

NATIONAL AGRICULTURAL ADVISORY SERVICES (NAADS)



FINAL REPORT FOR GROSS MARGIN STUDIES FOR FIVE SELECTED ENTERPRISES (Citrus, Ground nuts, Cassava, Fish Farming and Poultry)

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NAADS

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Ideal Development Consults Ltd.

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ACRONYMS

ATAAS	Agricultural Technology and Agribusiness Advisory Services
FAO	Food and Agricultural Organisation
IDCL	Ideal Development Consults Ltd
IFAD	International Fund for Agriculture
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MT	Metric Tonnes
NAADS	National Agricultural Advisory Services
NASARI	National Semi-Arid Research Institute
ROI	Return on Investment
SPSS	Statistical Package for Social Scientists
UBOS	Uganda Bureau of Statistics
UIA	Uganda Investment Authority
Ush	Uganda Shillings

Executive summary

Under ATAAS project, there is a key component of supporting agribusiness services and market linkages under which NAADS is required to provide gross margin information to farmers as well as advise them on profitability levels of different enterprises. This information is useful in guiding farmers and agribusiness entrepreneurs in the enterprise selection process. Policy makers and program managers also require enterprise profitability information as a tool in policy formulation and program management.

Therefore, the main objective of this study was to provide information to farmers, agribusiness entrepreneurs, policy makers and program managers on enterprise profitability levels through generation of gross margins and other profitability measures for different enterprises under different production packages; their market potential as well as their technological and input requirements.

The gross margins study was carried out in eight districts that included; Wakiso, Mukono, Jinja, Bukedea, Soroti, Dokolo, Apac and Kiryandongo. The enterprises under the study were; Citrus, Cassava, Aquaculture, Groundnuts and poultry. The study sampled 90 citrus farmers, 90 cassava farmers, 90 groundnut farmers, 60 poultry farmers and 40 aquaculture farmers. It was generally found that all the studied enterprises were profitable as shown by positive gross margins and ratios. However, profitability of these enterprises significantly differed by area of study, type of technology used, and scale of the farmer.

Citrus farmers in Soroti district earned more annual gross margins (Ush 7,553,802/acre) than their counterparts in Bukedea who earned an average of Ush 5,428,491/acre. This could probably be attributed to the higher yields obtained by citrus farmers in Soroti as well as higher prices prevailing in Soroti. Citrus profitability also varied by type of citrus grown, production

technology package, and size of farmer. Farmers who grew Valencia had the highest incomes (Ush 10,950,000/acre) compared to those that grew Washington (Ush 8,800,000/acre) and Hamlin (Ush 8,229,000/acre). With high use of inputs (organic manure, fertilizers, herbicides, fungicides and pesticides), citrus farmers obtained a gross margin of Ush 7,836,000/acre), while those farmers who used a combination of organic manure, fungicides and pesticides only earned a gross margin of Ush 5,540,000/acre). In terms of scale, Large scale farmers received the highest gross margins (Ush 7,663,680/acre) than Medium scale farmers (Ush 6,812,750/acre) and Small scale farmers (Ush 5,978,442/acre). This is explained by the fact that there were yield differences with the large scale farmers having the highest yields of 220 bags per acre.

On average, fish farmers raising both types of fish (tilapia and catfish) received a gross margin of Ush 2,991 per sq meter of the pond. However, tilapia farmers earned higher gross margins (Ush 4,838 per sq meter) than the cat fish farmers with Ush 1,514 per sq meter. This can be explained by the fact that tilapia produces in the water and farmers could have sold more fish per sq meter than they had stocked and thus, fetching higher gross margins. There were some economies of scale to fish farming. Small scale farmers earned lower gross margins (Ush 3,087 per sq meter), Medium scale farmers earned Ush 3,816 per sq. meter, while large scale farmers earned Ush 5,951 per sq. meter. The higher gross margins for large scale farmers can be attributed to higher yields obtained per square meter.

Cassava farmers in Kiryandongo earned higher gross margins (Ush 257,350/acre) compared to those in Apac who obtained Ush 195,834 per acre owing to higher prices prevailing in the former district. It was more profitable for farmers to grow improved than local varieties: local variety (Ush 130,600/acre); NASE 13 (Ush 186,500/acre); and NASE 14 (Ush 288,800/acre). Farmers who sold cassava chips generally received higher gross

margins (Ush 410,911/acre) compared to their counterparts that sold fresh cassava with Ush 212,390 per acre. The higher gross margins for farmers that sold processed cassava were as a result higher unit prices charged. On average, farmers sold about 31 bags of fresh cassava (each bag weighing about 150 kg) at an average price of Ush 30,733/bag. While, farmers who dealt in cassava in processed form, sold 15 bags each bag weighing 100 kg, at an average unit price of Ush 55,000. There were economies of scale to cassava production. Large scale farmers received the highest gross margin (Ush 224,085/acre) compared to medium scale farmers with Ush182,051 per acre and small scale farmers who obtained Ush 90,171/acre.

Groundnut production was profitable in both Soroti district (Ush 354,530/acre) and in Dokolo district (Ush 269,970/acre). The attractiveness of groundnut production was because farmers had a bumper harvest in this season. Profitability of groundnut farmers significantly differed by the type of variety they grew. *Serenut 2* was the most profitable variety to grow fetching a gross margin of Ush 477,210/acre (Ush 28,575/bag), followed by *Red Beauty* (Ush 178,500/acre or Ush 20,756/bag), and least by the local varieties (Ush 17,140/acre or Ush 1,823/bag). The only explanation to this finding is that *Serenut 2* was the highest yielding variety. Profitability of groundnut farmers also significantly differed by the size of acreage under groundnut production. Farmers who had more than 2 acres of groundnuts obtained a gross margin of Ush 494,340/acre (Ush 35,565/bag) while those with less than 1 acre got only Ush 253,400/acre (Ush 19,053/bag). With 1-2 acres of groundnuts, farmers were able to receive Ush 285,470 – Ush 298,530/acre (Ush 22,656 – 24,878/bag). These findings show that economies of scale accrue to groundnut production.

Poultry farmers who kept layers in Jinja generally earned significantly higher gross margins (Ush 10,596/bird) than those in Wakiso (Ush 8,874/bird). Likewise, broiler farmers in Jinja were more profitable than those in Wakiso,

that is, Ush 1,922/bird versus Ush 742/bird. The reason for higher gross margins obtained by farmers who reared layers is the contribution of eggs and the relatively higher price for off-layers compared to broilers. On consideration of scale of farmer keeping layers (broilers), medium scale farmers earned the highest gross margins of Ush 12,502/bird compared to large scale farmers with Ush 9,896/bird and small scale farmers that earned the lowest margin of Ush 7,653/bird.

All in all, the observed variation in enterprise profitability is brought by differences in market prices, yields and variable costs of production. Therefore, in order to improve the profitability of farmers, the following recommendations are forwarded:

- **Increase productivity of farmers.** Rise in productivity of farmers is necessary for the realization of larger surpluses for sale. This can be achieved through: use of high yielding varieties, control of pests and diseases, adoption of climate change mitigation strategies, and provision of timely and accurate production information.
- **Increase the value of farmers' produce.** Farmer empowerment and value addition in all enterprises lead to higher prices obtained by farmers. This can be done through: conducting farmers' trainings on value addition, provision of primary processing equipment, establishment of modern processing plants for secondary and tertiary processing, provision of market information, promotion of collective marketing, and improvement of produce quality.
- **Assist farmers to decrease costs of production and marketing.** Production and marketing costs incurred by farmers can be reduced in various ways: mechanisms that reduce input prices such as reduced taxes and reduced electricity tariffs for production; promotion of

collective procurement and marketing, provision of labour saving technologies, and physical infrastructural development.

1.0 Introduction

1.1 Background

The National Agricultural Advisory Services (NAADS) was set up to contribute to the national goal of causing agricultural transformation by supporting identification of agricultural commodities and farming activities (enterprises) that allow optimal exploitation of existing and potential market opportunities. This combined with better farmer access to productivity enhancing agricultural technologies; knowledge and advice should result in higher farm productivity and profitability. The resulting higher farm incomes increase the ability of rural farm households to access food through the market and to invest in agricultural production.

Key component of the Agricultural Technology and Agribusiness Advisory Services (ATAAS) Project is Agribusiness Services and Market Linkages. Under this component, NAADS is required to provide gross margin information to farmers as well as advise on profitability levels of different enterprises. This information is useful in guiding farmers in the enterprise selection process.

The present and future agribusiness entrepreneurs also need cost-benefit information to stimulate and guide day to day decision making. Policy makers and program managers require enterprise profitability information as a tool in policy formulation and program management. However, different categories of users will require information in different formats and packaging.

An analysis of each enterprise with a specific emphasis on the resultant gross margins and other profitability measures under different production packages was therefore the main focus of this study.

1.2 Objectives of the study

The main objective of this gross margin study is to provide information to farmers on profitability levels through generation of Gross margins and other

enterprise profitability measures for different enterprises under different production packages; their market potential as well as their technological and input requirements.

Specifically, the study sought to:

- (i) Estimate current production and marketing costs with a view to determining profitability of the enterprises.
- (ii) Establish current use levels and costs of inputs for different factors of production including labor (both hired and family labor).
- (iii) Assess current market prices.
- (iv) Perform sensitivity analysis for each enterprises highlighting the differences in gross margins that may be associated with different production packages (inputs and technology combinations), market prices, inputs and technology/inputs costs
- (v) Estimate gross margins and other simple profitability measures of the specified enterprises. .

1.5 Outline of the Report

The report has been organized into 4 main chapters plus annexes. The Introduction (Chapter 1) explains the background and purpose of the study. Chapter 2 covers the methodology of the study. In Chapter 3, the study findings on each enterprise under the study are presented. It discusses the profitability, market potential and challenges of the different enterprises. Finally, in chapter 4, the main conclusions and recommendations of the study are presented. Data collection tools, the documents reviewed and the terms of reference can be found in annexes.

2.0 Methodology

2.1 The Study Area

The study was done for five (5) selected enterprises in major producing districts of Uganda, namely: citrus (Soroti and Bukedea); aquaculture (Wakiso and Mukono); poultry (Wakiso and Jinja); groundnuts (Soroti and Dokolo); and cassava (Kiryandongo and Apac).

2.2 Sampling and Sample Size

The study employed a multi stage sampling technique to select farmers. Two districts were purposively selected for each enterprise basing on production status and potential. Apart from fish farming, two sub counties were purposively selected from each district basing on the same criteria as the districts making a total of four sub counties per enterprise. From each sub county, two villages were randomly selected making a total of eight villages per enterprise. From each village, a list from the LC Chairman was obtained and a total of forty five (45) farmers was randomly selected from each district making a total of ninety (90) farmers per enterprise. For Poultry, a total of thirty (30) farmers was randomly selected from each district as shown in Table 2.1 below.

The sampling method used to select fish farmers was different since the farmers were spread all over the district and it was difficult to find a reasonable number in a sub county. Twenty farmers were randomly selected from each district making a total of 40 fish farmers in the two districts (Table 2.1).

Table 2.1: Enterprises and districts

No	Enterprise	Districts	No. of Respondents
1.	Citrus	Bukedea	45
		Soroti	45
2.	Ground nuts	Soroti	45
		Dokolo	45
3.	Cassava	Kiryandongo	45
		Apac	45
4.	Fish farming (Aquaculture)	Mukono	20
		Wakiso	20
5.	Poultry	Wakiso	30
		Jinja	30

2.3 Data Collection Techniques

Both primary and secondary data were collected for the study. Primary data obtained from farmers on the five enterprises collected included; current production costs of all factors of production, sources of inputs, current marketing costs, other costs, market prices, sources of market information and constraints to marketing (the data collection tools are attached in appendix). Extensive literature review was undertaken to obtain any available information relevant to gross margin studies of the different enterprises in Uganda. Secondary data mainly came from NAADS offices in the districts visited, and production offices, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Uganda Bureau of Statistics (UBOS).

2.4 Team composition and Supervision

Ideal Development Consults Ltd (IDCL) has a large team of consultants, research supervisors and research assistants. Each enterprise was led by a consultant who was the overall supervisor. Under the consultant, there was a field supervisor in charge of three research assistants who directly reported to the consultant. The research assistants were in charge of data collection. To enable the field staff to conduct the assignment as competently and efficiently as possible, a training workshop covering basic research methodology, study

goals/ objectives, and tools was held before field work commenced. During training, role plays for interviewer and interviewee were carried out for research assistants and supervisors.

Table 2.2 Team Composition

Team member	Qualifications	Role
Dr. Elepu Gabriel	-PhD Agric. & Consumer Economics -MSc Agricultural and Consumer Economics -BSc Agriculture	-Overall team leader -In charge of Ground nuts enterprise
Dr. Ekere William	-PhD Agric. Economics -MA. Economics -BSc Agriculture	-Agricultural Scientist -In charge of Cassava enterprise
Dr. Walekwa Peter	-PhD Agric. Economics -MSc Agribusiness Management -BA Economics	-Economist -In charge of Poultry enterprise
Assoc. Prof. Hyuha Theodora	PhD Agric. Economics	In charge of Fish farming enterprise
Mr. Twinamasiko Julius	MSc. Agric. Economics	In charge of Citrus enterprise

2.5 Supervision procedure

There was a supervisor for every 3 research assistants. The supervisor conducted spot checks on all collected questionnaires to ensure data accuracy. Debrief meetings were held with data collectors/research assistants at the end of each day to review questionnaires and record any incidents/events occurring during data collection.

2.6.0 Development, Review and pre-testing of study tools

2.6.1 Development of tools and translation

The development of the tools was carried out by IDCL consultants. The consultants developed a separate questionnaire for each enterprise. Translation and back translation of study tools was conducted with the assistance of supervisors and research assistants.

2.6.2 Pre-testing of study tools

A pilot survey was carried out in Kawoko, in Wakiso district to pre-test the tools and ensure that they capture the intended information. The pilot survey was intended to check the suitability of all survey tools. Another importance of the pilot survey was the determination of non-response rate which could affect the sample size.

2.7 Data entry and Cleaning

All filled questionnaires were cleaned, entered and analysed in Statistical Package for Social Scientists (SPSS) software which had been fitted with range and consistency checks. A team of 5 highly trained and experienced data entrants based at our offices entered the data under the guidance of a highly qualified data manager. Observance of security and confidentiality of the data was at maximum.

2.8 Data analysis

Data analysis was done by the consultants of the different enterprises. Simple frequency tables and cross tabulations were drawn to present the results of the study. Graphs and tables were used accordingly to present the gross margins of different enterprises in an easy to read and understand format.

In this study, the gross margin or profit of farmer i , is equal to total revenue minus the total variable costs¹. That is,

$$\pi_i = p_i q_i - \sum_k vc_{ik} \quad (1)$$

Where:

π_i = gross margin or profit of farmer i in USh/acre.

p_i = unit price of the commodity in USh/kg for farmer i .

q_i = quantity of the commodity produced/marketed by farmer i in kg/acre.

vc_{ik} = the k^{th} variable cost for participant i in Ush/acre.

Further, indicators of efficiency of famers were analyzed using the following ratios:

2.8.1 Output to input ratio

Output to input ratio is a measure of efficiency of production. Output is typically measured in terms of value of output while input is generally measured in terms of capital investments or cost of inputs.

2.8.2 Return on Investment (ROI)

A performance measure used to evaluate the efficiency of an investment. To calculate ROI, the benefit (return) of an investment is divided by the cost of the investment; the result is expressed as a percentage or a ratio.

$$ROI = \frac{(\text{Gain from Investment} - \text{Cost of Investment})}{\text{Cost of Investment}}$$

¹ Castle, E, M. Becker, and A. Nelson (1987). "Farm Business Management: The Decision-Making Process." Macmillan Publishing Company, New York.

