43.0	df	5
Total	**126**			Asymp. Sig.	.000

Table 4.3 shows chi-square tests for association between farmer's participation in group demonstrations on site selection and number of farmers practicing good site selection. The table value of X^2 = at 5.d.f at 1% level of significance is 20.5. The computed value of X^2 is 77.00 which is greater than the tabular value. This shows a significant association between the two variables as shown by p=.000 at 0.01 level of significance. We therefore reject the null hypothesis and conclude that there is an association between farmer's exposure to group demonstrations and their knowledge and skills in site selection of cassava for HQCF.

4.2.1 Farmers responses on training topics covered through group extension methods

The trainings covered the following areas in HQCF production process; identification and selection of recommended cassava varieties namely; Nase 14, Nase 19 and NAROCAS 1 for HQCF, use of clean water for washing cassava, timely harvest of cassava between 9-12 months, timely processing of cassava within 24 hours after harvest and quality management. Out of the farmers interviewed, 75.2% received training in variety identification, 32.6% were trained in timely harvesting, 67.4% received training in processing techniques and 58.1% were trained in quality management practices in HQCF production as shown in Table 4.4.

Table 4.4: Farmers participation in training topics covered through group methods (n=126)

Topics covered	Participant Percentage	Non participant Percentage
Variety selection	75.2	24.8
Harvesting	32.6	67.4
Processing	67.4	32.6
Quality management	58.1	41.9

4.2.2 Farmers responses on use of recommended cassava varieties

The findings from the study revealed that out of the 126 farmers interviewed, 75.2% were found to be able to grow the recommended cassava varieties for HQCF. This means they were planting Nase 14, Nase 19 or Narocas 1 as recommended by the service providers, although 24.8% of the farmers were still planting a local variety called Bao for HQCF due to high cost of cuttings for recommended varieties. Results are shown in Table 4.5.

Table 4.5: Farmers responses on growing of recommended cassava varieties (n=126)

Variety grown	Percent
Recommended	75.2
Not recommended	24.8

4.2.3 Farmers responses on use of clean water in processing HQCF

In finding the use of clean water in processing HQCF, the responses showed that out of the 126 farmers interviewed, 80% were using clean water in processing HQCF and farmers reported challenges such as distance to clean source of water and reduced water size during dry season. Results from cross tabulations for relationships between attendance of group demonstrations and use of clean water showed that, out of 80 farmers who attended demonstrations on use of clean water, 74 farmers were practicing what they learned and out of 90 farmers who participated in exchange visits on planting recommended cassava variety, only 24 were practicing what they had learned as shown in Table 4.8, the use of clean water and planting recommended variety can be seen in Tables 4.6 and 4.7.

Table 4.6: Farmers responses on use of clean water in HQCF processing (n=126)

Type of water	Percent
Clean water	80
Dirty water	20
Total	**100.0**

Table 4.7: Cross tabulations for relationships between trainings in group demonstrations and farmers use of clean water in HQCF processing (n=126)

Participation in group demonstrations	Farmers use of water	
	Using clean water	using dirty water
Participant	74	6
Non participant	42	4
Total	**116**	**10**

Table 4.8: Cross tabulations for relationships between participation in exchange visits and farmers knowledge on recommended variety for HQCF (n=126)

Participation in group exchange visits	Planting correct variety	Not planting correct variety
Participant	24	90
Non participant	2	10

4.2.4 Farmers responses on timely harvesting of cassava for HQCF between 9 to 12 months

The frequency analysis showed that 82.9% of the farmers had knowledge on timely harvesting of cassava for HQCF between 9 to 12 months and 17.1% were still harvesting cassava late for HQCF which had an effect on flour yield and quality of cassava flour produced. Cross tabulations for relationship showed that out of 94 farmers who participated in field days for timely harvest of cassava, 78 were practicing what they learned. Farmers further added that the cause of the delayed harvest is sometimes they want to wait for dry season for good weather conditions which improves quality of flour as shown in Table 4.9 and 4.10.

Table 4.9: Farmer's responses on timely harvesting of cassava for HQCF between 9 to 12 months (n=126)

Timing of harvest	Percent
Timely harvest	82.9
Late harvest	17.1

Table 4.10: Cross tabulations for relationship between farmer's participation in field days and timely harvest of cassava for HQCF between 9 to 12 months (n=126)

Participation in field days	Timing of cassava harvest	
	Harvesting timely	**Harvesting late**
Participant	78	16
Non participant	28	4
Total	**106**	**20**

4.2.5 Farmers response to group extension methods used to improve smallholder farmers' knowledge in HQCF production practices

The farmers were also interviewed to find out if use of more than one group extension methods would improve their knowledge in HQCF production practices. Out of the 126 farmers interviewed, 82% accepted that use of more than one group extension methods improves knowledge acquisition on HQCF production practices, 63% of the respondents mentioned that it eases understanding, while 19.1% accepted that it is of convenience to particular farmers. On this, 24% agreed that it creates a compensation effect in the sense that what a farmer had not understood well from one method can be compensated by another method. In finding which group extension methods could be combined to improve farmers' knowledge in HQCF production practices, 45% of the respondents said that demonstrations and field days can be combined to improve their knowledge in HQCF production practices while the rest of the combinations such as field days with exchange visits scored less. The service providers noted

that, combination of different extension methods improved farmers' knowledge acquisitions in HQCF production practices. They also agreed on the following; it had a compensation effect, and some methods were of convenience to the farmers while other methods made it easy for farmers to understand the practices. On which group extension methods can be combined to improve farmers' knowledge acquisition, some key informants agreed that demonstrations, exchange visits and field days can be combined to improve farmers' knowledge while others noted that combination of demonstrations with seminars can improve learning. Table 4.11 shows farmers responses on characteristics of group demonstrations.

Table 4.11: Farmers' Opinions about importance of combining GEMs (n=126)

Response	Agrees	Percentage	Dis-agrees	Percentage
Ease understanding	80	63.0	46	37
Convenience	24	19.1	102	81
Compensation effect	31	24	95	76

4.2.6 Response of service providers on farmer's attitudes towards the different group extension methods

The service providers noted that, some farmers learnt more when they were exposed to new environment than being always trained in one environment. They reported that during field days, farmers revealed to them better practices that made them succeed. They also said during exchange visits, farmers felt challenged and became keen to learn from their counterparts and for those farmers

who had failed would put more effort as they would say if others can do it why not me and noted that generally exchange visits and field days built experience. Information obtained from focus group discussions showed that during exchange visits, time was not given enough for farmers to share their experiences, and farmers had requested for three (3) days of training during processing demonstration as they discovered that one (1) day training eliminates some stages in HQCF production.

4.3 Research question 2. What learning outcomes have the smallholder farmers of the targeted groups achieved from group extension methods used to promote HQCF production?

In order to answer this research question, objective number two that states; Assess what smallholder farmers, targeted for HQCF, have learned from training where group methods have been used was tested. Under this objective, the farmers learning satisfaction was linked with the methods that they thought gave them better knowledge and skills on HQCF production practices such as using recommended varieties, timely harvesting and timely processing. It also looked at how frequency of trainings affected farmer's knowledge on timely processing of cassava. Farmer's satisfaction was also assessed from the effect of frequency of farmer's exposure through field days on quality of flour and extension methods that farmers preferred most.

Through descriptive statistics by use of frequency analysis, and cross tabulations, the response from 126 smallholder farmers interviewed showed that, 96.1% of the respondents accepted to have acquired more knowledge from group

demonstrations, and 22.3% from field days. When asked on their preference for the different extension methods, 62.0% preferred demonstrations and 25.6% preferred field days. The farmers preferred demonstrations as the best training method citing reasons such as it kills boredom, ease of understanding, compensation effect where what you do not understand well in workshops or seminars would be made clear in demonstrations. Equal participation by gender and its convenience, challenges have been identified with demonstrations such as late starting as a result the process of HQCF was not completed, difficulty in acquiring equipment such as chipping machines, tarpaulins, stainless steel knives and incomplete demonstrations in which some demonstrations stopped at peeling and chipping, leaving out stages such as drying, packaging, milling and storage.

Farmers gave the following reasons for their responses; what was done at demonstrations can be remembered easily, demonstrations did not require reading and writing. In demonstrations, farmers can see and practice, farmers were allowed to practice what they had learned from other methods. Demonstration was convenient, as it killed boredom, eased understanding; compensation effect was possible where what one did not understand well in workshops or seminars would be made clear in demonstrations. On participation of men and women, demonstrations promoted equal participation by gender. On field days, farmers said it helped them learn from one another and they shared their experiences with new ideas. When asked on what general recommendations farmers would have to improve trainings, farmers said trainings needed to be done in local language, facilitators should lower their speed of delivery of training content, service

providers needed to increase number of machines for chipping demonstrations, group size be reduced to avoid crowding during demonstrations and facilitators needed to do follow ups after demonstrations. However, interviews with seven (7) service providers showed that farmers were more active in group extension methods such as demonstrations, field days and exchange visits as shown in Tables 4.12 and 4.13.

Table 4.12: Opinions about GEMs that gave more knowledge in promoting HQCF (n=126)

Group method	Percent
Demonstration	96.1
Exchange visits	1.6
Field ways	22.3

Table 4.13: Farmers' preferences for the different GEMs (n=126)

Group method	Percent
Demonstration	62
Field days	25.6
Exchange visits	26

4.3.1 Farmers opinions on training frequencies

The study sought farmers comments on the frequency at which farmers attended trainings through group extension methods. The responses from the respondents showed that the farmers learned with the service providers in group demonstrations monthly, quarterly, seasonally, annually and bi-annually. When

farmers were asked to indicate what they thought was the right frequency for the trainings, 42.6% said demonstrations needed to be organized seasonally, 6.2% said it should be weekly, 10.1% said it should be monthly, while 19.4% said it had to be annually, 9.3% said it should be twice in a year. On field days, 45.7% of the respondents suggested that it should to be organized annually for learning to be improved Table 4.13.

Table 4.14: Cross tabulations for relationships between frequency at which farmers attended group demonstrations on timely processing and number of farmers practicing timely processing (n=126)

Frequency of participation in group demonstrations	Number of farmers practicing processing	
	Processing timely	Delay processing
Monthly	20	1
Quarterly	10	6
Seasonally	28	18
Annually	24	6
Bi annually	6	7
Total	**88**	**38**

From Table 4.14, the findings revealed that, farmers who attended trainings monthly were found to be practicing what they had learned more than farmers who had attended quarterly or seasonally, or annually. This showed that the frequency at which farmers attended trainings had an effect on their practices and the more frequent farmers attend trainings, the more knowledge they acquired. To

determine an association between the frequency at which farmers attended group demonstrations and their knowledge, skills and practices in HQCF production, a hypothesis was formulated as; $\mathbf{H_{02}}$: There are no associations between the frequencies at which farmers participate in group demonstrations and their knowledge, skills and practices in HQCF production.

Table 4.15; Chi-square tests for association between frequency at which farmers attended group demonstrations on timely processing and their knowledge in timely processing (n=124)

Frequency	Observed N	Expected N	Residual	Test Statistics	Demonstration frequency
Weekly	8	20.7	-12.7	Chi-Square(a,b)	76.710
monthly	11	20.7	-9.7	df	5
quarterly	13	20.7	-7.7	Asymp. Sig.	.000
annually	25	20.7	4.3		
Seasonally	55	20.7	34.3		
Bi annually	12	20.7	-8.7		
Total	**124**				

Table 4.15 shows chi-square tests for association between frequencies at which farmers attended group demonstrations on timely processing and their knowledge in timely processing. The results showed that the table value of X^2 for 5 d.f.at 1% level of significance is 10.8. The computed value of X^2 is 76.7 which is more than the table value. This shows significant association between the two variables as

shown by p=.000 at 0.01 level of significance. We therefore reject the null hypothesis and conclude that there is an association between frequency at which farmers attended group demonstrations on timely processing and their knowledge and skills in timely processing of cassava for HQCF.

Table 4.16: Cross tabulation for relationship between frequency at which farmers attended field days and refusal of farmers HQCF due to quality of flour (n=126)

Frequency of field days	Farmers responses	
	Farmers without refusal	Farmers with refusal
Seasonal	27	7
Quarterly	26	19
Annually	14	8
Bi annually	5	10
Total	**82**	**44**

From Table 4.16, the findings indicated that farmers who attended field days seasonally had better quality HQCF than farmers who attended quarterly, annually and bi-annually. This was observed by some farmers experiencing refusal of their HQCF by buyers due to quality reasons such as. The number of farmers with poor quality flour kept on increasing with reduced frequency of field days.

4.3.2 Response of farmers on turn up for group trainings

Farmers were interviewed to get their comments on turn-ups of group members

for trainings on HQCF production practices. Out of the 126 farmers interviewed, 17.9% said only quarter of the total group members normally turn-up for trainings, while 65.1% agreed that half of the total group members always turn up for trainings, 25.4% said three quarters of the group members turn for trainings, 14% say all members turn for trainings while 0.8% could not provide their clear understanding of average attendance. The reasons given for poor attendance were; social issues such as funerals and weddings, demand for sitting allowances, weather challenges, distance, biased selection of participants by local leaders, poor mobilization and some illiterate farmers thought trainings were only for educated people and for information gap. When asked on what could be done to improve turn ups for group trainings, 41.9% of the respondents suggested good timing of the trainings, 38% proposed selection of farmers with interest in that enterprise, 22% suggested sensitization of the communities earlier before trainings start, avoid market days while 5.1% suggested training venues at group levels but not at sub-county headquarters. One (1) out of seven (7) service providers noted that when demonstrations were done in one farmers field, some farmers think it belongs to him and farmers who do not have good relationship with him would not turn-up for trainings. Another service provider said some farmers think what they were called for is something they already know so it was not important for them to go there. Others said they had been farming for many years and what new idea was there in trainings. Results are shown in Table 4.17.

Table 4.17: Farmers' opinions about attendance of trainings by group members (n=126)

Turn up	Percent
Quarter	17.9
Half	65.1
Three Quarters	25.4
All	14

4.4 Research question 3. What association exists between the group extension methods farmers were exposed to and their knowledge, skills and production practices for HQCF production?

To answer this research question, objective 3 that states, determine an association between group extension methods and farmers HQCF production practices such as timely planting, harvesting, and processing.

This objective was analyzed using cross tabulation to find out if any relationships existed between the number of group extension methods farmers were exposed to group demonstrations, field days or exchange visits and farmer's practices in HQCF production. Two categories of farmers existed where by some responded to be practicing and others responded not to be practicing what they had learned. According to Mehdi (2016) cross- tabulation also known as cross-tab or more formally contingency table is used to know the relationship between two or more variables when the variables are measured using nominal scale.

From the results of cross tabulations, out 68 respondents who received training in one method, only 4 were able to practice what they had learned representing 5.8%, while out of 40 respondents who had received training in two training methods, 8 were able to practice what they had learned giving 20%, for those who received training in three methods, out of 18 respondents, 12 were practicing what they had learned representing 66%. This means that, farmers who are exposed to many methods adopted more that farmers exposed to one or two group methods. Results are shown in Table 4.18.

Table 4.18: Cross-tabulation of farmers' exposure to one or more GEMs and knowledge in HQCF production practices (n=126)

Number of group methods	Able to practice	Un able to practice
One method	4	64
Two methods	8	32
Three methods	6	12
Total	**60**	**66**

4.4.1 Technologies practised by farmers as a result of exposure to group extension methods

The results from the analysis showed that technologies that did not require a lot of resources from farmers scored as follows: on selecting the right site for growing cassava to be processed as HQCF, 89.0% of the farmers were able to select the right site. On identification of the recommended cassava variety for HQCF 95.3% of the farmers were able to identify the recommended varieties. Through focus

group discussion, it was noted that some farmers still grew a local cassava variety called Bao for HQCF instead of Nase 14, Nase 19 and Narocas 1 as recommended by service providers. Concerning timely harvest of cassava for HQCF which should be between 9 to 12 months 82.9% had knowledge on this. In use of clean source of water for washing cassava, 90.7% of the farmers were using clean water for washing cassava before chipping. Concerning knowledge on processing cassava into HQCF within 24 hours after harvest was 68.2% of the farmers were able to practice this.

4.4.2 Conditions for farmers to put a technology into practice

Regarding the knowledge and practices of the farmers on HQCF production, the responses revealed that the extent to which a technology is used by the farmers related to its resource requirements such as tools, labour, financial requirements and time. It also depended on whether the technology had alternatives that farmers could use at lower cost such as use of saucepans instead of basins and as well as the ease of application of the technology as shown in table 4.19.

Table 4.19: Farmers' reports about technologies acquired through GEMs (n=126)

Production practice for HQCF	Able to Practice Percentage	Unable to practice Percentage
Site selection	89.9	9.3
recommended variety	95.3	4.7
Timely harvest	82.9	17.1
Stainless steel knife use	22.5	77.5
Use clean water	90.7	9.3
Process within 24 hours	68.2	31.8

4.5 Research question 4. What factors influence the use of group extension methods in the promotion of HQCF production?

In order to answer this research question, objective four which states; determine factors that affect the use of group extension methods in the promotion of HQCF production.