In the above formula "gains from investment", refers to the proceeds obtained from selling the investment of interest. If an investment does not have a positive ROI, or if there are other opportunities with a higher ROI, then the investment should not be undertaken.

2.8.3 Returns to family labour

Family labor productivity is the value of goods and services produced in a period of time, divided by the hours of family labor used to produce them. In other words family labor productivity measures output produced per unit of family labor, usually reported as output per hour worked or output per employed person.

2.9 Quality control of data collection and processing

This was gained through:

- a. Training Research Assistants
- b. Pretesting and Translation of tools
- c. Close field supervision of Research Assistants
- d. Daily review of field questionnaires and experiences with research assistants while in the field.
- e. Training and supervision of data entrants

2.10 Ethical considerations

- Pre-visits to the district local authorities was done to seek cooperation and guidance during data collection.
- Informed consent to participate in the survey was sought from all respondents. In the event that consent was not granted, the interviewer thanked the respondent and left.

- Maximum confidentiality was observed at all levels of data collection and processing.
- There were no risks to community members that accrued from this study.

2.11 Reporting

The consultant prepared and presented to the client the following:

- ❖ Survey tools/instruments
- ❖ Inception Report
- ❖ Draft final report
- ❖ Final Report.

2.12 Limitations of the study

During the data collection phase, it was established that some farmers did not keep records and the interviewers relied on the farmers' capacity to remember. Some farmers who were interviewed did not answer some questions- leading to non-responses on those particular questions. At analysis, those farmers were dropped for those particular questions. The study established that some of the enterprises especially Citrus and Aquaculture were not widespread in all the sub counties in the districts under the study. The study therefore concentrated in the sub counties where these enterprises were widely concentrated.

3.0 RESULTS

3.1 CITRUS ENTERPRISE

Citrus production in Uganda was commercialized in the 1960s under the Government schemes operated at Kiige, Ongino, Odina and Labori located in Kamuli, Kumi and Soroti districts². However, in the 1970s, the above schemes collapsed due to ineffective management caused by insecurity. Production however began picking up again in the 1990s, but mainly under the smallholder system. Citrus fruits are today grown by small-scale farmers in many parts of Uganda, especially in the Teso sub-region. In 1994/95, it was documented that the total production area for citrus fruits in Uganda was 2,000 ha giving a total output of 24,000 MT³. For the rest of the years, no such aggregate production record is available. However, due to the introduction of new technologies of budding and grafting and the citrus growing promotion activities carried out by NAADS, the production of citrus fruits has expanded countrywide. Moreover, the potential for increased production of citrus in Uganda still exists due to increasing productivity.

3.1.1 Acreage under citrus and type grown

The study established that on average a typical citrus farmer cultivated 1.65 acres with the smallest farmer having 0.5 acres and the biggest farmer cultivating 6 acres. Farmers from the two districts had approximately equal acreages with those from Bukedea on average having 1.65 acres and those from Soroti having on average 1.66 acres of citrus.

² Uganda Investment Authority (UIA). 2009. Investing in Uganda: Investment Potentials in Citrus Fruit Farming.

³ Ministry of Agriculture, Animal Industry and Fisheries. 2001. Agricultural Production Statistics.

3.1.2 Current citrus input use levels and costs

Citrus farmers used different inputs in citrus production. The inputs used included; organic manure, fertilizers, herbicides, pesticides and labour (land preparation, ploughing, planting, fertilizer application, weeding, knap sack, pesticides application and harvesting). Table 3.1 indicates input use levels and the costs for the different inputs used by the citrus farmers per acre.

Table 3.1: Average annual input use levels and costs per acre (Both fixed and variable inputs)

Input	Quantity	Unit cost (US\$)	Total cost (US\$)
Seedlings	101	2,069	208,969
Organic manure (trucks)	4	90,000	360,000
Fertilizers (litres)	18	10,000	180,000
Herbicides (litres)	3	16,800	50,400
Pesticides (litres)	24	17,000	408,000
Fungicides (kgs)	12	40,000	480,000
Labour			
Land preparation (man days)	6	21,458	133,039
Ploughing (man days)	10	28,300	283,000
Planting (man days)	8	10,476	83,808
Fertilizer application (man days)	5	11,100	55,500
Weeding (man days)	6	50,000	300,000
Pesticides application (man days)	6	10,000	60,000
Knap sack (all the acreage owned)	1	230,000	230,000
Harvesting (man days)	5	20,000	100,000
TOTAL			2,932,716

3.1.3 Sources of inputs

Table 3.2 shows the distribution of respondents by source of inputs for citrus enterprises. The results revealed that nearly a majority (64 percent) of the citrus farmers got the seeds/seedlings from the nursery operators while 16 percent got them NAADS, 9 percent from fellow farmers, and 11 percent raised their own seedlings. While organic manure used by farmers was home-made,

chemicals (fertilizers, herbicides, and pesticides) used were bought from input dealers.

Table 3.2: Sources of inputs used by citrus farmers

Input	Sources inputs (%)				
	Home made	Nearest input dealer/Nursery	Input dealer/Nursery in town	NAADS	Fellow farmer
Seedlings/ seeds	11	49	15	16	9
Fertilizers/ Manure	26	14	13	1	1
Herbicides	0	4	1	0	1
Pesticides	0	46	54	2	0

3.1.4 Variable costs incurred by citrus farmers

The variable costs incurred in citrus production included: cost of inputs (manure, fertilizers, herbicides, pesticides, fungicides and transport) and the cost of labor for fertilizer application, weeding, herbicide application, harvesting, and post-harvest handling). Other costs included water, packaging material, advisory services.

Farmers in Soroti district incurred higher variable costs per acre (Ush 2,372,998) compared to their counter parts in Bukedea who incurred variable costs amounting to Ush 1,874,539 per acre (Table 3.3).

Farmers that produced Valencia incurred the highest variable costs (Ush 2,179,200) while farmers that produced Washington incurred the lowest variable costs amounting to Ush 2,001,000 (table 3.4).

The major costs incurred by farmers were costs for fungicides for farmers that used the different production technologies. Farmers that used a combination of all inputs (manure, fertilizers, herbicides, pesticides and fungicides) incurred

the highest variable costs per acre (Ush 2,064,000) compared to those that used a combination of fertilizers, pesticides and fungicides (Ush1,688,500). Farmers that used a combination of manure, pesticides and fungicides incurred the lowest variable costs per acre amounting to Ush 1,660,000(Table 3.5).

The study established that small scale farmers (0.5-1.5 acres) incurred the lowest variable costs per acre (Ush 1,462,767) compared to medium scale farmers (1.6-2.5 acres) that incurred Ush 1,965,250 per acre. The large scale farmers (over 2.5 acres) incurred the highest variable costs per acre (Ush 2,334,000) probably because they used more inputs than their counterparts (Table 3.6).

3.1.5 Incomes from Citrus production

Farmers in Soroti district earned higher revenues per acre (Ush 9,926,800) compared to their counterparts in Bukedea that earned Ush 7,303,030 per acre. Farmers in Soroti district had higher yield (200 bags per acre) compared to farmers in Bukedea whose yields were 190 bags per acre (Table 3.3).

Farmers that grew Valencia had the highest incomes (Ush 10,950,000) compared to those that grew Washington (Ush 8,800,000) and Hamlin (Ush 8,229,000) as shown in Table 3.4 below.

Farmers that applied a combination of all inputs received the highest incomes per acre (Ush 9,900,000). This is because they had the highest yields (220 bags per acre) and yet they also sold at the highest price per bag (Ush 45,000). These farmers were found to have invested the highest amount of fertilizers costing Ush 200,000 and a significant amount of organic manure costing Ush

440,000. The lowest income was earned by the farmers that applied a combination of manure, pesticides and fungicides (Ush 7,200,000) [Table 3.5].

Large scale farmers earned the highest revenue per acre (Ush 9,997,680). This was attributed to the fact that they had the highest yield (220 bags per acre) and the highest unit price (Ush 45,444/bag). Medium scale farmers earned Ush 8,778,000 per acre and the lowest income was earned by small scale farmers that earned Ush 7,441,209 per acre (Table 3.6).

Fig 3.1: Harvested oranges ready for the market



3.1.6 Gross margins for Citrus farmers by district

Table 3.3 indicates the gross margin analysis by district. The study was carried out in Soroti and Bukedea and this analysis is based on these two districts. Results indicated that farmers in Soroti received significantly higher gross margins per acre (Ush7,553,802) compared to farmers in Bukedea that

received Ush 5,428,491 per acre. The higher gross margins in Soroti district are due to the higher yields (200 bags per acre per annum) and higher unit price (Ush 49,634).

Table 3.3: Gross margin analysis by district

Type of cost	District of farmer	
	Bukedea	Soroti
Organic manure	245,374	597,500
Fertilizers	150,000	210,000
Herbicides	43,750	62,500
Pesticides	380,000	420,000
Fungicides	460,000	500,000
Transport from the garden	36,666	0
Fertilizer application	61,000	50,000
Weeding	280,000	320,000
Pesticides application	60,666	6,500
Harvesting	90,000	110,000
Watering	15,633	0
Packaging	51,450	96,498
Total variable costs (Ush/acre)	1,874,539	2,372,998
Unit price (Ush/bag)	38,437	49,634
Quantity sold (bags)	190	200
Total revenue (Ush/acre)	7,303,030	9,926,800
Gross margin (Ush/acre)	5,428,491	7,553,802

Note: A bag of citrus is 110 kg

3.1.7 Gross margins for Citrus farmers by variety

The study established that farmers in the two districts produced a number of citrus varieties that included Valencia, Hamlin, Washington, American Jaffer, Mediteranian sweet and Denmark. Of the above varieties, Valencia, Hamlin and Washington were the major varieties grown. Valencia fetched the highest

annual gross margins (Ush 8,770,800) probably because it was the most yielding (219 bags per acre). Though more yielding than Washington, Hamlin farmers had the lowest gross margins (Ush 6,094,300/acre). This was due to the low prices it fetched on the market (Table 3.4).

Table 3.4 Annual Gross margins by variety per acre

Type of cost	Variety		
	Valencia	Hamlin	Washington
Organic manure	420,000	390,000	381,000
Fertilizers	150,000	162,000	193,000
Herbicides	37,000	68,000	44,000
Pesticides	440,000	428,000	335,000
Fungicides	491,000	460,000	470,000
Transport from the garden	30,000	42,000	25,000
Fertilizer application	53,200	50,700	64,000
Weeding	299,000	310,000	290,000
Pesticides application	55,000	63,000	57,000
Harvesting	112,500	109,000	83,000
Watering	25,000	14,000	19,000
Packaging	66,500	38,000	40,000
Total variable costs (Ush/acre)	2,179,200	2,134,700	2,001,000
Unit price (Ush/bag)	50,000	39,000	44,000
Quantity sold (bags)	219	211	200
Total revenue (Ush/acre)	10,950,000	8,229,000	8,800,000
Gross margin (Ush/acre)	8,770,800	6,094,300	6,799,000

3.1.8 Gross margins for Citrus farmers by production technologies

Table 3.5 indicates the gross margins earned by farmers by production technologies used. Farmers were categorised under four production technologies depending on the combination of inputs used. The first production

system was for the farmers that applied a combination of all the inputs (organic manure, fertilizers, herbicides, pesticides and fungicides). The second one used a combination of organic manure, fertilizers, pesticides and fungicides. The third used a combination of fertilizers, pesticides and fungicides while the fourth used a combination of organic manure, pesticides and fungicides. The highest gross margins came from the first production system while lowest gross margins came from the fourth production system.

Farmers that used a combination of organic manure, fertilizers, herbicides, pesticides and fungicides received the highest gross margins per acre (Ush 7,836,000) due to the fact that they got the highest yields (220 bags per acre) and sold at the highest per unit price (Ush 45,000 per bag). This was due to the fact that they applied the highest amount of inputs.

Farmers that used a combination of organic manure, pesticides and fungicides got the lowest gross margins (Ush 5,540,000) per acre. These farmers produced the lowest output of 180 bags per acre compared to the highest production system that produced 220 bags per acre.

Table 3.5: Gross margin analysis by production technologies per acre

Type of cost	Production technology			
	1	2	3	4
Organic manure	440,000	410,000	0	380,000
Fertilizers	200,000	150,000	180,000	0
Herbicides	55,000	0	0	0
Pesticides	450,000	320,000	380,000	330,000
Fungicides	420,000	456,000	502,000	500,000
Transport from the garden	0	40,000	0	25,000
Fertilizer application	49,000	60,000	47,000	0
Weeding	320,000	315,000	300,000	291,000
Pesticides application	50,000	73,000	80,000	58,000
Harvesting	80,000	79,999	130,000	76,000
Packaging	0	80,000	69,500	0
Total variable costs (Ush/acre)	2,064,000	1,983,999	1,688,500	1,660,000
Unit price (Ush/bag)	45,000	39,000	41,000	40,000
Quantity sold per acre	220	200	209	180
Total revenue (Ush/acre)	9,900,000	7,800,000	8,569,000	7,200,000
Gross margin (Ush/acre)	7,836,000	5,816,000	6,880,500	5,540,000

Key: Technology1= Organic manure, fertilizers, herbicides, pesticides and fungicides
Technology2= Organic manure, fertilizers, pesticides and fungicides
Technology3= Fertilizers, pesticides and fungicides
Technology4= Organic manure, pesticides and fungicides

Note: A bag of citrus is 110 kgs

3.1.9 Gross margins for Citrus farmers by size of farmer

Table 3.6 below indicates gross margins for citrus farmers by their size/acreage. Farmers were categorised into three groups; Small scale farmers, medium scale farmers and large scale farmers. Results indicate that large scale farmers received the highest gross margins per acre (Ush 7,663,680). This is explained by the fact that they had the highest yields (220 bags per acre).

Small scale farmers received the lowest gross margins per acre (Ush 5,978,442). This was due to the fact that they had the lowest yields (179 bags per acre) and sold at the lowest price per bag.

Table 3.6: Gross margin analysis of citrus farmers by size

Type of cost	Size of farmer		
	Small	Medium	Large
Organic manure	234,167	350,000	460,000
Fertilizers	140,000	181,000	200,000
Herbicides	30,000	45,000	60,000
Pesticides	250,000	380,000	500,000
Fungicides	414,000	461,000	499,000
Transport from the garden	20,000	45,000	0
Fertilizer application	30,000	41,000	63,000
Weeding	256,000	292,000	341,000
Pesticides application	0	49,000	61,000
Harvesting	60,000	92,500	111,000
Watering	23,000	23,500	29,000
Packaging	5,600	5,250	10,000
Total variable costs (Ush/acre)	1,462,767	1,965,250	2,334,000
Unit price (Ush/bag)	41,571	42,000	45,444
Quantity sold (bags)	179	209	220
Total revenue (Ush/acre)	7,441,209	8,778,000	9,997,680
Gross margin (Ush/acre)	5,978,442	6,812,750	7,663,680

Note: A bag of citrus is 110 kg

3.1.10 Output to input ratio per acre

Generally, the output to input ratios associated with citrus farming are too high. This is because orchard establishment costs were not included in the computation of total costs. Valencia farmers and the farmers who used a combination of fertilizers, pesticides and fungicides had the highest output to

input ratio of 5. For every one unit of input used, these farmers received five units of output. Hamlin farmers had the lowest output to input ratio. For every one unit of input used, they received approximately 3.8 units of output (Table 3.7).