Descriptive statistics by use of frequencies was used to analyze other personal and socio-economic factors that affect HQCF production. The findings revealed that: 18 out of 22 farmers who complained of limited time for training by service providers experienced refusal of their HQCF, 16 out of 28 farmers who experienced high speed of delivery of training content from service providers had refusal of their HQCF, 25 out of 32 farmers who said there is no follow up by service providers had experienced refusal of their HQCF by buyers. Farmers were asked to identify key areas where they normally had quality challenges in the HQCF production chain. The responses revealed that 17.1% experience quality challenges at harvesting stage, 13.2% at cleaning stage, 17.8% at peeling, 84.5% at drying while 25.6% experience quality challenges at storage levels. The levels of quality at drying were attributed to weather, labor shortage, limited access to tarpaulins and drying racks results are shown in Table 4.20.

Table 4.20: Cross tabulation of training related factors and refusal of farmers HQCF by buyers (n=126)

Training related factors	Farmers who sold and those whose HQCF were refused by buyers	
	Experienced refusal case	Had no refusal case
Training poorly scheduled	5	2
Speed of content delivery high	16	12
Training hours reduced	18	4
Information gap	6	4
Lack of follow up after training	25	7
Limited materials for training	5	2
Long distance to training venue	5	6
Training not in local language	1	8
Total	**81**	**45**

4.5.1 Input related factors that affect HQCF production

Regarding the use of stainless steel knives for peeling cassava for HQCF only 22.5% used it. This is also because farmers said stainless steel knives were not sold in rural markets; farmers believed they were meant for kitchen work such as cutting meat, bread, cakes and fish. One farmer said they were brought up using local knives (Palalango) for harvesting. The disadvantage of local knives is that, they make tubers dirty during peeling which would in turn affect quality of HQCF as this type of knives easily rust. Fifty two point seven percent (52.7%) of the farmers had knowledge on this. Farmers added that they sometimes followed cracks on ground during dry season to get the tuber but others said they harvest in piece meal. Use of clean towels for mopping after washing was done by 51.9% of

the farmers. Use of new bags for packing dried HQCF and the use of timber pallets for packing bags in the store was at 54.3% farmers responded that due to cost of timber, they are being used only in group stores but in their homes they use logs instead of wooden pallets as these were examples of technologies that required more resources from the farmers and the extent of their application had been low as shown in Table 4.21.

Table.4.21: Input related factors that affect HQCF production (n=126)

Input	Farmer owns Percentage	Farmer does not own Percentage
Knives	21.7	78.3
Chipper	39.5	60.5
Pallets	34.9	65.1

4.5.2 Cross tabulation for relationship between farmers whose HQCF was accepted by buyer and number of years they have been in a group

Cross tabulations have shown a relationship between the numbers of years a farmer had been in a group and the extent of practicing HQCF production practices. Results have shown that out of 126 respondents, 22 had been in group for 1 to 2 years, 2 were practicing what they learnt from group trainings, 69 had been group members for 3 to 5 years and 20 were able to put into practice what they had learnt while 35 had been in group for over 5 years and 29 were practicing what they had learnt as shown in Table 4.22.

Table 4.22: Cross tabulation for relationship between farmers whose HQCF has been accepted by the buyer and their years of membership in a group (n=126)

	Years as group member			
Decisions of buyers	**1-2**	**3-5**	**Over five years**	**Total**
Experienced refusal	20	49	6	75
Never had refusal	2	20	29	51
Total	**22**	**69**	**35**	**126**

4.5.2 Socioeconomic factors that affect group trainings

A number of socio-economic factors were found to affect HQCF production in the area. The relationship between refusal of HQCF due to quality challenges by the buyers and the household head showed that 28% of male headed households compared to 23% female headed had their HQCF refused by the buyers. Age of the farmer also had an effect on the production of HQCF as it had been found that 32% of farmers with age between 15-30 years had experienced refusal of HQCF, 19% for farmers with age range between 31-45, 33% for farmers with age between 46-60, while 37% for farmers with age above 60 years. The number of household members involved in HQCF work also had an effect as 19.1% of the households with 1-3 members involved in HQCF production had experienced refusal, 33% for households with 4-6 members, 32% for households with 7-9 members while 20% for households with above 10 members involved in HQCF work. The education levels of the farmers had also been seen to contribute to quality challenges which were shown by refusal of HQCF by the buyers and this

had been more in lower and upper primaries than secondary and institutions. Results are shown in Table 4.23.

Table 4.23: Cross tabulation of refusal of HQCF and education levels of farmers (n=126)

Refusal of HQCF	lower primary	upper primary	secondary	institution
Experienced refusal	15	47	14	2
Never had refusal	6	15	18	9
Total	**21**	**62**	**32**	**11**

To determine an association between the farmers' education levels and their knowledge, skills and practices in HQCF production, a hypothesis was formulated as $\mathbf{H_{03}}$: There are no associations between the factors of education and their knowledge, skills and practices in HQCF production.

Table 4.24 shows chi-square tests for association between farmer's education levels and the quality of their HQCF as determined by the decision of the buyer by either accepting or refusing the farmers HQCF depending on the quality. The results shows that the table value of X^2 for 1.d.f.at 1% level of significance is 10.8.The computed value of X^2 is 28.5 which is greater than the table value which showed a significant association between the two variables as shown by p=.000 at 0.01 level of significance. We therefore reject the null hypothesis and conclude that there is an association between the farmer's education levels and their knowledge and skills in processing of cassava for HQCF.

had been more in lower and upper primaries than secondary and institutions. Results are shown in Table 4.23.

Table 4.23: Cross tabulation of refusal of HQCF and education levels of farmers (n=126)

Refusal of HQCF	lower primary	upper primary	secondary	institution
Experienced refusal	15	47	14	2
Never had refusal	6	15	18	9
Total	**21**	**62**	**32**	**11**

To determine an association between the farmers' education levels and their knowledge, skills and practices in HQCF production, a hypothesis was formulated as $\mathbf{H_{03}}$: There are no associations between the factors of education and their knowledge, skills and practices in HQCF production.

Table 4.24 shows chi-square tests for association between farmer's education levels and the quality of their HQCF as determined by the decision of the buyer by either accepting or refusing the farmers HQCF depending on the quality. The results shows that the table value of X^2 for 1.d.f.at 1% level of significance is 10.8.The computed value of X^2 is 28.5 which is greater than the table value which showed a significant association between the two variables as shown by p=.000 at 0.01 level of significance. We therefore reject the null hypothesis and conclude that there is an association between the farmer's education levels and their knowledge and skills in processing of cassava for HQCF.

Table.4.24: Chi-square test for association between farmer's education levels and their knowledge and skills in fixing the recommended quality of HQCF

Response of farmers	Observed N	Expected N	Residual	Test-statistic	Buyers decision
Farmers with bad quality	33	63.0	-30.0	Chi-Square (a,b)	28.571
Farmers with good quality	93	63.0	30.0	df	1
				Asymp Sig.	.000
Total	**126**				

4.5.3 Input factors that negatively affect the marketability of HQCF

The production of HQCF is affected by a number of resource factors at household levels. Smallholder farmers experience challenges with inputs for HQCF production, 21.1% of the farmers have access to stainless steel knives that were recommended for peeling of cassava for HQCF as they do not rust to affect colour of cassava. Farmers gave additional comments of stainless steel knives as follows: they were not sold in rural areas, they are expensive, they cannot peel big tubers, and farmers say stainless steel knives were meant for cutting meat, fish, cakes and bread. Out of the 126 farmers, 82% indicated that drying materials such as tarpaulins were a challenge and 60% said chipping machines that were used at group levels were not enough. Clean source of water was also a challenge with some farmers moving over half kilometer to get clean water, 56% said wooden pallets and clean ventilated stores were also difficult to get at household levels but can only be found at group level. Results for input factors in Table 4.25.

Table 4.25: Input factors that negatively affect the marketability of HQCF (n=126)

Input	Farmer has access to Percentage	Farmer has no access to Percentage
Stainless steel knife	21.7	78.3
Having labor challenges	79.4	20.6
Having 3 basins	78.3	21.7
Easy access to machines	39.5	60.5
Using wooden pallets	34.9	65.1
Access to credit	79.8	20.2

4.5.4 Gender issues affecting farmers and service providers in HQCF production in Apac District

In understanding the participation of men and women in the different stages of HQCF production, the responses from 126 farmers showed that 54% of the respondents each agreed that women participated more actively in activities such as peeling, washing and transporting cassava home during harvest. Forty seven point two (47.2%) said women take it as their usual work. About 59.7% of the respondents mentioned that men were commonly involved in activities such as chipping, harvesting, land preparation, marketing and storage as these activities require a lot of energy and little time. Men were also found to be interested in marketing of HQCF as they want to control the money.

CHAPTER FIVE

DISCUSSION OF RESULTS

Introduction

The choice of an extension method is an important factor in ensuring the success of extension programmes. During the study, it was noted that: group extension methods have been used by a number of development partners such as governments and non-governmental organizations. This is due to the advantages of group extension methods such as multiplier effects, ability to reach large number of farmers in short time and setting challenging environment for its members among others have made them popular in dissemination of agricultural information (Madukwe, 2006).