Table 3.7: Output to input ratios for different types of Citrus farmers

Type of farmer	Value of Output	Cost of Input	Output to input ratio
Valencia	10,950,000	2,179,200	5.0
Hamlin	8,229,000	2,134,700	3.8
Washington	8,800,000	2,001,000	4.3
Production technology 1	9,900,000	2,064,000	4.7
Production technology 2	7,800,000	1,983,999	3.9
Production technology 3	8,569,000	1,688,500	5.0
Production technology 4	7,200,000	1,660,000	4.3
Small scale farmer	7,441,209	1,462,767	5.0
Medium scale farmer	8,778,000	1,965,250	4.4
Large scale farmer	9,997,680	2,334,000	4.2
Bukedea farmer	7,303,030	1,874,539	3.9
Soroti farmer	9,926,800	2,372,998	4.1

Key: Technology1= Organic manure, fertilizers, herbicides, pesticides and fungicides

Technology2= Organic manure, fertilizers, pesticides and fungicides

Technology3=Fertilizers, pesticides and fungicides

Technology4=Organic manure, pesticides and fungicides

3.1.11 Returns on Investment (ROI) for Citrus farmers

Generally, ROIs to citrus farmers are too high. This is because orchard establishment costs were not included in the computation of total costs since they were taken as fixed costs. From this study, it was worthwhile for the citrus farmers to take up the investment since their ROI is positive. Valencia farmers

received the highest returns to investment of 410% while Hamlin farmers received the lowest returns on investment of 280% (Table 3.8).

Table 3.8: Returns on Investment for Citrus farmers

Type of farmer	Gain	Cost	ROI (%)
Valencia	10,950,000	2,179,200	410
Hamlin	8,229,000	2,134,700	280
Washington	8,800,000	2,001,000	340
Production technology 1	9,900,000	2,064,000	380
Production technology 2	7,800,000	1,983,999	290
Production technology 3	8,569,000	1,688,500	400
Production technology 4	7,200,000	1,660,000	330
Small scale farmer	7,441,209	1,462,767	400
Medium scale farmer	8,778,000	1,965,250	340
Large scale farmer	9,997,680	2,334,000	320
Bukedea farmer	7,303,030	1,874,539	290
Soroti farmer	9,926,800	2,372,998	310

Key: Technology 1= Organic manure, fertilizers, herbicides, pesticides and fungicides
 Technology 2= Organic manure, fertilizers, pesticides and fungicides
 Technology 3= Fertilizers, pesticides and fungicides
 Technology 4= Organic manure, pesticides and fungicides

3.1.12 Returns to family labour per acre

Large scale farmers received the highest returns on family labour. For every hour of family labour invested in citrus production, large scale farmers got USh 124,971 while Valencia farmers received USh 89,024 for every hour of family labour. Farmers that used a combination of manure, pesticides and fungicides got the lowest returns on family labour equivalent to USh 38,095 (Table 3.9).

Table 3.9: Returns to family labour by citrus farmers per acre

Type of farmer	Value of citrus	Time (hours)	Returns to family labour
Valencia	10,950,000	123	89,024
Hamlin	8,229,000	100	82,290
Washington	8,800,000	106	83,018
Production technology 1	9,900,000	120	82,500
Production technology 2	7,800,000	111	70,270
Production technology 3	8,569,000	213	40,230
Production technology 4	7,200,000	189	38,095
Small scale farmer	7,441,209	119	62,531
Medium scale farmer	8,778,000	112	78,375
Large scale farmer	9,997,680	80	124,971
Bukedea farmer	7,303,030	149	49,013
Soroti farmer	9,926,800	120	82,723

Key: Technology1= Organic manure, fertilizers, herbicides, pesticides and fungicides

Technology2= Organic manure, fertilizers, pesticides and fungicides

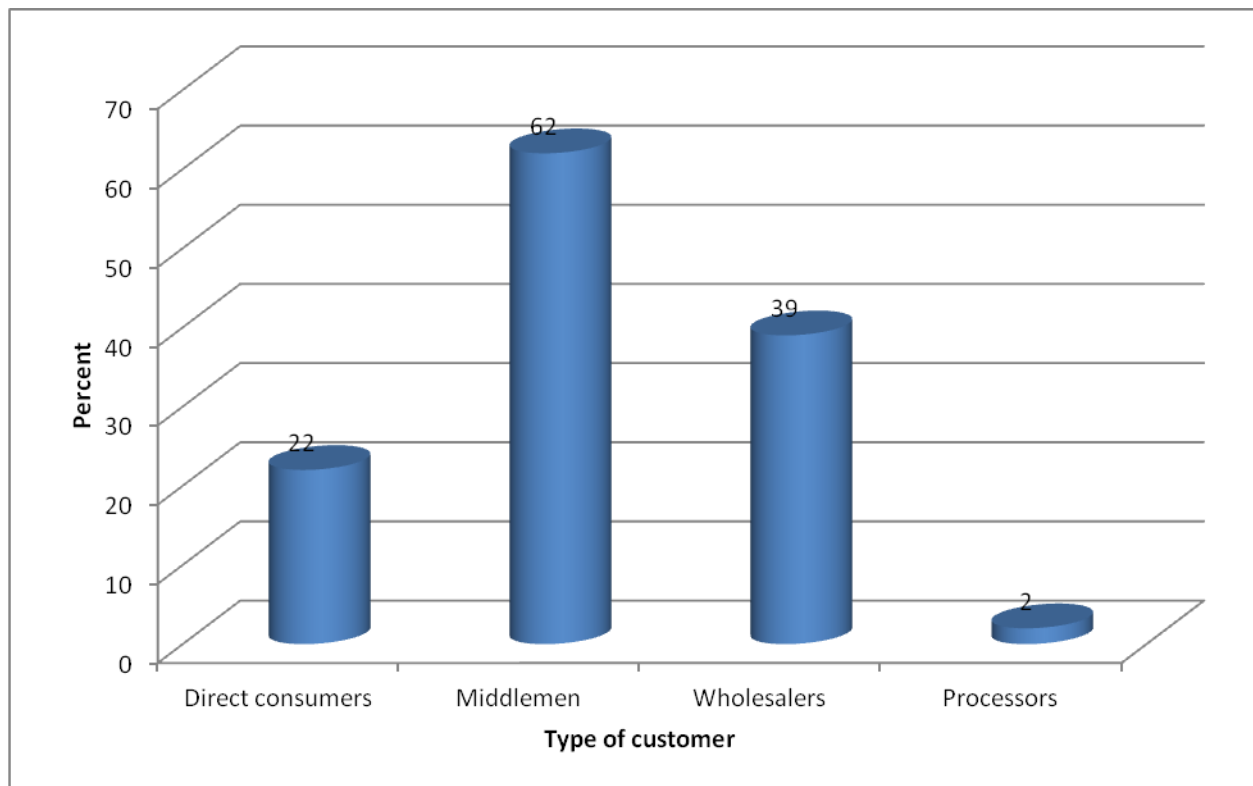
Technology3= Fertilizers, pesticides and fungicides

Technology4= Organic manure, pesticides and fungicides

3.1.13 Major produce markets used by farmers

Figure 3.2 shows major produce markets accessed by farmers for citrus. The results revealed that 62% of the citrus farmers sold their fruits to middlemen while 39 percent sold their fruits to wholesalers. This probably may explain why farmers complained of low prices for their citrus fruits since they could not sell directly to the consumers. Only 22 percent of the farmers sold directly to the consumers.

Figure 3.2: Major markets used by farmers



3.1.14 Sources of Market Information

Market information to the farmers is very important since it will inform them about prevailing market situation including existence and prices. Farmers got market information mainly from informal sources. The majority (60%) got market information from fellow farmers while 17% got market information from the media. The other sources of market information were government staff and private extension workers (Table 3.10).

Table 3.10: Market information sources for the citrus farmers

Information source	Frequency	Percentage
Fellow farmers	54	60
Media	15	17
Private extension workers	9	10
Government staff	14	16

3.1.15 Challenges to Citrus production and marketing

Farmers reported a number of challenges that have hindered efficient production and marketing of citrus in Bukedea and Soroti districts. Notable of them were the pests and diseases, particularly the yellow spot disease. Farmers reported that this disease is resistant to pesticides and has destroyed a significant share of their crop. The other challenges reported included limited markets leading to wastage, prolonged drought and thieves (Table 3.11)

Table 3.11: Challenges faced by the citrus farmers

Challenges	Frequency	Percentage
Pests and diseases like yellow spot disease (fig 3.3)	83	92.2
Prolonged drought	29	32.2
Limited market leading to wastage	74	82.2
Lack of capital to buy pesticides	28	31.1
Thieves	27	30.0
Lack of inputs like spray pump	5	5.6
Poor quality pesticides	3	3.3
Expensive labour	17	18.9
Middlemen over cheating by over packing of bags	16	17.7
High competition in orange growing	2	2.2
Expensive transport due to poor roads	7	7.8
Expensive and scarce seedlings	5	5.5
Poor and infertile soils	2	2.2
Fluctuation of prices	9	10.0
Limited information on citrus growing	3	3.3

Fig 3.3: The yellow spot disease that has attacked oranges in Bukedea and Soroti districts



Fig 3.4 A well fenced orange garden to protect against thieves



3.1.16 Suggested solutions to the challenges

Citrus farmers suggested a number of possible solutions to the challenges mentioned above. Notable of these included; government intervention in the provision of affordable pesticides, government's help in the identification and stabilization of the citrus market by setting up a fruit factory in the Teso region, good quality drugs should be enforced in the market (Table 3.12)

Table 3.12: Suggested solutions by the citrus farmers

Challenges	Frequency	Percentage
Government should provide pesticides to farmers at low prices	43	49.4
Dams should be built to help in times of drought	14	16.1
Good and stable prices for oranges should be enforced	6	6.9
Government should provide soft loans to farmers	16	18.4
Government should look out for citrus markets for farmers	41	47.1
Formation of farmers groups for collective marketing	10	11.5
fencing citrus gardens	12	13.8
Government should set up a factory in the area to process citrus	35	40.2
Government should help farmers to identify quality drugs and pesticides for oranges	25	28.7
More training to farmers on how to grow and maintain citrus	22	25.3
Need to acquire for an automatic spray pump at subsidized prices	2	2.3
Roads should be worked on for easy transportation	9	10.3
Intensive research needs to be done on upcoming pests	5	5.7
Weighing scales should be emphasized because buyers over cheat using sacks	4	4.6
Provide seedlings at a low cost	4	4.6
Improve on storage facilities to minimize losses	3	3.4
Government should provide irrigation schemes	3	3.4
Clear linkage between farmers and traders should be established	2	2.3

3.2 AQUACULTURE ENTERPRISE

Fish farming started in Uganda in 1953 with the establishment of Kajjansi Fisheries Experimental Station⁴. It was then widely adopted and by 1968, the number of fish ponds had reached 11,000 covering 410 ha with estimated annual fish production of 800 - 900 metric tons. However, due to political instability in the country, fish farming declined in the 1970s through the 1980s. This left less than 1,000 fish ponds in operation with estimated annual fish production of 30 metric tons. From early 1990s to date, there has been renewed effort by the Government, business organizations, NGOs and donor organizations to revive fish farming through the rehabilitation of the fisheries infrastructure, strengthening of support institutions, and improvement in extension delivery services. By 1992, there were already 29,999 fish ponds in Uganda distributed as follows: western (32%); central (43%); and the rest from other regions⁵. The potential for investment in fish farming exists due to the high demand for fish domestically and internationally, and the dwindling numbers of fish in natural water bodies.

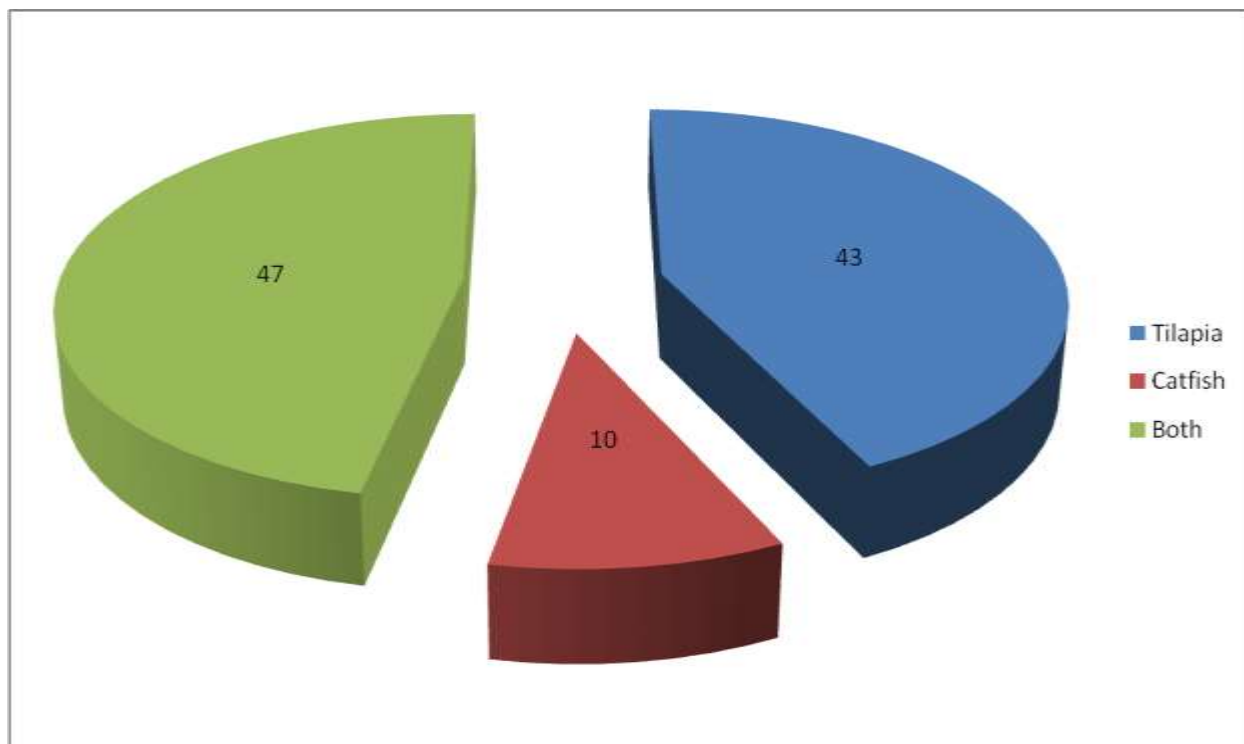
3.2.1 Type of Farmed Fish

The fish farming study was carried out in Mukono and Wakiso districts. A total of 40 farmers were sampled in the two districts. Both catfish and tilapia farmers were sampled for the study. The study involved 17 tilapia farmers (43%), 4 catfish farmers (10%) and 19 farmers (47%) who were both catfish and tilapia farmers (Figure 3.5).

⁴"Investing in Uganda's Fish and Fish Farming Industry." <http://www.ugandainvest.com/fishing.PDF>

⁵ Ministry of Agriculture, Animal Industry and Fisheries. 2001. Agricultural Production Statistics.

Figure 3.5: Type of fish farmers



3.2.2 Number and size of ponds and amount stocked

Fish farmers owned between 1 and 29 ponds with an average farmer owning 6 ponds. Catfish farmers on average owned more ponds (10) compared to tilapia farmers (6) and the farmers who had both tilapia and catfish (5). The ponds owned by aquaculture (cat fish) farmers covered an area ranging from 6500 square metres (m²) to 15,000 m². An average farmer had cat fish ponds covering an area of 8,691 m². The total area of ponds owned by aquaculture (tilapia) farmers ranged from 200 m² to 72,500 m². An average farmer had tilapia fish ponds covering an area of 11,448m². This data is interpreted to mean that most farmers do not own ponds of standard size which is supposed to be 40 m x 30 m (1200 m²). This could be explained by the fact that farmers lacked excavation equipment to construct standard size ponds. The majority of

the ponds are hand dug and they have limitations with manual labor. Besides, there is also lack of knowledge in pond citing, construction and management (Fig 3.6).

Fig 3.6: A poorly constructed and maintained pond.



3.2.3 Current fish input use levels and costs

The variable costs considered for fish farming were cost for breeding stock, feeds, labour for sampling, labour for harvesting, labour for clearing around the ponds, harvesting gear and tools and equipments. The average pond size owned by farmers in this study was found to be 9,955 sq metres. The highest input cost was for breeding stock (Table 3.13)

Table 3.13: Fish input use levels and costs per sq metre

Input	Quantity per sq metre	Unit cost (Ush)	Total cost (Ush/sq meter)	Overall cost (Ush) for total area of the ponds owned
Breeding stock	3	200	600	5,973,000
Feeds (kg)	0.1	2602	260	2,588,300
Hired labour for sampling (man days)	5	9	45	447,975
Hired labour for harvesting (man days)	9	13	117	1,164,735
Hired labour for clearing around the ponds (man days)	12	9	108	1,075,140
Harvesting gear (nets)	3	120	360	3,583,800
Tools and equipment	5	2	10	99,550
Total costs (Ush)			1500	14,932,500

3.2.4 Sources of inputs for fish farmers

Fish farmers obtained inputs from multiple sources. A quarter of farmers (25%) made feeds from their own homes. Reasons advanced for use of home made feeds are expensive feeds on the open market but also the poor quality of the feed sold on the market. However, the major source of feeds to farmers is the input dealers. While the major source of breeding stock was hatcheries, more than a quarter (28%) of farmers raised their own fingerlings (Table 3.14).

Table 3.14: Sources of inputs for farmers

Input	Sources			
	Home made	Nearest input dealer/Hatchery	Input dealer/Hatchery in town	NAADS
Breeding stock	28	45	73	0
Feeds	25	30	30	0

3.2.5 Variable costs for fish enterprises

The variable costs for fish farming included cost of inputs (breeding stock and feeds) and the cost of labor for sampling, harvesting, clearing around the ponds and other costs like transport, harvesting gear, tools and equipment and advisory services.

The major costs incurred by farmers were costs for procuring breeding stock (USh 900 per sq meter for tilapia and Ush 450 for cat fish), costs for harvesting gear (Ush 400 per sq meter for tilapia and 320 for cat fish).

Tilapia farmers incurred higher variable costs (Ush 1,958 per sq meter) than cat fish farmers that incurred Ush 1,114 per sq meter (Table 3.15). The small scale farmers incurred the lowest variable costs per sq meter (Ush 1,379) compared to medium scale farmers that incurred Ush 1,476 and large scale farmers that incurred Ush 1589 per sq metre (Table 3.16).

3.2.6 Incomes from Fish farming

On average, tilapia fish farmers sold about 1.5 kg per sq meter per cycle. It was established that tilapia farmers sold a kilogram at an average of Ush 4,531 to the traders. Cat fish farmers sold an average of 0.4 kg per sq meter at an average price of Ush 6,570 per kg. Study results further indicate that a typical tilapia farmer earned an average of Ush. 6,796 per sq meter compared to Ush 2,628 per cycle for catfish farmers. For the farmers that had both cat fish and tilapia, they earned Ush 4,488 per sq meter (Table 3.15).

Small scale farmers earned the lowest incomes per sq meter (Ush 4,060) compared to their counterparts the medium scale farmers (Ush 4,071) and large scale farmers (Ush 7,540). Large scale farmers were found to sell higher

quantities per sq meter compared to medium scale and small scale farmers (Table 3.16).

3.2.7 Gross margins for farmers by type of fish

Table 3.15 indicates the gross margins earned by fish farmers in Wakiso and Mukono districts. Tilapia farmers earned higher gross margins (USh 4,838 per sq meter) than the cat fish farmers (Ush1,514 per sq meter). This can be explained by the fact that tilapia produces in the water and farmers could have sold more fish per sq meter than they had stocked thus fetching higher gross margins.

Table 3.15: Gross margin analysis by type of fish farmer per sq meter of the pond

Type of Cost	Tilapia	Catfish	Both
Average cost for breeding stock	900	450	550
Average cost for feeds	340	120	280
Average cost for hired labour for sampling	60	30	40
Average cost for hired labour for harvesting	125	98	120
Average cost for hired labour for clearing around the ponds	115	90	160
Average costs for harvesting gear	400	320	340
Average costs for tools and equipment	18	6	7
Total Variable costs (Ush per sq meter)	1,958	1,114	1,497
Unit price (Ush/kg)	4,531	6,570	6,411
Quantity sold (kg per square meter)	1.5	0.4	0.7
Total Revenue (Ush per sq meter)	6,796	2,628	4,488
Gross margin (Ush per sq meter)	4,838	1,514	2,991

3.2.8 Gross margins of fish farmers by size of the enterprise

Fish farmers were categorized by their size. Three categories of farmers were generated that included: small scale farmers (below 3,000 sq meters), medium scale farmers (3,000-10,000 sq meters), and large scale farmers (above 10,000 sq meters). Forty-three (43) percent (17 farmers) were small scale, 35 percent (14 farmers) were medium scale and 22 percent (9 farmers) were large scale. Table 3.16 shows the gross margins of farmers per size of the enterprise.

Table 3.16: Gross margins by size of fish enterprise

Type of Cost	Small scale	Medium scale	Large scale
Average cost for breeding stock	540	580	640
Average cost for feeds	238	256	286
Average cost for hired labour for sampling	34	46	52
Average cost for hired labour for harvesting	107	116	126
Average cost for hired labour for clearing around the ponds	110	103	109
Average costs for harvesting gear	345	370	356
Average costs for tools and equipment	5	5	20
Total Variable costs (Ush per sq meter)	1379	1476	1589
Unit price/kg	4,060	4,071	5,027
Quantity sold per square meter (kgs)	1.1	1.3	1.5
Total Revenue (Ush per sq meter)	4,466	5,292	7,540
Gross margin (Ush per sq meter)	3,087	3,816	5,951

Large scale farmers earned higher gross margins per sq meter of the pond (Ush 5,951) while medium scale farmers earned Ush 3,816 per sq meter. Small scale farmers earned the lowest gross margins (Ush 3,087 per sq meter). The higher

gross margins for large scale farmers can be attributed to higher yields per square meter and higher prices in the market.

3.2.9 Output to input ratio for fish farmers

Generally, the output to input ratios associated with fish farming are high. This is because aquarium establishment costs were not included in the computation of total costs. For this study, it was established that for all types of fish farmers, a profit was made for every unit of inputs used (Table 3.17). Tilapia farmers earned 3.4 units of output for every one unit of inputs. Large scale fish farmers earned the highest as every one unit of inputs used led to four units of output. This in economic sense means that farmers made a profit on every unit of fish inputs used.

Table 3.17: Output to input ratios for the fish farmers by type

Type of farmer	Input costs	Output value	Output-input ratio
Tilapia	1,958	6,796	3.4
Catfish	1,114	2,628	2.3
Both tilapia and catfish	1,497	4,488	2.9
Small scale	1,379	4,466	3.2
Medium scale	1,476	5,292	3.5
Large scale	1,589	7,540	4.7

3.2.10 Return on Investment for fish enterprises

Generally, the output to input ratios associated with fish farming are high. This is because aquarium establishment costs were not included in the computation of total costs. In this study, it was found to be worthwhile for the fish farmers to take up the investment since their ROI is positive. The large scale farmers had the highest return on investment of 370% because they incurred the highest gain on investment per square meter of the fish ponds (Table 3.18).

Table 3.18: Return on Investment for the different types of fish farmers

Type of farmer	Gain on Investment	Cost of investment	Return on investment
Tilapia	6,796	1,958	240%
Catfish	2,628	1,114	130%
Both tilapia and catfish	4,488	1,497	190%
Small scale	4,466	1,379	220%
Medium scale	5,292	1,476	250%
Large scale	7,540	1,589	370%

3.2.11 Returns to family labour

The study established that family labour was used for harvesting and clearing the bushes around the ponds. Family labour was used by small scale, medium scale and the farmers that had both tilapia and catfish. Large scale farmers, tilapia farmers and cat fish farmers did not use family labour. Table 3.19 indicates that medium scale farmers had higher returns to family labour because they invested less hours per square meter and had higher gains on investment.

Table 3.19: Returns to family labour

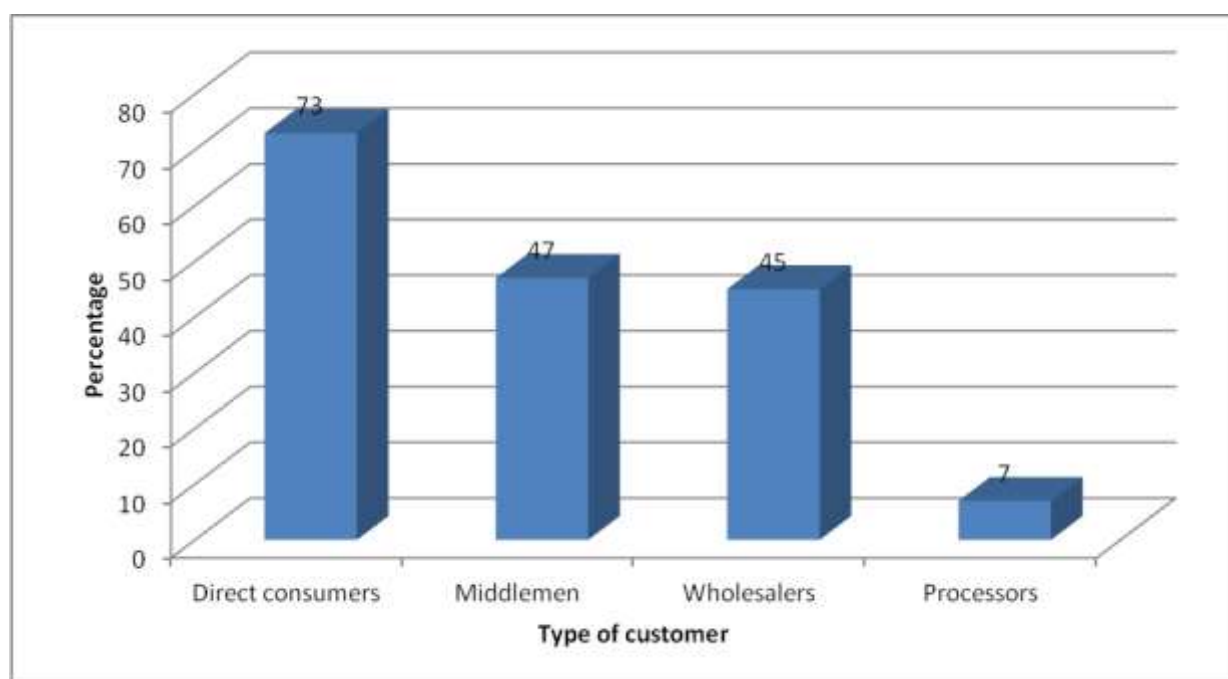
Type of farmer	Gain on Investment	Hours per sq meter	Returns to family labour
Both tilapia and catfish	4,488	0.1	44,880
Small scale	4,466	0.14	31,900
Medium scale	5,292	0.1	52,920

3.2.12 Major markets accessed by fish farmers

Figure 3.7 shows major markets accessed by farmers for fish. The results revealed the majority (73 percent) of the fish farmers sold their fish directly to

consumers. The other markets accessed by fish farmers were: middlemen (47 percent), wholesalers (45 percent) and processors that accounted for 7 percent of the market (Figure 3.7). The study findings established that all the sampled farmers sold their fish in fresh form without any value addition. This probably led to lower prices fetched by the farmers than what they would have got if they had added value before sale.

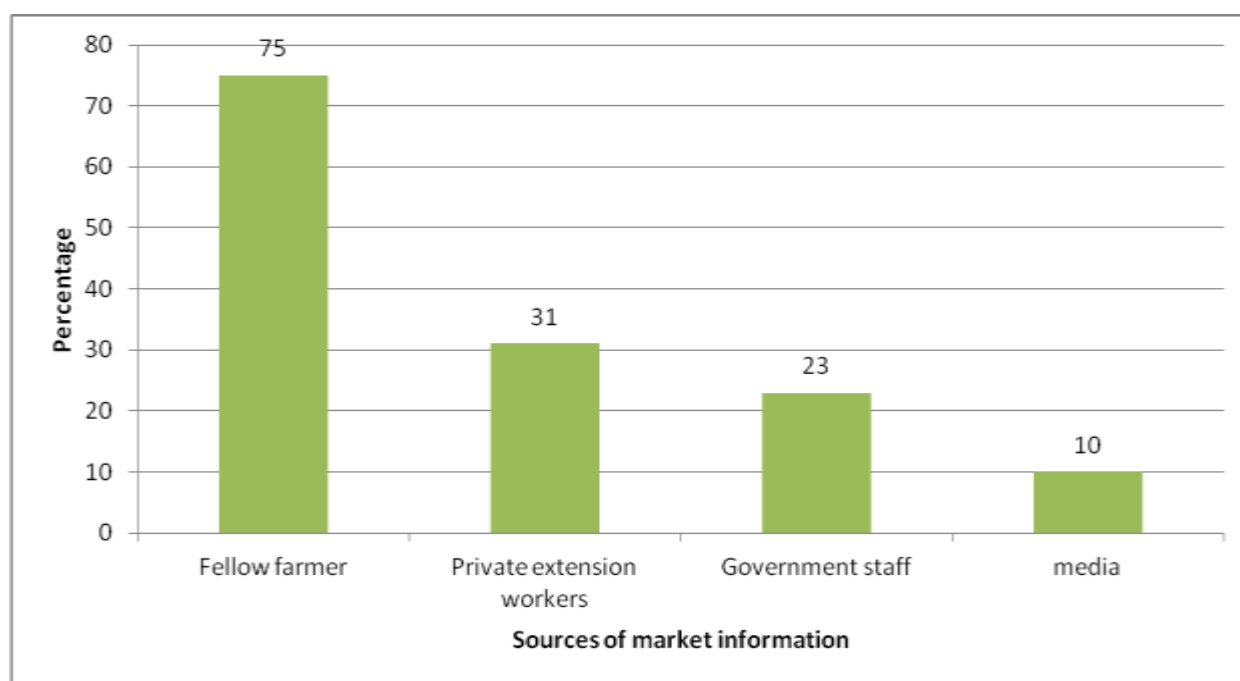
Figure 3.7: Major markets accessed by fish farmers



3.2.13 Sources of Market Information for fish farmers

The majority of the fish farmers got market information from fellow farmers (75%) while 31% got market information from private extension staff. The other sources of market information were government staff and the media like radios and news papers (Figure 3.8).

Figure 3.8: Market information sources for the fish farmers



3.2.14 Challenges to fish production and marketing

Farmers reported a number of challenges that have hindered efficient production and marketing of fish in Mukono and Wakiso districts. Notable of them were the expensive feeds (70%) and predators (65%). The other notable challenges reported included limited market for fish and low price for the fish, poor quality feed and lack of technical knowledge and skills (Table 3.20).

Table 3.20: Challenges faced by the fish farmers

Challenges	Frequency	Percentage
Expensive /high prices for feeds	28	70
Predators	26	65.0
Low price for the produce	13	32.5
Limited market	19	47.5
Government officials arrested their fish for being small in size	2	5.0
Floods	6	15.0
Poor quality breeding stock	2	5.0
Poor quality feed	13	32.5
High labour costs	8	20
Lack of technical knowlege and skill	16	40
Transport costs are high	1	2.5
Price fluctuation	8	20.0
Limited capital to manage the farm	6	15.0
Poor water quality	2	5.0
Low production levels	3	7.5
Theft	1	2.5
Fuel costs are high	7	17.5
Diseases	1	2.5

3.2.15 Suggested solutions to the challenges

Fish farmers suggested improvement on the quality and quantity of extension services offered by the government, setting up fish collection centres and formation of farmer associations, market identification and availing pond cover nets to protect the fish from predators (Table 3.21).