5.1 Characterize group extension methods to show their effectiveness in promoting HQCF production among smallholder farmers in Apac District

Results showed that, a high proportion of the respondents preferred group demonstrations for trainings this means that farmers acquired more knowledge from group demonstrations. This is in line with findings by Adijah *et al.* (2011), who found that extension staffs were also asked to indicate the order of preference of three extension methods that they considered to be most cost effective. Group demonstration was chosen by a relatively high percentage (29.3%) of extension staff as the first choice extension method that was cost effective. This could be because in group demonstrations, farmers are taught in groups hence the same demonstration materials are used as could have been used for an individual client. In addition, a client is taught skills in full, for example the group may be taught

practically on all steps in maize planting among others; hence adoption rates may be high. The group demonstration also has the advantage of multiplier effect (whereby if one client is convinced about an innovation he/she may convince the others to adopt). Relatively high percentage of extension staff (26.1%) chose field days as the second choice extension method that was most cost effective while 16.3% chose exchange visits as the third choice extension methods which were most cost effective. However, this study found that 64% of the respondents had participated in group demonstrations for HQCF, 60% were exposed in exchange visits to their counter parts in other districts and 73% participated in field days to share experiences on the success and failures in HQCF production. Further still other methods apart from demonstrations did not leave a reminding effect for the practices communicated, this comes out of the fact that farmers had found that when they see their demonstration sites, it reminds them of the practices that they had learned.

5.2 Assess what smallholder farmers, targeted for HQCF, have learned from training where group methods have been used.

Farmer's satisfaction with an extension method is an indication that, the extension method has fulfilled his/her expectations. However this varies from one farmer to another depending on personal and socio-economic characteristics of the farmer. External factors such as expected economic gain, relevance of extension package, communication skills of the extension staff, perceived knowledge gain and how frequent the extension staff interfaces with farmers can also be a satisfaction factor with an extension method. In this study, farmers perceived extension

method that gave them more knowledge, quantity of HQCF resulting from group trainings and incomes from HQCF are some of the satisfaction factors.

The findings from this study revealed that farmers were more satisfied with methods that had the following characteristics; easy to understand, less reading and writing, having compensation effect, reminding effect and generally perceived knowledge acquired from the method. This means, farmers can understand easily when the training in more practical that trainings that involve pamphlets and handouts as noted that, to learn the necessary knowledge and skills, new farmers have come to depend on a range of formal and informal training programs run primarily by nonprofit organizations (Niewolny & Lillard, 2010). While these types of farmer training programs can yield valuable learning experiences, research has demonstrated that they tend to be limited in educational scope and quite costly (Calo, 2017; Laforge & McLachlan, 2018).

The results showed that, although the number of farmers who had received trainings through field days was higher than other group extension methods, farmers reported more learning from group demonstrations than other methods this therefore means that field days have not been effective in making farmers learn compared to group demonstrations. Similar results were reported by Anderson (2007) who concluded that as per latest reports, the effects of oral presentation retention were 10%, visual was 35% and visual with oral was 65%. Similarly there is an old proverb which states that "people may doubt what you say, but they will believe what you do. Khan (2003) also stated that the demonstration method was the priority of all the agriculture officers in Punjab.

Demonstration method is one of the most important group techniques used for extension purposes. The purpose of using demonstration method is to prove that the new practice is superior to the one being used currently, to convince and motivate extension clientele to try a new practice, and to set up long-term teaching-learning situation (Khan *et al.,* 2009). Field days can range from structured presentations about the practices and impacts of those practices to more informal events where participants walk though field plots or view implements at their own pace (Lion Berger & Gwin, 1991). Respondents noted that during field days, farmers combine ideas and see the results of their knowledge.

Concerning use of more than one group extension method to improve knowledge acquisition, a slightly higher percentage of the respondents accepted that it increases knowledge acquisition. This is because in some methods such as workshops and seminars, farmers can mainly hear only without practicing but combination of different methods exposes them to hearing, seeing and doing. This information is in line with the findings by Hazem (2014) in which he concluded that farmers exposed to all methods have significantly higher scores than farmers exposed singly to demonstration, meetings and pamphlet in knowledge gain.

The farmers (62%) preferred demonstrations as their best for receiving new information on innovations. This was also found true from service providers and in focus group discussions. On farm demonstrations, tours and field trips over the mass media methods such as Computer-assisted instruction and home study methods were at opposite ends of the preference scale (Lou *et al*., 1889). The importance of demonstrations and field days in promoting new innovations had

also been realized by other authors who cite that, extension methods such as demonstration of seed multiplication programme and field days were some of the major weapons for introducing the findings of modern research in agricultural practices to increase agricultural production in particular and uplift the rural masses in general (Afzal, 1995).

5.3 Determine an association between group extension methods and farmers HQCF production practices such as timely planting, harvesting, processing.

There are number of factors that influence the extent of adoption of technology such as characteristics or attributes of technology, the adopters or clientele which is the object of change, the change agent (extension worker or professional), the socio-economic, biological, and physical environment in which the technology takes place (Cruz 1987).

Farmers have been seen as major constraint in development process (Cruz 1987). They are innovators or laggards. Socio-psychological trait of farmers is important. The age, education attainment, income, family size, tenure status, credit use, value system, and beliefs were positively related to adoption. The personal characteristics of extension worker such as credibility, good relationship with farmers, intelligence, emphatic ability, and sincerity, resourcefulness, ability to communicate with farmers, persuasiveness, and development orientation were found important in adoption. The biophysical environment influences the adoption. From the perspective of the researcher, the exposure of farmers to various group extension methods was intended to help farmers achieve improved productivity, better quality product, better application of inputs, and improved

knowledge in production practices, increased incomes and positive attitudes towards group extension methods in promoting HQCF production.

In finding the relationships between the GEMs that farmers were exposed to and their HQCF production practices, the study found that, farmers who were exposed to only one group extension method scored less in practicing what they had learned than farmers who were exposed to at least two or more GEMs. The study further found that only technologies that required less input from farmers were easily adopted through GEM trainings than technologies that demanded a lot of resources from farmers such as cassava chipping machines. On cost of inputs, it was found out that technologies with alternative inputs such as use of basins instead of saucepans were adopted by farmers.

5.4 Determine the factors that influence promotion of HQCF production in Apac District

The factors that affect promotion of HQCF production have been grouped into farmer's personal characteristics, socio-economic factors and service provider related factors. The education level of the farmers had been found to affect farmer's adoption of practices as refusal of farmers HQCF by buyers was linked with poor quality resulting from limited knowledge in production practices. The observation here was that, farmers with education levels up to secondary and institutions experienced less refusal of their HQCF by buyers meaning they had better knowledge than primary levels. This finding has been supported by (Asadullah & Rahman, 2005) who stated that in a research conducted on 141 villages consisting of rice farmers within Bangladesh, it was found out that

schooling has positive effects on agriculture due to the skills of literacy and numeracy that give the farmers better understanding of agricultural issues.

The service providers also contributed to a greater extent in reducing HQCF production in the following ways; they allocated limited time for trainings, low frequency of trainings, lack of follow up of farmers after trainings, some had inadequate training materials, long distance to training venue and training in foreign languages. These findings were in line with Okwu and Ejembi (2005) who stated that, an inadequate number of agricultural training/extension officers, therefore, may hinder the number of training packages the trainers could deliver per time as well as the quality of time spent with the farmers during the training sessions. The studies also found the percentage of males were higher than females. This appears to be consistent with the percentages reported by Uganda Cooperative Alliance (UCA) 2008/9, in which it was estimated that out of 19.3 million persons living in agricultural households, 50.5% were males and 49.5% were females. Most of the household members were aged between 31-45 years and the lowest percentage was aged above 60.

The number of household members who were married is higher than divorced and widowed as women and men in Apac District still looked at marriage as security to succeed in life. The highest number of the respondents stopped in upper primary. Ali (1972) concluded that education was found to play a vital role in the adoption of improved agricultural practices. He further suggested that the higher the education level, the more would be the adoption of improved practices.

The study revealed that over 54% of the respondents confirm active women participation than men in all stages of production. This is because of the traditional beliefs that women do most farm work and men mostly stop at land opening which is consistent with the findings that women were responsible for the majority of the cassava processing, transportation, and harvesting tasks, while men were often associated with the heavier farming tasks. This statement is in line with Mmasa (2013) who noted that the agriculture sector is regarded as female-intensive, meaning that women comprise a majority of the labour force in agriculture (54%). Women's role in cassava processing is highly labor-intensive and is largely non-mechanized (IFAD 2005). However, men's involvement increases as processing becomes more mechanized and commercialized, as was noted by Martin, Forsythe and Butterworth (2008). Frequency of group trainings were also found to have an effect on farmers knowledge of HQCF production practices which was manifested by poor quality products resulting into refusal of farmers HQCF by buyers. The years a farmer had been in farming had an effect on his practices as old farmers practiced what they had learned better than young farmers. Older farmers are more satisfied with services provided by extension than younger farmers which may be related to their farm experience (Lavis and Blackburn 1990; Terry and Israel 2004).