Table 3.21: Suggested recommendations by the fish farmers

Challenges	Frequency	Percentage
Identify specific supplies of feeds	3	7.5
Identify market for the fish farmers	14	35.0
Improve on the extension services offered by government	26	65.0
Set up collective centres and formation of associations for farmers	16	40.0
Put up specific standards and prices for fish	8	20.0
Provision of cover nets	11	27.5
Need for funds/capital in form of soft loans	6	15.0
Train farmers on how to process personal feeds	10	25.0
Need for advertising	6	15.0
Control poor methods of fishing to limit competition	1	2.5
Government should provide feeds to farmers at a cheaper price	5	12.5
Set up a processing plant for farmed fish	1	2.5
Set up demonstration farms	2	5.0
Proper planning so that farmers can meet the demand	1	2.5
Government should set up seed producing centres	4	10.0

3.3 CASSAVA ENTERPRISE

Cassava ranks second to banana in importance among the major food crops in Uganda⁶. It is grown throughout the country by smallholder farmers as a cheap source of food and for income generation. Annual cassava production in Uganda was estimated to be 2.7 million tonnes, grown on an estimated 822,000 hectares in 2011⁷. Its flexibility in the farming and food systems, ability to do well in marginal or stressed environments and apparent resistance/tolerance to diseases and pests, have encouraged cassava rapid spread and adoption throughout the country, especially in eastern and northern regions. Cassava production therefore has potential to increase household incomes, and ensure food security and thus, creating great promise for feeding Uganda's growing population.

3.3.1 Acreage under Cassava

The study established that on average typical cassava farmers cultivated between 0.5 to 5 acres. On average a cassava farmer was found to cultivate 1.6 acres. Farmers from Apac district cultivated more cassava (1.7 acres) than their counterparts in Kiryandongo who cultivated 1.4 acres of cassava.

3.3.2 Current cassava input use levels and costs

The variable costs considered for cassava farming were cost for cassava cuttings, transport for cassava cuttings, labour for land preparation, ploughing, planting, weeding, harvesting, packaging, peeling and drying. The highest cost incurred per acre was cost of harvesting costing Ush 190,703 followed by cost of weeding (Table 3.22).

⁶ IFAD, F. (2005). A review of CAssava in Africa. *Proceedings of the Validation Forum on the Global Development Strategy* (pp. 7-8). Rome: FAO.

⁷ Uganda Bureau of Statistics, UBOS (2012). Statistical Abstract.

Table 3.22: Cassava input use levels and costs per acre

Input	Quantity	Unit cost (Ush/unit)	Total cost (Ush/acre)
Cassava cuttings (bags)	4	14,652	58,611
Transport	1	15,416	15,416
Land preparation (man days)	10	8,071	80,714
Ploughing (man days)	12	9,871	118,461
Planting (man days)	11	10,340	113,750
Weeding (man days)	15	9,325	139,886
Harvesting (man days)	22	8,668	190,703
Packaging (bags)	31	735	22,792
Peeling and drying (man days)	10	3500	35,000
TOTAL			775,333

3.3.3 Sources of inputs for cassava farmers

The results revealed that the only cassava inputs used by the farmers were cassava cuttings and pesticides. The main sources of cassava cuttings were own home (58%) and NAADS (26%). The other sources cassava cuttings were nearest input dealers (11%), fellow farmers (3%) and input dealers in town (2%). Only 2 percent of the farmers used pesticides and they got them from input dealers from town.

Generally, the findings from the study demonstrated that there is limited input resource use by the cassava farmers especially fertilizers/manure and herbicides. Farmers believed that cassava can still grow well without inputs like fertilizers and herbicides.

3.3.4 Variable costs incurred by cassava farmers

The variable costs for cassava included cost of inputs (cassava cuttings) and the cost of labor for land preparation, ploughing, planting, weeding, harvesting and processing). Other costs included packaging material and transportation.

Results indicate that farmers that sold fresh cassava incurred higher variable costs (Ush 740,333). The highest costs incurred by both farmers were harvesting costs (Table 3.24). The lowest cost was transportation cost because cuttings were bought within the village and farmers mostly sold at the farmgate.

Large scale farmers incurred the highest variable costs per acre (Ush 731,738) compared to large scale farmers (Ush 678,799). Small scale farmers incurred the lowest costs per acre amounting to Ush 434,049 (Table 3.25).

There was a significant difference in the variable costs per acre incurred by farmers in Kiryandongo (Ush 733,058) and Apac (Ush 590,286). The highest contribution to these variable costs were costs of harvesting for both Kiryandongo and Apac farmers (Table 3.26).

3.3.5 Income from Cassava production

The study established that 67 percent of cassava farmers sold it in fresh form while 36 percent of the farmers sold cassava in processed form (chips). On average, farmers who sold fresh cassava sold 31 bags at a unit price of Ush 30,733 while farmers that sold processed cassava sold an average of 15 bags at a unit price of Ush 55,000. A bag of fresh cassava was estimated to weigh 150 kg while that of cassava chips weighed 100 kg. Farmers that sold fresh cassava received higher revenues (Ush 952,723 per acre) compared to farmers who sold processed cassava that earned Ush 825,000 per acre (Table 3.24). Farmers that sold fresh cassava complained of over packing of cassava bags that led to losses (Figure 3.9).

Figure 3.9: Bags of fresh cassava ready for the market



Large scale farmers received the highest revenues per acre (Ush 955,823) compare to Ush 524,220 earned by small scale farmers. The higher revenues for large scale farmers are attributed to higher yields coupled with higher prices received (Table 3.25).

Farmers in Kiryandongo received higher revenues per acre (Ush 990,408) compared to Ush 786,120 earned by farmers in Apac. The higher revenues in Kiryandongo are as a result of higher unit prices received (Table 3.26)

3.3.6 Gross margins for farmers by variety of cassava grown

Different cassava varieties were found to be produced by farmers. The major cassava varieties included Local varieties (Nyaraboke and Karangwa) and the improved varieties included NASE 13 and NASE 14. The improved varieties had higher yields and higher gross margins than the local varieties though the price was not significantly different (Table 3.23). The higher yields for improved

varieties are due to the good attributes such as resistance to pests and drought.

Table 3.23: Gross margins per variety of cassava grown per acre

Input name	Local	NASE 13	NASE 14
Cassava cuttings (bags)	50,200	56,000	60,000
Transport	15,000	15,500	15,900
Land preparation (man days)	85,000	84,300	75,000
Ploughing (man days)	121,000	109,000	102,000
Planting (man days)	108,000	123,000	120,500
Weeding (man days)	120,000	137,000	142,500
Harvesting (man days)	179,000	191,700	189,300
Packaging (bags)	20,000	23,000	25,000
Peeling and drying (man days)	36,400	34,000	34,500
Total variable costs (Ush/acre)	734,600	773,500	764,700
Unit price	30,900	30,000	30,100
Quantity sold (bags per acre)	28	32	35
Total revenue (Ush/acre)	865,200	960,000	1,053,500
Gross margins (Ush/acre)	130,600	186,500	288,800
Gross margins (Ush/bag)	4,664	5,828	8,251

3.3.7 Gross margins for farmers by type of cassava sold

Table 3.24 indicates the gross margins earned by farmers in Kiryandongo and Apac districts based on the type of cassava sold. Farmers that sold processed cassava (chips) received higher gross margins per acre (Ush 410,911) compared to their counterparts that sold fresh cassava that received Ush 212,390 per acre. The higher gross margins for farmers that sold cassava chips were as a result of higher value for cassava chips.

Table 3.24: Gross margin analysis for farmers by type of cassava sold

Type of cost	Type of Cassava sold	
	Fresh	Processed
Cassava cuttings	58,611	57,500
Transport	15,416	16,000
Land preparation	80,714	44,000
Ploughing	118,461	76,666
Planting	113,750	40,000
Weeding	139,886	36,857
Harvesting	190,703	80,000
Packaging	22,792	28,066
Peeling and drying (chips)	0	35,000
Total variable costs (Ush per acre)	740,333	414,089
Unit price (Ush per bag)	30,733	55,000
Quantity sold (bags per acre)	31	15
Total Revenue (Ush per acre)	952,723	825,000
Gross margins (Ush per acre)	212,390	410,911
Gross margins (Ush per bag)	6,851	27,394

Note: 1 bag of fresh cassava is 150 kg

1 bag of processed cassava is 100 kg

3.3.8 Gross margins by size of cassava farmers

Cassava farmers were categorized into three groups namely; small scale farmers (0.5-1 acres), medium scale farmers (1.1-2 acres) and large scale farmers (above 2 acres). Results suggested that large scale farmers received the highest gross margins per acre (Ush 224,085) compared to small scale farmers that earned Ush 182,051 per acre. The higher gross margins for large scale farmers were attributed to the higher unit price charged. The lowest gross margins were earned by small scale farmers amounting to Ush 90,171 (Table 3.25).

Table 3.25: Gross margins by size of cassava farmers

Type of cost	Size of farmer		
	Small	Medium	Large
Cassava cuttings	43,333	76,250	60,416
Transport	14,000	0	17,500
Land preparation	45,000	100,000	75,000
Ploughing	75,000	106,666	140,000
Planting	42,000	130,000	91,250
Weeding	82,062	148800	137,722
Harvesting	108,888	103,333	170,600
Packaging	23,766	13,750	39,250
Total variable costs per acre	434,049	678,799	731,738
Unit price	26,211	28,695	30,833
Quantity sold per acre	20	30	31
Total Revenue per acre	524,220	860850	955,823
Gross margins per acre	90,171	182,051	224,085
Gross margins per bag	4,508	6,068	7,228

Note: A bag of fresh cassava is 150 kg

3.3.9 Gross margins of cassava farmers by district

The districts of study were Apac and Kiryandongo. Results of this study indicated that there was a significant difference in the gross margins earned in apac and Kiryandongo districts. Farmers in Kiryandongo earned higher gross margins per acre (Ush 257,350) compared to farmers in Apac that earned Ush 195,834 per acre. Farmers in Kiryandongo received higher unit price (Ush 34,152) thus explaining the higher gross margins (Table 3.26).

Table 3.26: Gross margins of cassava farmers by district

Type of cost	District of farmer	
	Apac	Kiryandongo
Cassava cuttings	54,166	72,500
Transport	17,125	13,333
Land preparation	81,250	57,500
Ploughing	113,750	107,500
Planting	79,642	116,666
Weeding	95,050	125,526
Harvesting	120,300	228,333
Packaging	29,003	11,700
Total variable costs (Ush per acre)	590,286	733,058
Unit price (Ush per bag)	26,204	34,152
Quantity sold (Ush per acre)	30	29
Total Revenue (Ush per acre)	786,120	990,408
Gross margins (Ush per acre)	195,834	257,350
Gross margins (Ush per bag)	6,528	8,874

Note: A bag of fresh cassava is 150 kg

3.3.10 Output to input ratio for cassava farmers

Results indicated that farmers that sold cassava chips received the highest output to input ratio. For every one unit of inputs, these farmers received 1.9 units of output. It should also be noted that since output to input ratios for all categories of farmers were greater than one, then it made economic sense to invest in cassava production though the ratios were small (Table 3.27).

Table 3.27: Output to input ratio of Cassava farmers

Type of farmer	Output	Input	Output to input ratio
Local Variety	865,200	734,600	1.1
NASE 13	960,000	773,500	1.2
NASE 14	1,053,500	764,700	1.3
Fresh cassava seller	952,723	740,333	1.3
Processed cassava seller	825,000	414,089	1.9
Small scale farmer	524,220	434,049	1.2
Medium scale farmer	860,850	678,799	1.3
Large scale farmer	955,823	731,738	1.3
Apac farmer	786,120	590,286	1.3
Kiryandongo farmer	990,408	733,058	1.4

3.3.11 Return on cassava Investment

Farmers that sold cassava chips received the highest returns on investment (90%) compared to small scale farmers who received 20% returns on investment (Table 3.28). However, it was worthwhile for the cassava farmers to take up the investment since their ROI is positive.

Table 3.28: Return on investment for cassava farmers

Type of farmer	Gain	Cost	ROI (%)
Local Variety	865,200	734,600	10
NASE 13	960,000	773,500	20
NASE 14	1,053,500	764,700	30
Fresh cassava sellers	952,723	740,333	30
Processed cassava sellers	825,000	414,089	90
Small scale farmers	524,220	434,049	20
Medium scale farmers	860,850	678,799	30
Large scale farmers	955,823	731,738	30
Apac farmers	786,120	590,286	30
Kiryandongo farmers	990,408	733,058	40

3.3.12 Returns to family labour for cassava farmers

Study results indicated that large scale farmers had highest returns to family labour. For every one hour of family labour invested, a large scale farmer received Ush 18,741 (Table 3.29). This can be attributed to the fact that large scale farmers used more of hired labour than family labour as compared to other categories of farmers.

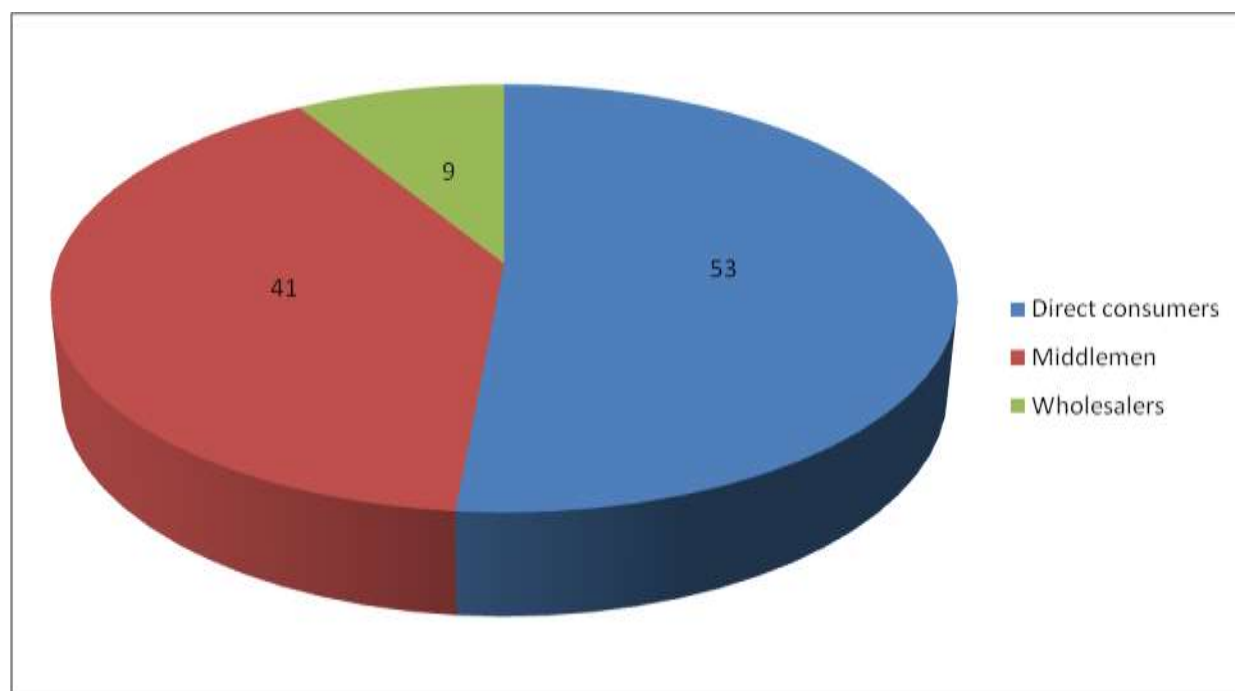
Table 3.29: Returns to family labour by cassava farmers per acre

Type of farmer	Value of citrus	Time (hours)	Returns to family labour
Local Variety	865,200	276	3,134
NASE 13	960,000	149	6,442
NASE 14	1,053,500	135	7,803
Fresh cassava sellers	952,723	297	3,207
Processed cassava sellers	825,000	349	2,364
Small scale farmers	524,220	381	1,376
Medium scale farmers	860,850	301	2,860
Large scale farmers	955,823	51	18,741
Apac farmers	786,120	301	2,612
Kiryandongo farmers	990,408	253	3,913

3.3.13 Major produce markets accessed by cassava farmers

Figure 3.9 shows major produce markets accessed by farmers for cassava. The results revealed that 53% of the cassava farmers sold their produce to direct consumers while 41 percent sold their produce to middlemen. Only 9 percent of the farmers sold to the wholesalers.

Figure 3.9: Major markets accessed by cassava farmers



3.3.14 Sources of Market Information for cassava farmers

Farmers got market information from mainly informal sources. The majority (57%) of them got market information from fellow farmers while 26% got market information from the media. The other sources of market information were government staff and private extension workers (Table 3.30).

Table 3.30: Market information sources for the cassava farmers

Information source	Frequency	Percentage
Fellow farmers	51	57
Media	23	26
Private extension workers	7	8
Government staff	11	12

3.3.15 Challenges to Cassava production and marketing

Farmers reported a number of challenges that have hindered efficient production and marketing of cassava in Apac and Kiryandongo districts. Notable of them were diseases (58%), limited market (41%), labour intensity (28%) and low prices offered by the traders. The other challenges reported included underground rodents, low yielding cassava varieties, lack of funds to buy pesticides (Table 3.31).

Table 3.31: Challenges faced by the cassava farmers

Challenges	Frequency	Percentage
Labour intensive and expensive	24	27.9
Underground rodents	11	12.8
Lack of drying materials	5	5.8
Low prices offered by traders	20	23.3
Diseases affecting the roots	50	58.2
Too much weeds	6	7.0
Limited market for cassava	35	40.7
Prolonged drought	2	2.3
Low yielding cassava varieties	11	12.8
Unstable prices	6	7.0
High transport costs and poor roads	2	2.3
High market costs/dues	4	4.7
Lack of appropriate technology to enable processing	4	4.7
Lack of funds to buy pesticides for farming	11	12.8

3.3.16 Suggested recommendations by cassava farmers

Table 3.32 indicates the recommendations suggested by the cassava farmers in view of the challenges they faced. Since markets appeared to a big challenge facing the farmers, they suggested that the government should help them in the marketing of their cassava. They also sought government intervention to

control and or eliminate the diseases that have affected their cassava. Farmers further implored government to intervene in the introduction of new cassava varieties that are high yielding and disease resistant.

Table 3.32: Suggested recommendations by the cassava farmers

Challenges	Frequency	Percentage
Soft loans should be offered to farmers	13	18.8
Drying materials should be provided	6	8.7
Government t should assist in establishing the market for farmers	32	36.3
Government t should provide measures to control root diseases	24	34.8
Government should provide remedy for rodents	10	14.5
Milling machines should be provided at parish level	14	20.3
Government should provide improved cassava varieties resistant to diseases	22	31.9
Need for group selling and cooperatives	8	11.6
Provision of equipment like tractors	1	1.4
Introduction of herbicides to reduce on weeding costs	3	4.3
Constant government official visits for awareness and sensitization on good farming methods	2	2.9
Need for construction of water centers like boreholes and valley dams	1	1.4
Need to provide farm equipments like ox ploughs to minimize of labor costs	2	2.9
Improve on roads to easy transport	2	2.9
Research aimed at herbicide provision should be carried out	3	4.3
Value addition should be encouraged	2	2.9
Need for market information through media	2	2.9

3.4 GROUNDNUT ENTERPRISE

3.4.1 Introduction

Groundnut is the second most widely grown legume in Uganda after beans. It is widely grown by smallholder farmers in all regions of Uganda, especially eastern and northern regions, for subsistence and income purposes. In 2011, the total output of groundnut was estimated at 327,000 tons from an area of about 409,000 hectares⁸. Farmers in Uganda grow both local and improved varieties of groundnuts. Improved groundnut varieties that have been developed by National Semi-Arid Research Institute (NASARI) at Serere are *Red Beauty* and the *Serenuts* (Serenut 1 – 4). These improved varieties are being promoted among farmers by NAADS. However, *Red Beauty* is more susceptible to diseases, such as Rosette virus than *Serenut* varieties. Climate change impacts (drought and floods) also pose a great challenge to groundnut production with farmers experiencing total losses in severe conditions.

A total of 90 groundnut farmers, 45 from each of the two districts, Soroti and Dokolo, were interviewed in regard to: acreage, costs of production, sources of inputs, produce markets, sources of market information, revenue, challenges that they faced in the groundnut enterprise and their own recommendations to address those challenges. Data provided by farmers were for the first season of 2012 since there was a very poor harvest of groundnuts in the first season of 2013 due to bad weather.

3.4.2 Groundnut variety grown and acreage

A majority (73.3%) of the farmers in Soroti District interviewed were engaged in the production of *Serenut 2* for both food security and sale. Their reasoning was that this variety is drought resistant, non-susceptible to pests and diseases, and above all, high yielding. In sharp contrast, most (77.8%) of the

⁸ Uganda Bureau of Statistics, UBOS (2012). Statistical Abstract.

farmers interviewed in Dokolo District were engaged in the production of *Red Beauty* mainly for commercial purposes because it has the high market demand. However, a small proportion (11.1%) of the farmers in Soroti District was still growing local varieties of groundnuts probably because of lack of improved seed (Table 3.33).

Table 3.33: Groundnut varieties in Soroti and Dokolo districts

Variety	District		Total
	Soroti	Dokolo	
Serenut 2	73.3%	22.2%	47.8%
Red Beauty	15.6%	77.8%	46.7%
Local	11.1%	0.0%	5.6%

In terms of acreage, groundnut farmers in both districts were smallholder farmers with a typical farmer growing 1.55 acres of groundnuts. While the largest farmer had up to 4 acres, farmers' fields varied in size with the smallest one being only 0.5 acre (Table 3.34).

Table 3.34: Acreage under groundnuts in Soroti and Dokolo districts

Acreage	District		Total
	Soroti	Dokolo	
Mean	1.43	1.67	1.55
Minimum	0.5	1	0.5
Maximum	3	4	4

3.4.3 Sources of Inputs for ground nut farmers

The critical input to groundnut production was seed since farmers were not using agrochemicals. In Soroti District, a majority (97.8%) of the farmers used home saved seeds while in Dokolo District, the main source of groundnut seed

was the agro-input dealers as reported by 71.1% of the farmers (Table 3.35). A small proportion (5.6%) of farmers in both districts bought seed from the market.

Table 3.35: Farmers' Sources of Agro-inputs in Soroti and Dokolo districts

Source	District		Total
	Soroti	Dokolo	
Home saved	97.8%	22.2%	60%
Agro-input dealer	24.4%	71.1%	47.8%
Market	2.2%	8.9%	5.6%

Since *Serenut 2* was released by the National Semi-Arid Research Institute (NASARI) at Serere, to mainly the Teso Sub-Region, in the early 2000s, the propagation of its seeds has been through home saving. So most of the groundnut farmers interviewed in Soroti sourced their planting seed through home saving. Other farmers who did not have groundnuts, procured seed from other fellow farmers from the local weekly markets where several farmers take their surplus farm products for sale. In Dokolo, where the majority of the farmers interviewed grew *Red Beauty*, most of them said they procured the seeds from the nearest local input dealers. Asked why they were focusing their attention on the production of *Red Beauty*, though not as high yielding as *Serenut 2*, they revealed that buyers offer an attractive and better price for it than *Serenut 2*.

Across the study districts, it was found that groundnut farmers were not using any pesticides, fertilizers and herbicides in their fields. Only 2 (4%) farmers in Dokolo claimed they applied pesticides on their groundnuts. Perhaps, this is because they lacked the knowledge and skills necessary for the use of these agro-chemicals. They also perceived costs of buying and applying these chemicals to be high. There was also limited or no supply of these chemicals in

farmers' localities. A few even harbored unfounded fears of these chemicals, particularly fertilizers, as aggravating their soil fertility problems in the long run. Training farmers on agrochemical use coupled with improved access to these inputs could increase their adoption.

3.4.4 Produce Markets used by Groundnut Farmers

The majority of farmers in the two districts sold their groundnuts in unshelled form to rural traders and wholesalers in urban centers (Table 3.36). These dealers then processed groundnuts, mainly by shelling, cleaning and bagging, before selling it to urban markets. Some farmers, however, sold the unshelled groundnuts locally to fellow farmers and residents for immediate consumption or as planting seed. Asked why they sold their groundnuts mainly in an unshelled form, many farmers said that shelling was too cumbersome and time consuming when done manually. Moreover, a few existing groundnut shelling machines in farmers' localities were thought to be costly. As if that is not enough, they also claimed that shelling machines damaged groundnut seeds by cracking and thus, lowering its market price. Farmers therefore called for better shelling machines to be fabricated and availed to them so that they could add value to their produce before sale.

Table 3.36: Category of groundnut buyers in Soroti and Dokolo districts

Category of buyer	District		Total
	Soroti	Dokolo	
Direct consumers	40%	28.9%	34.4%
Rural traders	100%	86.7%	93.3%
Wholesalers	60%	73.3%	66.7%
Processors	2.2%	15.6%	8.9%

3.4.5 Profitability of Groundnut Production

Costs associated with groundnut production were estimated through farmers' recall process since none of them kept any farm records. It should quickly be

noted that most farmers used family labor and home-saved seed and so, the costs used in this study are imputed costs. Table 3.37 below shows that the average cost of producing groundnuts in Soroti (Dokolo) district in the first season of 2012 was about Ush 684,640/acre while in Dokolo district, it was Ush 664,660/acre. Ploughing, weeding, and harvesting were costly operations to farmers since they had to be done multiple times (2 or 3 times).

Considering that all output was sold, groundnut production was generally profitable as shown by the positive margins obtained by farmers in both districts, that is Ush 354,530/acre (Ush 24,118/bag) in Soroti district and Ush 269,970/acre (Ush 25,959/bag) in Dokolo district. The attractiveness of groundnut production was because farmers had a bumper harvest in this season. Due to oversupply conditions, prices were low and ranged from Ush 60,000 – 95,000/bag for *Serenut 2* and Ush 65,000-100,000/kg for *Red Beauty*.

Table 3.37: Gross Margins got by groundnut farmers in Soroti and Dokolo districts

	District		Total (N = 90)
	Soroti (n = 45)	Dokolo (n = 45)	
Revenue:			
Output (bags/acre)	14.7	10.4	12.6
Price (Ush/bag)	70,694	89,868	78,325
Total Revenue	1,039,200	934,630	986,900
Costs:			
Land preparation (Ush/acre)	9,395	8,897	9,146
Ploughing (Ush/acre)	146,330	156,300	151,310
Seed (Ush/acre)	66,829	105,880	86,356
Planting (Ush/acre)	20,638	21,000	20,814
Weeding (Ush/acre)	192,060	182,190	187,130
Harvesting (Ush/acre)	211,780	159,990	185,880
Post-harvest (Ush/acre)	18,868	17,869	18,378
Bagging (Ush/acre)	18,740	12,534	15,636
Total Variable Costs (Ush/acre)	684,640	664,660	674,650
Gross Margin (Ush/acre)	354,530	269,970	312,250
Gross Margin (Ush/bag)	24,118	25,959	24,980

Note: 1 bag of unshelled g-nuts = 50 kg

3.4.6 Analysis of Profitability of Groundnut Farmers

3.4.6.1 Profitability of farmers by variety of groundnuts

Profitability of groundnut farmers significantly differed by the type of variety they grew (Table 3.38). *Serenut 2* was the most profitable variety to grow fetching a gross margin of Ush 477,210/acre (Ush 28,575/bag), followed by *Red Beauty* (Ush 178,500/acre or Ush 20,756/bag), and least by the local

varieties (Ush 17,140/acre or Ush 1,823/bag). The only explanation to this finding is that *Serenut 2* was the highest yielding variety with 16.7 bags/acre, followed by the local varieties (9.4 bags/acre), and least by *Red Beauty* (8.6 bags/acre). However, *Red Beauty* commanded a premium price of Ush 98,076/bag compared with *Serenut 2* (Ush 69,915/bag) and the local varieties (Ush 67,872/bag).

Table 3.38: Gross margins got by farmers by variety of groundnuts

	Variety of Groundnuts		
	Local (n = 5)	Serenut 2 (n = 43)	Red Beauty (n = 42)
Revenue:			
Output (bags/acre)	9.4	16.7	8.6
Price (Ush/bag)	67,872	69,915	98,076
Total Revenue	638,000	1,167,580	843,450
Costs:			
Land preparation (Ush/acre)	8,000	9,319	9,103
Ploughing (Ush/acre)	125,000	149,530	156,270
Seed (Ush/acre)	68,700	63,374	111,990
Planting (Ush/acre)	19,600	20,752	21,030
Weeding (Ush/acre)	168,000	189,450	187,030
Harvesting (Ush/acre)	206,000	217,130	151,500
Post-harvest (Ush/acre)	15,000	19,683	17,413
Bagging (Ush/acre)	10,560	21,132	10,614
Total Variable Costs (Ush/acre)	620,860	690,370	664,950
Gross Margin (Ush/acre)	17,140	477,210	178,500
Gross Margin (Ush/bag)	1,823	28,575	20,756

Note: 1 bag of unshelled g-nuts = 50 kg

3.4.6.2 Profitability of groundnut farmers by size of acreage

Profitability of groundnut farmers significantly differed by the size of acreage under groundnut production (Table 3.39). Farmers who had more than 2 acres of groundnuts obtained a gross margin of Ush 494,340/acre (Ush 35,565/bag) while those with less than 1 acre got only Ush 253,400/acre (Ush 19,053/bag). With 1-2 acres of groundnuts, farmers were able to receive Ush 285,470 – Ush 298,530/acre (Ush 22,656 – 24,878/bag). These findings show that economies of scale accrue to groundnut production. Further analysis corroborated the above finding since it was found that unit cost of production were lower for farmers with more than 2 acres, that is Ush 652,260/acre compared to those with 1 acre whose unit costs were Ush 691,080/acre and those with more than 1 acre to 2 acres who spent Ush 664,600. There was no significant difference in average yield across the groups of farmers. Groundnut yields by size of acreage were as follows: less than 1 acre (13.3 bags/acre); 1 acre (12.6 bags/acre); more than 1 to 2 acres (12.0 bags/acre); and more than 2 acres (13.9 bags/acre).

Table 3.39: Gross margins got by groundnut farmers by size of acreage

	Size of Acreage			
	< 1 acre (n = 3)	1 acre (n = 45)	> 1 – 2 acres (n = 32)	> 2 acres (n = 10)
Revenue:				
Output (bags/acre)	13.3	12.6	12.0	13.9
Price (Ush/bag)	64,913	77,504	80,261	82,489
Total Revenue	863,340	976,550	963,130	1,146,600
Costs:				
Land preparation (Ush/acre)	10,200	9,420	8,828	8,655
Ploughing (Ush/acre)	140,000	156,220	149,010	140,000
Seed (Ush/acre)	50,000	85,404	89,627	91,083
Planting (Ush/acre)	20,000	22,316	19,393	18,907
Weeding (Ush/acre)	189,000	190,580	185,860	174,780
Harvesting (Ush/acre)	166,740	191,600	180,420	183,400
Post-harvest (Ush/acre)	18,800	19,730	16,588	18,025
Bagging (Ush/acre)	15,200	15,810	14,874	17,410
Total Variable Costs (Ush/acre)	609,940	691,080	664,600	652,260
Gross Margin (Ush/acre)	253,400	285,470	298,530	494,340
Gross Margin (Ush/bag)	19,053	22,656	24,878	35,564

Note: 1 bag of unshelled g-nuts = 50 kg

3.4.7 Output to input ratio for groundnut farmers

For the groundnut enterprise, output to input ratio is generally above 1.0. This means that for one unit of inputs used, groundnut farmers produced over 1 unit of output. This in economic sense means that farmers made a relatively some profit on every unit of inputs used. Farmers with over 2 acres had the

largest output/input ratio of 1.76 while those producing local varieties had the smallest output/input ratio of 1.03 (Table 3.40).