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of findings

Farmers identified specific characteristics with the group extension methods to which they were exposed. In their findings, field days build experience of farmers, makes farmers feel challenged by their counter parts creating pressure to learn on them. They also found out that demonstrations involve no reading and writing, demonstrations were not boring, easy to understand and demonstrations kept on reminding farmers of what they had learned.

The farmers and the extension service providers had found that combination of group methods increases knowledge acquisition in a particular technology and cited combination of group demonstrations with field days as the best combinations for learning. The advantages that farmers and service providers identified out of combination of methods included; compensates what a farmer never learned well from other methods and improves understanding. Extension service providers also found that change of training environment can stimulate more learning among the farmers than training always in one place. The service providers noted that in field days farmers learned more as they said some farmers learn more when exposed in a new environment.

Smallholder farmers had observed challenges on the side of the extension service providers during group demonstrations as mainly large group size during demonstrations, incomplete demonstrations and speed of conducting

demonstrations that affect learning. Smallholder farmers in Apac District had received trainings in HQCF production through group extension methods from extension service providers. Regarding all the trainings using the various group extension methods, farmers preferred group demonstrations as the best method for training.

The farmers were more satisfied with group demonstrations than other group extension methods as their satisfaction is based on the group extension method that gave them more knowledge. Other advantages of demonstrations were ease of understanding, less boredom, no reading and writing. According to the findings of the study, half of the farmers most times turned for the trainings organized by the service providers and farmers proposed that demonstrations need to be organized seasonally. The study found that the group extension methods were effective in creating awareness among the farmers on existence of extension services on HQCF production practices. However, most farmers did not belong to groups. These trainings only gave opportunity to group members to be aware of such services.

Group extension methods used by service providers in promoting HQCF production were also found to be effective in helping farmers acquire skills in practices such as site selection for HQCF production, knowledge in recommended varieties for HQCF, timely harvest, use of clean water and three clean basins for washing cassava. The study also found that the group extension methods have not been effective in providing farmers with skills in timely processing of cassava into HQCF within 24 hours, cleaning of tarpaulins before drying HQCF and

maintaining the chipping machine clean. On the side of income, it was found that the group extension methods have been effective in providing opportunity for farmers to increase their incomes through promoting HQCF as a kilogram of HQCF ranged between 1200 to 1500 depending on quality, compared to traditional cassava flour that sold between 500 to 800 Ugandan shillings depending on season, but farmers cannot utilize this opportunity because of limited knowledge on HQCF production practices.

The group extension method had been effective in creating awareness on the importance of inputs used in HQCF production such as chipping machines, tarpaulins, stainless steel knives and clean packing bags but farmers are constrained by lack of funds to acquire them. Extension service providers had trained farmers on the recommended practices for HQCF production but the findings from the study showed that only technologies that did not require a lot of resources from farmers were easy to apply and those with alternatives were also adopted while technologies with a lot of resource requirements from farmers and time consuming were not adopted by the farmers.

The number of methods that farmers were exposed to had both negative and positive impacts on farmer's practices in the sense that, farmers exposed to many methods had better practices than farmer who were exposed to one method. The years that a farmer had spent in a farmer group was found to have an effect on the farmer's practices as observed. Farmers who spent over five years in a group were practicing more than farmers who had spent one or two years in a group.

Framers and the extension service providers found that quality of cassava is mainly compromised at peeling and drying stage. This was found to be mainly caused by inadequate inputs for farmers.

The study also found that although farmers receive equal trainings, quality varied from one farmer to another and education levels and access to production resources on the side of the farmers also affected implementation of the recommendations in the sense that farmers who had studied in institutions and secondary schools had better practices and access to resources than farmers who stopped in primary. Farmers identified bias selection of group members as one of the key reasons for low turn ups during group trainings and found that farmers of different interests are brought in groups as a result turn ups are low. Farmers and the extension service providers concluded on the best training intervals for group demonstrations to be seasonally and twice a season for field days.

The study also found that demonstrations and field days are extension methods to train farmers in practices such as identification of recommended cassava varieties, use of clean water in processing HQCF and timely processing of cassava within 24 hours after harvest. The study further found that the frequency and number of extension methods had an effect on knowledge acquisition of farmers in the recommended practices as farmers who attended trainings more frequently were practicing recommendations better that farmers who attended at low frequencies.

Results from cross tabulations show that there is a relationship between the frequency at which farmers attended trainings and their knowledge, skills and

practices in HQCF production. The relationship showed that farmers who attended trainings monthly and seasonally had better knowledge than farmers who attended annually and bi-annually.

Chi-square test showed a significant association between farmer's education levels and their knowledge, skills and practices in HQCF production. Farmers who stopped in primary and secondary experienced refusal cases by buyers due to poor quality than farmers who studied up to institutions.

6.2 Conclusions

i). Group extension methods used by service providers in promoting HQCF production have been found to be effective in helping farmers acquire skills in HQCF production practices which is indicated by number of farmers with knowledge in the following practices namely site selection for HQCF production, knowledge in recommended varieties for HQCF, timely harvest and use of clean water.

ii). The study also found that the group extension methods have not been effective in providing farmers with skills in timely processing of cassava into HQCF within 24 hours and other post-harvest handling techniques.

iii). On the side of income, it was found that the group extension methods have been effective in providing opportunity for farmers to increase their incomes through promoting HQCF as a kilogram of HQCF ranged between 1200 to 1500 depending on quality, compared to traditional cassava flour that sold between 500

to 800 Ugandan shillings depending on season, but farmers cannot utilize this opportunity because of limited knowledge on HQCF production practices.

iv). Combination of group extension methods such as demonstrations, field days and exchange visits improves farmers' knowledge in HQCF production practices. Some of the reasons given were; ease of learning, compensation effect where by what farmers did not understand well in one method could be understood better in the second method or so.

v). Group demonstrations for processing HQCF were characterized by demonstrations starting late and stopping at chipping stage but leaving out drying and storage as the extension service provider is always caught out by time and hurried to go back to town. Group sizes had always been large making learning difficult as over 20 farmers could crowd around one chipping machine with limited demonstration materials.

vi). Although farmers reported to have acquired knowledge in practices such as; site selection, variety identification, use of 3 basins and clean water for washing cassava, these areas contributed less to quantity of HQCF as knowledge in the core areas have remained low such as in processing and drying, resulting in low production of HQCF.

vii). Farmers who receive trainings in more than one extension method have more knowledge than those farmers who receive trainings in one method. This is good observation but which cannot easily be put into practice unless resource challenges are addressed. Other factors such as education levels of farmers, the

years a farmer had been in a group and low frequency of trainings also influened learning from group extension methods.

viii). Some of the causes of low frequency of trainings were the fewer extension staff to farmers, resource constraints that affected extension staff, poor planning on the side of extension staff and management problems of the extension organization. Unless these challenges are addressed, the adoption rates for HQCF production practices will remain low.

ix). Access to improved inputs was observed as a major challenge. Unless farmers are exposed to credit opportunities with their proper use, these challenges will persist and production levels will always be affected negatively.

x). In communities with variations in socioeconomic status of the farmers, it is only possible to eliminate biasness in group formation if the integrity of the local leaders is first built in good governance. The challenge of forming groups comprising relatives, friends and well to do farmers in groups had been a common practice which brought in farmers whose interests were not common hence affecting participation in group activities.

Group demonstrations were considered to have provided more knowledge to the farmers according to the findings. Farmers and service providers noticed that farmers remained active during group demonstrations and demonstrations remained to communicate practices to farmers.

The education levels of farmers has been found to have an effect on farmers rate of adoption of knowledge, skills and practices in HQCF production and the frequency at which farmers attend trainings from group extension methods also affects knowledge acquisition as monthly trainings improve learning better that annual and bi-annual trainings.

6.3 Recommendations

6.3.1 Extension agents

i) Trainers need to break large groups into smaller numbers of up to 6 members to avoid congestion during cassava chipping demonstrations. Demonstrations for HQCF processing should go for 3 days so as to make farmers learn all the stages of processing and facilitators should reduce the speed of demonstration.

ii) Trainers need to create good learning situation as poor environment may contribute to poor learning by farmers. Farmers complained of some of the trainings organized by service providers were done in a wrong environment and speed of trainings was too high for farmers to understand.

6.3.2 Policy makers

i). Policy makers should plan competency assessment for service providers before recruitment or organize capacity building for service providers seasonally. This would help them grasp knowledge in the different group

extension methods which they would employ as alternatives to train farmers.

ii). Policy makers need to allocate adequate resources for extension services so as to employ more extension staff to give more extension workers to farmers, an arrangement which would increase frequency of interaction of extension staff with farmers and extension staff could employ many methods to train farmers.