Table 3.40: Output to Input ratios by type of groundnut farmers

Type of farmer	Output to input ratio
District: Soroti	1.52
Dokolo	1.41
Variety: Local	1.03
Serenut 2	1.70
Red Beauty	1.27
Acreage: < 1 acre	1.43
1 acre	1.41
> 1- 2 acres	1.45
> 2 acres	1.76

3.4.8 Returns on investment in groundnut production

ROI for the groundnut enterprise was generally positive. This implies that it was worthwhile for the groundnut farmers to take up the investment in groundnut production. For example, ROI for farmers with over 2 acres was 76% while for farmers growing the local variety it was only 3% (Table 3.41).

Table 3.41: Return on Investment by type of groundnut farmer

Type of farmer	ROI (%)
District: Soroti	52
Dokolo	41
Variety: Local	3
Serenut 2	70
Red Beauty	27
Acreage: < 1 acre	43
1 acre	41
> 1- 2 acres	45
> 2 acres	76

3.4.9 Returns to family labour

The study established that for all activities including land preparation, ploughing, planting, weeding, harvesting, post-harvest handling and bagging, farmers on average spent about 6 hours per day in the garden. Returns to family labour are highest for farmers with more than 2 acres (Ush 2,952/hour) and lowest with farmers growing the local variety of groundnuts (Ush 1,879/hour) [table 42].

Table 3.42: Returns to family labour by type of groundnut farmers

Type of farmer	Returns to labour (Ush/hour)
District: Soroti	2,407
Dokolo	2,208
Variety: Local	1,879
Serenut 2	2,803
Red Beauty	2,233
Acreage: < 1 acre	2,156
1 acre	2,404
> 1- 2 acres	2,579
> 2 acres	2,952

3.4.10 Sources of Market Information

Most of the farmers in the two districts claimed that they got market information from fellow farmers (98.9%) and the media (83.3%), mainly the local FM radio stations and the local newspapers (Table 3.43). Farmers accessed market information mainly during local weekly market days. A few who travelled to near and far urban centers also obtained market information from there and shared it with their fellow farmers. A significant proportion of farmers reported that they got market information from extension workers working with non governmental organizations (NGOs) and governmental organizations. A small proportion (5.6%) of farmers also claimed that they accessed market information on groundnut prices from market information service (MIS) providers through their mobile phones, though they complained that most of the information was too brief and sometimes outdated.

Table 3.43: Farmers' sources of information in Soroti and Dokolo districts

Source of information	District		Total
	Soroti	Dokolo	
Fellow farmers	100%	97.8%	98.9%
Media	84.4%	82.2%	83.3%
NGOs	28.8%	28.8%	28.9%
Government organizations	57.8%	84.4%	71.1%
Private MIS providers	4.9%	6.3%	5.6%

3.4.11 Challenges faced by Groundnut Farmers

Table 3.44 below shows that the main challenges faced by groundnut farmers in both districts include: Low demand resulting in low prices (97.8%); Labor intensity (96.7%); Costly transportation to markets (87.8%); Low yields (82.2%); adverse weather conditions (80%); and middlemen cheating farmers on prices (61.1%). Other challenges mentioned by at least a quarter of the total number of farmers interviewed were: Lack of drying facilities (45.5%); Difficulty of shelling groundnuts (41.1%), Loss of soil fertility (28.9%); and Inadequate storage facilities (28.9%).

Table 3.44: Challenges faced by farmers in Soroti and Dokolo districts

Production Challenges	District		Total
	Soroti	Dokolo	
Lack of farm power	35.6%	13.3%	24.4%
Adverse weather conditions	77.8%	82.2%	80.0%
Labor intensive	93.3%	100%	96.7%
Inadequate production land	8.9%	15.6%	12.2%
Loss of soil fertility	31.1%	26.7%	28.9%
Low yields	73.3%	91.1%	82.2%
Pest & vermin attacks	17.8%	28.9%	23.3%
Processing Challenges			
Difficulty of shelling gnuts	44.4%	37.8%	41.1%
Lack of processing machines	68.9%	75.6%	72.2%
Lack of drying facilities	42.2%	48.9%	45.5%
Marketing Challenges			
Inadequate storage facilities	31.1%	26.7%	28.9%
Costly transportation to markets	75.6%	100%	87.8%
Low demand/low prices	95.6%	100%	97.8%
Middlemen cheating farmers	62.2%	60.0%	61.1%

High labour costs featured prominently among the challenges affecting groundnut farmers in both Soroti and Dokolo districts. It is costly to hire labour to weed the garden two or three times before good yields can be expected and to harvest groundnuts.

Farmers also complained about adverse and unpredictable weather conditions that have made farming a very big gamble for them. The first planting season of this very year 2013 has hit their investments in the groundnut enterprise very

badly due to a prolonged drought that dried up all their seasonal crops in the gardens leading to poor or no harvests at all. While there might be prolonged droughts some times; other times, there is over-flooding; all these conditions are very unfavorable for groundnut production.

The issue of buyers fixing low and unfavorable prices for farmers was also frequently raised. Groundnut farmers sell their groundnut individually and so, have a low bargaining power compared to traders, especially larger traders. Asymmetry in market information also makes farmers to often get cheated by some unscrupulous traders.

It is also important to note that due to the Karamojong cattle rustling and the protracted civil strife, the study districts lost their primary source of farm power – oxen. Although there have been restocking programmes in these regions, oxen coverage is still low in general. Further, farm implements such as ox-ploughs, hand-hoes, pangas, and sickles are also lacking in many households.

Improper storage facilities such as polythene bags have often led to storage losses due to vermin as well as the deterioration in groundnut quality due to attack by a fungus known as *Aspergillus*. This fungus causes aflatoxins that render groundnut unsuitable for human consumption. The safety of groundnuts in the granary, which has been a traditional store, has also become uncertain due to thieves.

3.4.12 Recommendations by Groundnut Farmers

Following the above challenges, farmers forwarded the following various recommendations as shown in Table 3.45 below. Key among them include: Group marketing for stronger bargaining power (95.6%); Supply of processing machines for value addition (77.8%); Development of new and better varieties of groundnuts (70.0%); Organization of regular farmer trainings for improvements (64.4%).

Table 3.45: Recommendations provided by G-nut Farmers in Soroti and Dokolo districts

Recommendation	District		Total
	Soroti	Dokolo	
Provision of oxen & ploughs	37.8%	20.0%	28.9%
Farmer group labor	53.3%	60.0%	56.7%
Provision of loans & credits	40.0%	51.1%	45.6%
Development of new varieties	68.9%	71.1%	70.0%
Provide production trainings	4.4%	11.1%	7.8%
Soil fertility trainings	42.2%	24.4%	33.3%
Supply of processing machines	75.6%	80.0%	77.8%
Organization of regular trainings	62.2%	66.7%	64.4%
Group marketing of produce	91.1%	100%	95.6%
Provision of drying tarpaulins	33.3%	40.0%	36.7%
Dissemination of market information	26.6%	20.0%	23.3%
Implementation of theft bi-laws with LCs	22.2%	40.0%	31.1%
Availing of agrochemicals	4.4%	4.4%	4.4%

Many farmers interviewed were of the view of forming marketing associations or farmer groups for collective efforts in market research, bulk storage, transportation, distribution and bargaining power for better produce prices. The same forums could also be utilized for bulk purchase and distribution of inputs to farmers aimed at discounts and reduction of input and production costs for farmers. Challenges to these proposals are that farmers still lack sufficient knowledge to form powerful, effective and self-sustaining groups and associations. This requires training of farmers on group formation and management too. Furthermore, farmers also lacked adequate knowledge and basic skills in optimum production, post-harvest handling, storage, processing,

packaging and eventually reasonably profitable marketing. This calls for training of farmers in these aspects.

3.5 POULTRY ENTERPRISE

3.5.1 Introduction

Poultry farming is widely practiced throughout Uganda, especially in the eastern and central regions. Free-range indigenous poultry accounts for 80 percent of poultry production, while 20 percent of poultry production is undertaken under intensive systems⁹. Due to the importance of poultry for meeting Uganda's food needs and recent increasing trends in poultry exports, the poultry sector has been identified by the government as a key sector to benefit from government promotion and assistance for productivity enhancement.

National poultry population was estimated at 47.5 million in 2011¹⁰. In the same year, egg production stood at 27,057 tonnes (807,634 eggs)¹¹. Chickens are raised in all parts of the country and form the main type of poultry kept. But, turkeys, ducks, geese, pigeons and ostriches are also kept in some areas in the country.

3.5.2 Average size of chicken flocks reared by Households

Results from the survey indicate that chicken production in the study area falls in two distinct categories: Broilers and Layers. Commercial production of these exotic chicken is broadly categorized into three: (i) small scale farms – with a stocking level of up to 400 birds; (ii) medium scale – with stocking level of up to 800 birds; and (iii) large scale farmers with a stocking level of over 800 birds.

A majority (60%) of the farmers in both Wakiso and Jinja Districts interviewed were engaged in the rearing of broilers as compared to those rearing layers; 53% in wakiso and 47% in Jinja. The reason for preferring broilers is that they require less capital to start and take a shorter time to dispose of (2 months) unlike layers which require more capital and take longer (5 months) before they begin laying eggs (Table 3.46).

⁹ FAO (2008). Uganda Poultry Sector Country Review Report

¹⁰ Uganda Bureau of Statistics, UBOS (2012). Statistical Abstract.

¹¹ Africa Farming and Food Processing Report (2013).

Table 3.46: Poultry types kept by farmers in Wakiso and Jinja Districts

Poultry Type	District	
	Wakiso	Jinja
Broilers	60%	60%
Layers	53%	47%

Results from this study show that for smallholder farmers rearing the exotic breeds (broilers and layers), the number of layers owned by an average farmer were 843 in Wakiso District and 790 in Jinja District. The number of broilers kept averaged 806 in Wakiso District and 502 in Jinja District.

3.5.3 Current poultry input use levels and costs

The variable costs considered for poultry farming were cost for chicks, feeds, vaccines, dewormers, transport, labour for feeding and husks. The highest cost incurred per bird was cost of feeds amounting to Ush 5,197 per broiler and Ush 54,000 per layer (table 3.47).

Table 3.47: Poultry input use levels and costs per bird

Input name	Input amount per bird		Input cost per unit		Total cost per bird	
	Broilers	Layers	Broilers	Layers	Broilers	Layers
Chicks (owned)	654	818	1,693	2,613	1,693	2,613
Feeds (kgs)	4	47	1,299	1,148	5,197	54,000
Vaccines (litres)	0.0137	0.0124	10,000	10,000	137	124
Dewormers (litres)	0.010	0.016	9,000	9,000	95	149
Transport (shs)	1	1	709	348	709	348
Labour for feeding (man days)	0.09	0.12	8,888	4,841	800	581
Husks (bags)	0.01	0.02	12,600	9,350	126	187
TOTAL					8,757	58,002

3.5.4 Sources of inputs for Poultry farmers

The survey also sought to know the major sources of inputs for poultry farmers in the two districts. The major inputs for which information was collected

included: Day Old Chicks, poultry feeds, and drugs and vaccines. Results from the survey for the major sources of these inputs are shown in Table 3.48 below:

Table 3.48: Source of poultry inputs

Input	Sources of inputs (%)				
	Home made/own	Nearest input dealer/Hatchery	Input dealer/Hatchery in town	NAADS	Fellow farmer
Chicks	5	24	75	0	0
Feeds	5	29	73	0	0
Vaccines	0	22	78	0	0

3.5.5 Variable costs incurred by poultry farmers

The variable costs involved in the poultry study included, costs of chicks, feeds, vaccines, dewormers, transport, labour for feeding, water, husks and charcoal. Results indicate that layer farmers incurred significantly higher variable costs (Ush 58,638 per bird) than the broiler farmers who incurred Ush 8,507 per bird. The highest percentage of the cost went to feeds (Ush 54,000 per bird) for layers and Ush 5,197 per bird for broilers (Table 3.49).

Large scale layer farmers incurred the highest variable costs (Ush 49,121 per bird) compared to medium scale layer farmers that incurred the lowest variable costs (Ush 24,118 per bird). Overall, medium scale broiler farmers incurred the lowest variable costs amounting to Ush 5,310 per bird (Table 3.50).

Layer farmers in Jinja incurred the highest variable costs (Ush 62,834 per bird) with broiler farmers in the same district incurring the lowest variable costs (Ush 6,430 per bird). It was generally observed that layer farmers incurred higher variable costs compared to broiler farmers (Table 3.51).

3.5.6 Incomes from poultry production

The study established that layer farmers earned higher incomes (Ush 68,752 per bird) including eggs compared to broiler farmers (Ush 9,500 per bird). The price for broilers was Ush 9,500 per bird while the price for layers was Ush 10,000 per bird. The unit price for eggs was Ush 7344 per tray (Table 3.49).

Large scale layer farmers received the highest revenue (Ush 59,477 per bird) compared to small scale farmers that received the lowest revenue (Ush 32,700 per bird). Layer farmers generally received higher incomes than their counterparts the broiler farmers. Small scale broiler farmers received the highest revenues amounting to Ush 10,400 per bird compared to medium scale farmers that received Ush 7,833 per bird (Table 3.50).

Layer farmers in Jinja earned higher incomes (Ush 74,000 per bird) compared to Wakiso layer farmers who earned Ush 64,621 per bird. Broiler farmers in Wakiso district earned higher incomes of Ush 10,000 per bird (Table 3.51)

3.5.7 Gross margin analysis by type of poultry farmers

Table 3.49 shows poultry gross margins by type of the farmers. Layer farmers were found to earn higher gross margins (Ush 10,114 per bird) compared to broiler farmers that earned Ush 993 per bird. The reason for higher gross margins for layers is the contribution of eggs and the relatively higher price for off-layers compared to broilers.

Table 3.49: Gross margin analysis by type of poultry farmer per production cycle (2 months for broilers and 17 months for layers)

Type of cost	Type of farmer	
	Broiler	Layer
Chicks	1693	2,613
Feeds	5,197	54,000
vaccines	137	124
Dewormers	95	149
Transport	709	348
Labour for feeding	800	581
Water	130	261
Husks	126	187
Charcoal	174	375
Total variable costs (Ush/bird)	8,507	58,638
Unit price (Ush/bird)	9,500	10,000
Unit price (Ush/tray)		7,344
Quantity of eggs sold (trays of 30 eggs each)		8
Total revenue (Ush per bird)	9,500	68,752
Gross margin (Ush per bird)	993	10,114

3.5.8 Gross margins by size of poultry farmer

Table 3.50 show gross margins of poultry farmers by size (small scale, medium scale and large scale). Results indicate that medium scale layer farmers earned the highest gross margins of Ush 12,502 per bird, compared to small scale layer farmers that earned the lowest Ush 7,653 per bird. This was because medium scale farmers incurred less variable costs than small scale and large scale farmers. For broilers, the highest gross margins (Ush 2,523 per bird) were earned by medium scale farmers. Layer farmers generally earned significantly higher gross margins than the broiler farmers per chicken. This was due to the fact that on top of selling off-layers, layer farmers also sold eggs.