6.3.3 Farmer group leaders

i). Facilitators to work with farmer group leaders to use participatory methods to engage farmers in extension trainings and in identifying the real needs of the farmers so as to direct resources for addressing the actual needs of the farmers.

ii). Farmer group leaders to lead exemplary lives that other farmers can follow, which meant that he or she should be the first to try the technology before other farmers follow and always involve farmers with similar interest in groups so as to enhance uniform participation.

6.3.4 Further research

Further research in attributes related to group demonstrations such as they leave a reminding effect for the farmer, they have compensation effect, no reading and writing, a farmer sees the result of the knowledge that contributed to learning needs of cassava farmers.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER FROM HEAD OF DEPARTMENT AGRICULTURE KYAMBOGO UNIVERSITY TO THE CHIEF ADMINISTRATIVE OFFICER APAC DISTRICT LOCAL GOVERNMENT

KYAMBOGO UNIVERSITY

P.O. BOX 1 KYAMBOGO, KAMPALA-UGANDA
Tel: 041 - 286237/8/285001 Fax: 041 – 220464
Email: agriculture@kyu.ac.ug

FACULTY OF VOCATIONAL STUDIES
DEPARTMENT OF AGRICULTURE

6th October, 2016

Permission granted. Please liaise with the DPO for further guidance.
13/10/16

The Chief Administrative Officer
Apac District Local Government

Dear Sir,

Ref: GOBO DENIS

This is to introduce to you the above referenced person, who is a graduate student in Department of Agriculture enrolled for ***Masters of Science in Agricultural Education and Extension*** programme of Kyambogo University. As a requirement for the fulfillment for the award of master's degree, a student is expected to conduct research on a specific area of interest. His research area is title ***"Effectiveness of Group Extension Methods in Promoting High Quality Cassava Flour Production"***.

The Student will interact with farmers and farmers' groups in your District especially the sub-counties of: Cegere, Cawente, Aduku, Amilo, Akokoro and Apac Town council. I therefore request for your permission and guidance to enable the student interact with these farmers.

The student is given no special funding for this activity, therefore your patriotic consideration while offering this support will be highly appreciated.

Sincerely yours,

KYAMBOGO UNIVERSITY
06 OCT 2016
HEAD
AGRICULTURE DEPARTMENT

Dr Mulebeke Robert
HEAD OF DEPARTMENT

APPENDIX III: QUESTIONNAIRE FOR CASSAVA FARMERS

EFFECTIVENESS OF GROUP EXTENSION METHODS IN PROMOTING HIGH QUALITY CASSAVA FLOUR PRODUCTION AMONG SMALLHOLDER FARMERS IN APAC DISTRICT

Background

High Quality Cassava Flour production had been promoted in Apac District for the last three years with the aim of increasing farmers' income and raw material substitute for industries. This study is being conducted to establish the extent to which group extension methods have contributed to production of HQCF. You have been identified as a suitable respondent among the beneficiaries who received training in groups to respond in this study, your participation and commitment of your time is highly appreciated. The findings of this study will be confidential and used for research purpose only.

Basic information

Date of interview	A1	District
Interviewed by	A2	Sub-county
Checked by	A3	Parish
Date checked	A4	Village/Lc1
Data entered by		
Date entered		
Household ID		

Ask the respondent if he/she had been involved in HQCF production in the last two years (2014 and 2015), if no, terminate the interview.

1.0 SECTION A: SOCIO ECONOMIC AND DEMOGRAPHIC INFORMATION

1.1	Name of respondent		contact	
1.2	Sex of respondent	1-male 2-female		
1.3	Relation to HH head		1.Spouse ( ) 2.son/daughter ( ) 3.pwerent ( ) 4 in-law ( ) 5.sibling ( ) 6.HH head ( ) 7.Others (specify)	
1.4	What is the sex of HH head		1. Male ( ) 2. Female ( )	
1.5	Age (in complete years)		1-(15-30)( ) 2-(31-45)( ) 3-(46-60)( ) 4-(60-above)( )	
1.6	Marital status (see code)			

1.8	Educational level attained (Circle	A (Lower primary) 1 2 3 4 B (Upper primary) 5 6 7 C (Secondary) 1 2 3 4 5 6 D (Institution) 1 2 3 E University 1 2 3 4 5 E Others.....
1.10	Household size(see codes below)	Very small ( ) Small ( ) Medium ( ) Large ( )
1.11	Household size by gender	No of males ( ) No of females ( )
1.12	Household size by age category	1-Below 14 ( ) 2.Between 16 and 64 ( ) 3.From 64 & above ( )
1.13	Number of HH members involved in HQCF work	(1-3) ( ) (4-6) ( ) (7-9) ( ) (above 10) ( )
1.14	HH occupation other than farming (see code)	A (Business) B (Office work) C (casual) D (Others)
1.15	How far is your home from nearest trading center	( )km/m
1.16	How far is your home from nearest tarmac road	( )km
1.17	Were you a member of any farmer group	Yes ( ) 2. No ( )
1.18	How long have you been a member of a farmer group (Tick where appropriate)	1-2 year ( ) .3-5years ( ) Over five years ( )
1.19	What activities does your group do? Cassava production ( ). Saving and credit ( ) Cassava processing ( ) Bulking ( ) Milling ( ) Marketing ( ) 5. Processing 6. Training 7. others(specify)	
1.20	What is your farming experience in years	

Marital Status Codes (1 = single, 2 = Married, 3 = Separated/Divorced, 4 = Widowed, 5 = other) Occupation codes (1 = none, 2 = Salaried Employment, 3 = off farm work, 4 = Housekeeping, 5 = others (specify)
Household size Codes (1 = very small, 3= small, 6 = medium, 4 = 10 = large.

2.0 Group extension methods for promoting HQCF production

2.1	Have you ever received any training on HQCF?	Yes ( ) 2. No ( )
2.2	What was the training about?	1. Cassava agronomy 2.Variety selection 3.Harvesting for HQCF 4.processing 5.storage.
2.3	What method of training was	1.Demonstration; Result ( ) or Method ( )

	it	2.Seminar ( ) 3.Exchange visits ( ) 4.Field days ( ) 5 Workshops ( )
2.4	Have you being able to practice what you learnt from the training?	1Yes ( ) 2.No( )
2.5	Do you think using many training methods is useful?	1-Yes ( ) 2. No ( )
2.6	If yes, what is the importance of many methods?	1. Ease of understanding ( ) 2. Convenience ( ) 3. Compensation effect ( )
2.7	In which stage of HQCF production did use of many methods help you	1 Harvesting 2 Washing 3 Peeling 4 Chipping 5 Drying 6 storage

2.8 Which of the methods do you think can be combined for better learning and why.....

3.0 Farmers learning satisfaction about group extension methods

3.1 Tick the group extension method that had helped you acquire more knowledge in the following stages in HQCF production

S/NO	Recommended practice	Demonstrations	W/shops	Field ways	Exchange visits
1	Identification of required variety				
2	Proper land preparation				
3	Age of cuttings for planting				
4	Spacing for cassava				
5	Timely weeding				
6	Weeding interval				
7	Pest and disease control				
8	Harvest				
9	Peeling methods				
10	Cleaning methods				
11	Chipping				
12	Drying methods				
13	Storage techniques				
14	Milling				
15	Packaging				

3.2 Which of the following extension methods would you prefer tick where applicable1.Demonstration ( ) 2.Seminars ( ) 3.Field days ( ) 4 Exchange visits ( )

3.3 Can you provide explanation for your answer?

.....

3.4 Did you notice any problems with the way the trainings were conducted?

.....

3.5 If yes, how can we address the above problems to improve the trainings?

.....

What problems did you see with the way seminar, field day or exchange visit was conducted?.....

What did you think should have been done to make members learn more from the training methods above?

.....

Which stage in HQCF production is more interesting to you during trainings and why?.....

3.9 Do you think men and women participate equally in above stages of HQCF 1-Yes ( ) 2-No ( )

3.10 If no in which stage do you see women participate more during trainings?

.....

3.11 Why do you think this is so

.....

3.12 If no in which stage do you see men participate more during trainings?

.....

3.13 Why do you think this is so.....

3.6 What percentage of group members do see you normally attend these training: 1-25% a quarter of members ( ) 2- 50% half of members ( ) 75% three quarters of members ( ) and 100% all members ( ).

3.7 What other factors in your area here do you think limit people from attending trainings?.....

3.8 In any training with low turn up, how would you advise the facilitator in case he wants to have a good attendance in the next training?

.....

3.12 How often do you participate in demonstrations?

A-weekly ☐ B Monthly ☐ C Quarterly ☐ D Annually ☐ Seasonal ☐ Bi-annual ☐

3.13 How often do you participate in seminars?

A-weekly ☐ B- Monthly ☐ D-Annually ☐ E-Quarterly ☐ Seasonal ☐ Bi-annual ☐

3.14 How often do you organize field days?

A-Weekly ☐ B-Monthly ☐ C-Seasonal ☐ D-Quarterly ☐ E-Annually ☐ F-Bi-annual ☐

3.15 How often do you go for exchange visits?

A Weekly ☐ B Monthly ☐ C Seasonal ☐ D-Quarterly ☐ E- Annually ☐ Bi-annual ☐

3.16 What according to you is the best time and frequency for demonstrations

.....

3.17 What according to you is the best time and frequency for Field days

.....

3.18 What according to you is the best time and frequency for Workshops

.....

3.19 What according to you is the best time and frequency for Seminars

.....

3.20 What according to you is the best time and frequency for Exchange visits

.....

3.21 Can you provide explanations for the above

.....

4.0 **Practices in production of HQCF**

S/NO	Is the farmer practicing the following in stages of HQCF production	Response	
		Yes	No
1.1	Site selection(No spear grass, muddy, swampy)		
1.2	Planting recommended variety(Nase 14)		
1.3	Harvesting between 12-18 months		
1.5	Uproot using hands after reducing soil on tubers		
2.1	Use stainless steel knives		
2,2	Hold in middle and use round peeling from tip(let him/her demonstrate peeling to you)		
3.1	Cleaning machine after chipping		
4.1	Use of clean water(confirm source of water)		
4.2	Use of 3 basins (confirm the basins)		
4.3	Use of towels after washing		
5.1	Use of black tarpaulin		
5.2	Drying on cemented floor or on grass		
5.3	Cleaning of tarpaulin before drying		
5.4	Spreading immediately after chipping		
5.5	Disturbing frequently after spreading		
5.7	Process within 24 hours		
5.8	Avoid contamination by animals		
6.1	Using new bags for packing		
6.2	Using well ventilated store		
6.3	Cool before storing in a bag		
6.4	Leak proof store		
6.5	Use timber pallets in store		
6.6	Transports in rain protected vehicle		
6.7	Using milling machine which is clean		

4.1 Did you grow improved cassava varieties for HQCF in 2015? 1. Yes ( ) 2. No ( )

4.2 What is your average land opening for cassava ( ) hectares

4.3 How do you normally measure your dried HQCF: 1-Basins ( ) 2-Bags ( ) 3-Kilograms ( )

4.4 How many kilograms of dry HQCF did you produce in 2015? ( ) kg

4.5 How many kilograms do you normally get from one bag? ( ) kg

4.6 How many kilograms do you normally get from one basin? ( ) kg
4.7 What quantity did you sell in 2015? ( ) KG.
4.8 What was the farm price of HQCF per KG? (SHS).....
4.9 Was the above price per KG the ruling market Price? 1. Yes ( ) 2. No ( )
4.10 If No, why you sold at your own rate?
.....
4.11Had the buyer ever refused your HQCF due to poor quality 1.Yes ( )
2. No ( )
4.12 At which stage do you experience quality challenges tick where appropriate?
1. Harvesting ( ) 2. Cleaning ( ) 3. Peeling ( ) 4. Drying ( ) 5. Storage ( )
4.13 Did you hire labor for HQCF production in 2016? Yes ( ) 2. No ( )

5.0 Factors affecting HQCF production

Does the farmer have the following assets for HQCF production

S/NO	Quality Parameter	Assets	Response		Comment
			Yes	No	
1	Peeling	Stainless steel knife			
2	Harvest size to be processed in a day	Labour			
3	Washing	3 basins			
4	Use of clean water	Clean water source			
5	Drying	4 tarpaulins			
6	Use of black tarpaulin	Black Tarpaulins			
7	Knowledge on drying environment	Cemented / grass ground for drying			
8	Process within 24 hours	Chipper			
9	Storage	Clean store			
10	Ventilation of store	Ventilated store			
11	Cool before storing	Knowledge			
12	Leak proof	Leak proof store			
13	Use pallets in store	Pallets for packing			

5.2 Do you think having access to financial support will increase your HQCF production? 1. Yes ( ) 2. No ( )
5.3 If yes, have you ever received any financial support: 1-Yes ( ) 2-No ( )
5.4 If yes, from which source (1 = Bank, 2 = MDI, 3 = SACCO, 4 = ROSCA, 65= Friends, 6= others)
5.5 Was the support adequate to achieve what you wanted.1-Yes ( ) 2-No ( )
5.6 How do you see absence of credit facilities affecting you
.....
5.7 What is your comment on the cost of producing HQCF.....
5.8 How do you compare your income from HQCF with other cassava products that you have been producing before.....
5.9 In case producing HQCF is expensive, what according to you makes it expensive.....

APPENDIX IV: QUIDE FOR FOCUS GROUP DISCUSSIONS

EFFECTIVENESS OF GROUP EXTENSION METHODS IN

PROMOTING HIGH QUALITY CASSAVA FLOUR PRODUCTION

AMONG SMALLHOLDER FARMERS

IN APAC DISTRICT

Region		**District**		**Sub county**
Parish		Village		
Date of interview dd/mm/yy				
Group composition		Total……..	Men……	Women……
Note recorder				Tel contact……..

1.0 Number of extension methods used in trainings attended

1.1 Had this group ever received any training on HQCF?
1.2 Was it a seminar, demonstration, workshop, field day or an exchange visit?

(Record number of members who have attended each training method)

1.3 On which stage of HQCF production was it i.e. production, processing, storage, milling and marketing(record percentage attendance per stage among members)
1.4 Which stage in HQCF production would members feel that it needs a combination of group extension methods and why(find group extension methods that farmers feel can be combined and for which stage in HQCF production)

2.0 Farmers' learning satisfaction about group extension methods

2.1 Can the group members compare the level of knowledge they obtain from: Demonstrations, seminars, workshops, field days and exchange visits.
2.2 According to this group which extension method suits well for learning the following stages in HQCF production; variety identification, site selection, harvesting, cleaning peeling, chipping, drying, packaging, milling and marketing.
2.3 At which stage does members spoil quality(record number of members for each response)
2.4 What problems did you see with the way demonstration, seminar, field day or exchange visit was conducted?

2.5 What did you think should have been done to make members learn more during the training?
2.6 In any training with low turn up, how would you advise the facilitator in case he wants to have a good attendance in the next training?
2.7 What other factors in your area here do you think limits people from attending trainings?
2.8 How many times do members attend seminars in a week, month and year?
2.9 How many times do members attend workshops in a week, month and year?
2.10 How many times do members attend demonstrations in a week, month and year?
2.11 How many times do members go for exchange visits in a week, month and year?
2.12 How many times do members organize field days in a week, month and year?
2.13 At what interval does the group think the above trainings should be organized?
2.14 For the group to learn more about HQCF which method and at what interval should it be organized?

3.0 Practices in production of HQCF produced

3.1 What quality challenges do members of this group experience (record number of responses per challenge?)

3.2 What cassava variety is recommended for HQCF and do members grow it (record number of members who know and who don't know) and any other local varieties that members were growing for HQCF.
3.3 How do members harvest cassava for HQCF (record number who know it)
3.4 Do group members follow the right peeling procedure?
3.5 Do all the members use stainless steel knives, if not why?
3.6 Do members have cemented floor or grass compound for drying, if where do they dry
3.7 Do member own chipping machines?
3.8 What is the colour of tarpaulin that members use and how many does each person have?
3.9 How frequently do members disturb cassava during drying?
3.10 What type of bags do members pack HQCF in after drying?
3.11 What type of store do members have?
3.12 Do members have wooden pallets in store?
3.13 Do members get these products from one field or they have separate field for HQCF production?
3.14 How do members know the total kilograms of HQCF they produce every year?
3.15 How many kilograms of dry HQCF did members produce on average last season?
3.16 How many kilograms did members sale?

4.0 Factors affecting HQCF production

4.1 What challenges do farmers face at peeling stage in HQCF production?

4.2 Do members use the required type of knife for peeling?

4.3 When does the group experience Labour challenges more in HQCF production?

4.4 Do the group members use the required number of basins for processing HQCF?

4.5 How easy is it for members to access clean source of water for processing HQCF?.

4.6 What drying challenges do group members face?

4.7 What challenges do group members face with recommended drying grounds?

4.8 What storage challenges do members face?

4.9 Do members have access to credit to increase HQCF production (record number that had access and no access to credits?

Thanks for your efforts

APPENDIX V: KEY INFORMANT INTERVIEW GUIDE

EFFECTIVENESS OF GROUP EXTENSION METHODS IN PROMOTING HIGH QUALITY CASSAVA FLOUR PRODUCTION AMONG SMALLHOLDER FARMERS IN APAC DISTRICT

Background

High Quality Cassava Flour production had been promoted in Apac District for the last three years with the aim of increasing farmers' income and raw material substitute for industries. This study is being conducted to establish the extent to which group extension methods have contributed to production of HQCF. You have been identified as a suitable respondent among the extension service providers to respond in this study, your participation and commitment of your time is highly appreciated. The findings of this study will be confidential and used for research purpose only.

Questionnaire for extension service providers

Basic information

Date of interview	A1	District	
Interviewed by	A2	Sub-county	
Checked by	A3	Parish	
Date checked	A4	Village/Lc1	
Data entered by			
Date entered			
Household ID			

Ask the respondent if he/she had been involved in training farmer groups in HQCF production in the last two years (2014 and 2015), if no, terminate the interview.

1.0 SECTION A: SOCIO ECONOMIC AND DEMOGRAPHIC INFORMATION

1.1	Name of respondent		Contact	
	Name of organization			
1.2	Sex of respondent	1-male 2-female		
1.3	Education level		1.Certificate ( ) 2.Diploma( ) 3.Degree ( ) 4 Masters ( )	
1.4	Years in extension work		A. 1-2 YEARS ( ) B. 3-5 years ( )	

		C.6-10 years
1.5	Age (in complete years)	1-(15-30)( ) 2-(31-45)( ) 3-(46-60)( ) 4-(60-above)( )
1.6	Marital status (see code)	
1.15	How far is your office from your groups	( )km/m
1.16	What is your means of transport	A. Vehicle ( ) B. Bicycle ( ) C.M/cycle ( ) D. Others……..

Marital Status Codes (1 = single, 2 = Married, 3 = Separated/Divorced, 4 = Widowed, 5 = other)

1.0 Group extension methods for promoting HQCF farmers

1.1 Have you ever trained farmers on HQCF production? A (Yes) B (No)

1.2	What was the training about?	1. Cassava agronomy 2.Variety selection 3.Harvesting for HQCF 4.processing 5.storage.
1.3	What method of training was it	1.Demonstration ( ) 2.Seminar ( ) 3.Exchange visits ( ) 4.Field days ( ) 5 Workshops ( )
1.4	In which method do you normally see farmers more active?	1.Demonstration ( ) 2.Seminar ( ) 3.Exchange visits ( ) 4.Field days ( ) 5 Workshops ( )
1.5	Do you think using many training methods is useful?	Yes ( ) 2. No ( )
1.6	If yes, what is the importance of many methods?	1. Ease of understanding ( ) 2. Convenience ( ) 3. Compensation effect ( )
1.7	In which stage of HQCF production do you see use of many methods important	1 Harvesting 2 Washing 3 Peeling 4 Chipping 5 Drying 6 storage

1.8 Which of the methods do you think can be combined for better learning and why

……

1.9 Which of the group extension methods do you use most and why.

2.0 Farmers' learning satisfaction about group extension methods

2.1 Can you rate the level of participation of groups in the above group extension methods?

S/No	Group method	Rating			
		Very low	Low	High	Very high
1	Demonstrations				

2	Seminars				
3	Exchange visits				
4	Field days				

2.2 Can you provide an explanation for your rating.....

2.3 Which part of the training was exciting to you and why.....

2.4 How do you rate the attitudes of group members towards your training methods?

A-Very poor ( ) B-Poor ( ) C- Positive ( ) D-Very Positive ( )

2.5 How do you rate the turn ups for these trainings?

A-bad ( ) B-Fair ( ) C-Good ( ) D-Very Good? ( )

2.6 What reasons did members give on the days of low turn ups?

2.7 How often do you organize extension trainings?

A-1-3 Times a week ( ) B-1-4 Times a month ( ) C-Weekly ( ) D-Monthly ( ) E-Quarterly ( )

2.8 How many times do you organize demonstrations in a week, month and a year?

2.9 How many times do you organize seminars in a week, month and year?

2.10How many times do you organize field days in a week, month and year?

2.11 What is your comment on adoption of HQCF production practices regarding training interval for the above methods?

2.12 Can you provide explanations for your feelings?

.....

2.13 What according to you is the best time, day, week and month for training on HQCF?

3.0 Practices in production of HQCF produced

S/No	Do you think your farmers have knowledge in the following stages in HQCF processing	Response		
				Comment
		Yes	No	
1.0	Planting sweet varieties with low cyanide			
1.1	Proper land preparation			

1.2	Age of cuttings for planting			
1.3	Spacing for cassava			
1.4	Timely weeding			
1.5	Weeding interval			
1.6	Pest and disease control			
1.7	Uproot using hands after reducing soil on tubers			
1.8	Avoid injuries on tubers			
1.9	Harvest size to be processed in a day			
2.0	**Peeling**			
2.1	Use stainless steel knives only			
2.2	Hold in middle and use round peeling from tip			
3.0	**Washing**			
3.1	Use of clean water			
3.2	Use of 3 basins			
3.3	**Drying**			
3.4	Use of black tarpaulin			
3.5	Drying on cemented floor or on grass			
4.0	**Colour fixing**			
4.1	Process within 24 hours			
4.2	Avoid contamination by animals			
4.3	Observe weather			
4.5	Have enough tarpaulins			
5.0	**Storage**			
5.1	Ventilation of store			
5.2	Cool before storing			
5.3	Leak proof			
5.4	Use pallets in store			

3.0 Had there been case in which buyers refused to buy farmers HQCF due to poor quality

1. Yes ( ) 2. No ( )

3.1 At which stage do you experience quality challenges tick where appropriate?

1. Harvesting ( ) 2. Cleaning ( ) 3. Peeling ( ) 4. Drying ( ) 5. Storage ( )

4.0 Factors affecting HQCF production

Do the farmers you train have the following assets for HQCF production

S/No	**Quality Parameter**	**Assets**	**Response**		**Comment**
			Yes	N	

				o	
1	Peeling	Stainless steel knife			
2	Harvest size to be processed in a day	Labour			
3	Washing	3 basins			
4	Use of clean water	Clean water source			
5	Drying	4 tarpaulins			
6	Use of black tarpaulin	Black Tarpaulins			
7	Knowledge on drying environment	Cemented / grass ground for drying			
8	Process within 24 hours	Chipper			
9	Storage	Clean store			
10	Ventilation of store	Ventilated store			
11	Cool before storing	Knowledge			
12	Leak proof	Leak proof store			
13	Use pallets in store	Pallets for packing			
14	Capital to acquire equipment's				

4.2 Do you link your farmers to access to credit? 1. Yes ( ) 2. No ( )

4.3 If yes, from where do you access credit?

(1 = Bank, 2 = MDI, 3 = SACCO, 4= VSLA, 5 = Friends, 6 = others)

APPENDIX VI: OBSERVATION GUIDE

EFFECTIVENESS OF GROUP EXTENSION METHODS IN

PROMOTING HIGH QUALITY CASSAVA FLOUR PRODUCTION

AMONG SMALLHOLDER FARMERS

IN APAC DISTRICT

S/NO	OBJECTIVE	PARAMETERS	TICK	
	To find if a farmer attended the different extension methods		**Yes**	**No**
01	Group extension methods	Cassava group demonstration site exists		
		Group processing demonstration site exists		
		Evidence of exchange visit present		
		Sign of field day and its place present		
		Evidence of attending workshops present		
		Evidence of attending seminars present		
		Visitors book signed by extension staff		
		Note books from workshops and seminars		
	This will identify the practices that farmers have adopted as a result of trainings			
02	Practices in HQCF production	Nase 14 variety planted		
		Other varieties planted		
		Garden in swampy area		
		Garden in area with dry soil		
		Garden had spear grass		
		Garden had no spear grass		
		Harvesting at one year		
		Harvesting after one year		
		Sign of rats in field		
		No sign of rats		
		Using stainless steel knife		
		Using rusting knife		
		Using ring method of peeling		
		Using forward method of peeling		
		Using backward method of peeling		
		Having 3 basins		
		Having 2 or 1 or nothing		
		Having 3 towels		
		Having 2 or 1 or no towel		
		Had chipping machine		
		Had no chipping machine		
		Machine is clean		
		Machine is dirty		

		Machine operator had dirty clothes		
		Machine operator had clean clothes		
		Farmer had cemented floor for drying		
		Does not have cemented floor for drying		
		Had black tarpaulins and 3 or 4		
		Had other colours and less		
		Uses new bags		
		Uses old bags		
		Uses clean water		
		Uses muddy water		
		Farmer had store		
		Farmer had no store		
		Store had good roof		
		Store had pallets for packing bags on		
		Store had no termites or rats		
	To identify factors that affect HQCF production			
03	Factors affecting HQCF production	Farmer had production assets seen		
		Some production assets not seen		
		No sign of credit source		
		Sign of VSLA present for financial support		
		Land available		
		No land		
		Market source seen		
		No sign of available market		
		Labour source seen		
		No sign of labour present		
		Extension services seen frequent and available		
		Were there evidence of extension services from visitors book		