Table 3.50: Gross margins by size of poultry farmer per production cycle (2 months for broilers and 17 months for layers)

Type of cost	Size of farmer					
	Small		Medium		Large	
	Broilers	Layers	Broilers	Layers	Broilers	Layers
Chicks	1,590	2,428	1,740	2,900	1,790	2,605
Feeds	7,109	20,875	2,625	20,216	3,331	45,000
Vaccines	232	365	114	47	43	69
Dewormers	99	33	38	56	134	216
Transport	59	292	68	418	197	356
Labour for feeding	162	500	392	520	1,154	460
Water	165	0	118	39	102	292
Husks	162	309	117	169	83	147
Charcoal	203	245	98	273	222	436
Total variable costs (Ush per bird)	9,781	25,047	5,310	24,638	7,056	49,581
Unit price (Ush/bird)	10400	10,200	7,833	7,300	8272	8,846
Unit price (Ush/tray)		7,500		7,460		7,233
Quantity of eggs sold (trays of 30 eggs each)		3		4		7
Total revenue (Ush per bird)	10,400	32,700	7,833	37,140	8,272	59,477
Gross margins (Ush per bird)	619	7,653	2,523	12,502	1,216	9,896

3.5.9 Gross margins for poultry farmers by district

Layer farmers from Jinja earned more gross margins (Ush 10,596 per bird) compared to their counterparts in Wakiso who earned Ush 8,874 per bird. This was due to the fact that layer farmers sold their offlayers and eggs at a higher price than their counterparts in Wakiso (Table 3.51). Broilers in Wakiso district earned the lowest gross margins of Ush 742 per bird.

Table 3.51: Gross margin analysis of poultry farmers by district per production cycle (2 months for broilers and 17 months for layers)

Type of cost	Type of farmer			
	Wakiso		Jinja	
	Broilers	Layers	Broilers	Layers
Chicks	1,586	2,462	1,800	2,785
Feeds	5,812	51,000	3,671	59,000
Vaccines	154	69	123	174
Dewormers	120	165	79	139
Transport	148	602	72	47
Labour for feeding	902	580	305	570
Water	207	260	111	261
Husks	119	153	132	218
Charcoal	210	496	137	210
Total variable costs (Ush per bird)	9,258	55,787	6,430	63,404
Unit price (Ush/bird)	10,000	8,461	8,352	10,000
Unit price (Ush/tray)		7,020		8,000
Quantity of eggs sold (trays of 30 eggs each)		8		8
Total revenue (Ush per bird)	10,000	64,621	8,352	74,000
Gross margin (Ush per bird)	742	8,874	1,922	10,596

3.5.10 Output to input ratio for poultry farmers

Results indicated that medium scale broiler farmers and medium scale layer farmers received the highest output to input ratio of 1.5 (Table 3.52). For every one unit of inputs, these types of farmers received 1.5 units of output. It should also be noted that since output to input ratios for all categories of farmers were greater than one, then it made economic sense to invest in poultry production though some of the ratios were small.

Table 3.52: Output to input ratio for poultry farmers

Type of farmer		Output	Input	Output input ratio
Broiler farmers		9,500	8,507	1.1
Layer farmers		68,752	58,638	1.2
Small scale	Broilers	10,400	9,781	1.1
	Layers	32,700	24,547	1.3
Medium scale	Broilers	7,833	5,310	1.5
	Layers	37,140	24,118	1.5
Large Scale	Broilers	8,272	7,056	1.2
	Layers	59,477	49,121	1.2
Wakiso	Broilers	10,000	9,258	1.1
	Layers	64,621	55,207	1.2
Jinja	Broilers	8,352	6,430	1.3
	Layers	74,000	62,830	1.2

3.5.11 Return on investment for poultry farmers

Medium scale farmers received the highest returns on investment (50%) compared to general broiler farmers, small scale broiler farmers and Wakiso broiler farmers who received ROI of 10% (Table 3.53). However, it was worthwhile for the poultry farmers to take up the investment since their ROI is positive.

Table 3.53: Return on investment for poultry farmers

Type of farmer		Gain	Cost	ROI (%)
Broiler farmers		9,500	8,507	10
Layer farmers		68,752	58,638	20
Small scale	Broilers	10,400	9,781	10
	Layers	32,700	24,547	30
Medium scale	Broilers	7,833	5,310	50
	Layers	37,140	24,118	50
Large Scale	Broilers	8,272	7,056	20
	Layers	59,477	49,121	20
Wakiso	Broilers	10,000	9,258	10
	Layers	64,621	55,207	20
Jinja	Broilers	8,352	6,430	30
	Layers	74,000	62,830	20

3.5.12 Returns to family labour for poultry farmers

Generally, layer farmers received the highest returns to family labour. For every hour of family labour invested in layer production, farmers got Ush 137 per bird. This means that for every one hour invested in the poultry business, the layer farmer got Ush 137. The reason advanced for this was the higher prices for offlayers and the sale of eggs. Medium scale broiler farmers got the lowest returns on family labour equivalent to Ush 70 per hour per bird (Table 3.54). This was due to the low prices received per broiler in this category.

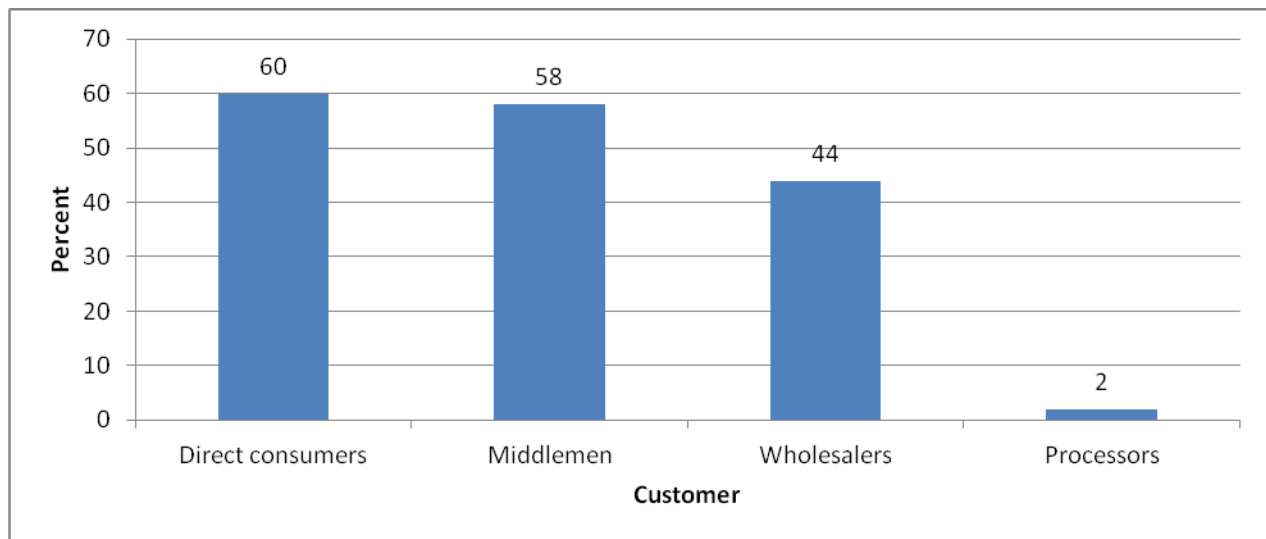
Table 3.54: Returns to family labour for poultry farmers

Type of farmer		Value of poultry (Ush/bird)	Time (hours)	Returns to labour (Ush/hour/bird)
Broiler farmers		9,500	100	95
Layer farmers		68,752	500	137
Small scale	Broilers	10,400	120	87
	Layers	32,700	378	87
Medium scale	Broilers	7,833	112	70
	Layers	37,140	458	81
Large Scale	Broilers	8,272	105	79
	Layers	59,477	600	99
Wakiso	Broilers	10,000	96	104
	Layers	64,621	460	140
Jinja	Broilers	8,352	126	66
	Layers	74,000	640	116

3.5.13 Markets used by poultry farmers

The majority of the farmers (60 percent) sold their poultry directly to consumers (Figure 3.10). This was because most of the farmers visited had outlets in towns from where they sold their poultry and eggs. A very small proportion (2%) of the farmers sold to processors. This was because of the small quantities of birds produced by the farmers.

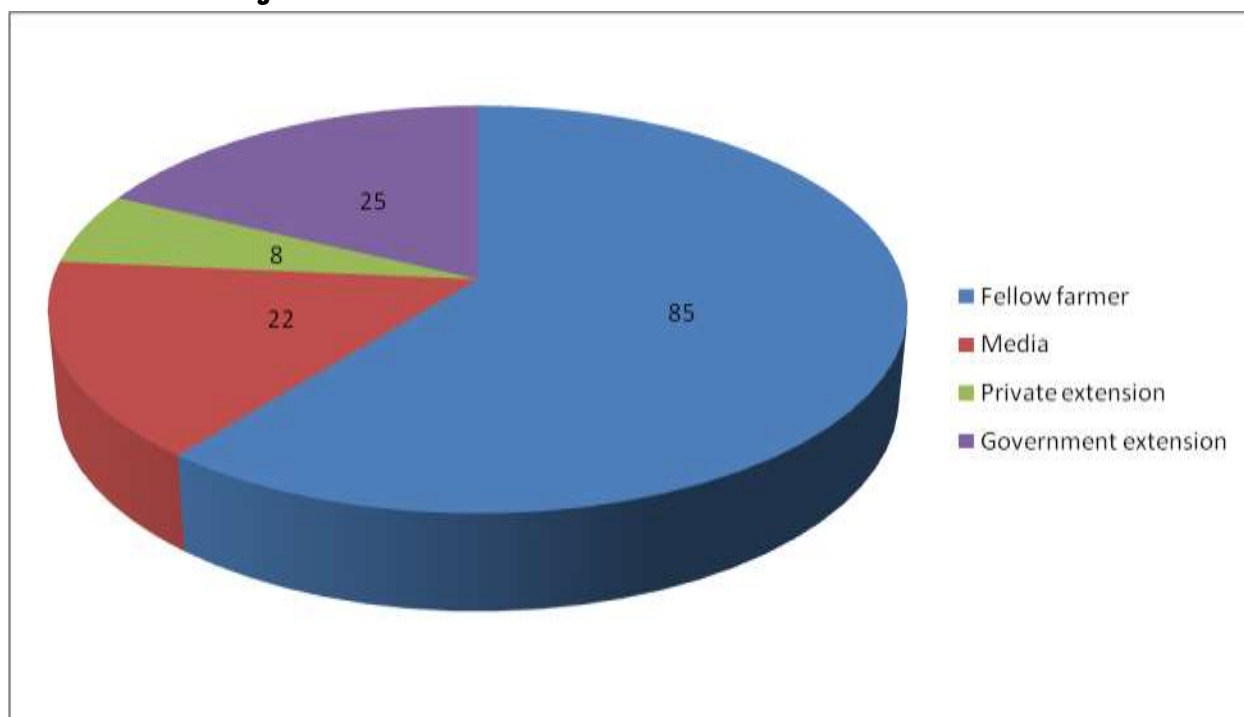
Fig 3.10: Types of market accessed by the poultry farmers



3.5.14 Sources of market information

The survey investigated the major sources of market information to farmers in the districts of study. The majority of the farmers received market information from fellow farmers (85 percent). The other major source of market information for the farmers (25 percent) was the media especially the FM radios (Figure 3.11).

Figure 3.11: Major sources of market information for poultry farmers in Wakiso and Jinja Districts



3.5.15 Challenges to poultry production and marketing

The major challenges faced by poultry farmers in the two districts include the high cost of feeding, lack of quality chicks, diseases, poor quality feeds as shown in Table 3.55.

Table 3.55: Challenges faced by poultry farmers

Challenge	Wakiso	Jinja
Expensive chicks	10	3
Diseases	58	58
Expensive vaccines	13	34
Poor quality feeds	27	20
Poor quality breeds	17	6
Fluctuating prices	13	34
Expensive feeds	62	65
Deaths	3	13
Expensive labour	20	13
High transport costs	13	3

Results show that expensive feeds (62%) in Wakiso and 65% in Jinja are a major constraint to poultry farming in the two districts. Farmers have resorted to alternative feeds like vegetable leaves in order to reduce on the costs (fig 3.12).

Fig 3.12: Poultry being fed on vegetable leaves



Diseases were the second most prevalent challenge to poultry farmers (58%) in both districts. Due to expensive vaccines, farmers cannot afford them in time and right quantities. These diseases have led to high poultry losses leading to reduced profitability.

Other constraints reported by farmers include included expensive vaccines, fluctuating prices, expensive labour and high transport costs.

3.5.16 Recommendations by the poultry farmers

Farmers in a bid to rectify the challenges mentioned above, they suggested recommendations which they thought that if effected well, they would overcome their poultry farming challenges.

The majority (53%) of the farmers in Wakiso suggested farmer associations which would help to bargain for higher prices. In Jinja district, 40 percent of the farmers suggested training of the farmers in poultry management skills for better profitability. The other recommendations suggested by the farmers included; regulatory body to standardize quality of breed and feeds, providing feeds at a relatively cheaper price, providing loans at low interest rates, standardizing prices for poultry products and creating a direct linkage between farmers and traders (Table 3.56)

Table 3.56: Recommendations from farmers

Recommendation	Wakiso	Jinja
Farmer associations to bargain for higher prices	53	28
Regulatory body to standardize the quality of feeds & breed	46	16
Provide feeds to farmers at low prices	15	0
Training of farmers in poultry management	38	40
Provide loans to farmers at low interest rate	19	8
Standardize prices for poultry products	30	20
Create a direct link between traders and farmers	15	20

3.5.17 Conclusion and recommendations for poultry

Although the enterprise exhibited a positive gross margin and therefore a profitable enterprise, this margin is still very low especially for broilers. Most

poultry famers sold their poultry products directly to consumers. Generally, most famers obtained market information from fellow farmers. This was considered to be not good source of market information. Therefore, imperfect markets do exist where most farmers lack market information which prevents the smallholder farmers to fully benefit from prospective increase in prices of agricultural produce that would have otherwise enhanced their gross margins.

Sensitivity Analysis results show that that the cost of feeds is very crucial in the gross the profitability of the poultry enterprise. A small percentage change in the cost of feeds greatly affects the gross margin (profitability) of the poultry enterprise. Farmers must ensure cheaper and reliable sources of feeds if they to make profits in this sector. The major challenges to poultry farming in the study area were the high cost of inputs, diseases, poor breeds of DOCs and expensive transport.

3.5.18 Recommendations for poultry

Financial support in this industry will be of great importance due to its capital intensity. Financial support is greatly required to meet the following financial needs for the poultry sub-sector/poultry producers: Establishing of adequate poultry houses, water supply, electricity and drainage and managing effluents, funds for purchase of initial stocks, feeds and operational cost (labour), investing in adequate veterinary medicines and provision of adequate feeds for the birds, establishment of poultry processing facilities and cold-chain storage, etc. There thus need to:

- Assist in capacity building of farmers groups and entrepreneur management skills.
- Assist poultry SME entrepreneurs with low interest loans
- Assist poultry producers with market linkages and assist with developing marketing strategies for wholesaling and retailing of poultry products.

- Organization of farmers into groups, which can be used as focal points for contract farming, input supply credit, produce -price negotiation and provision of advisory services.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Generally, production of the five (5) selected enterprises (citrus, cassava, aquaculture, groundnuts, and poultry) is profitable in Uganda. However, profitability of these enterprises significantly differed by area of study, type of technology used, and scale of the farmer. The observed variation in profit is brought by differences in market prices, yields and variable costs of production.

Citrus farmers in Soroti district earned more annual gross margins (Ush 7,553,802/acre) than their counterparts in Bukedea who earned an average of Ush 5,428,491/acre. This could probably be attributed to the higher yields obtained by citrus farmers in Soroti as well as higher prices prevailing in Soroti. Citrus profitability also varied by type of citrus grown, production technology package, and size of farmer. Farmers who grew Valencia had the highest incomes (Ush 10,950,000/acre) compared to those that grew Washington (Ush 8,800,000/acre) and Hamlin (Ush 8,229,000/acre). With high use of inputs (organic manure, fertilizers, herbicides and pesticides), citrus farmers obtained a gross margin of Ush 7,836,000/acre), while those farmers who used a combination of organic manure and pesticides only earned a gross margin of Ush 5,540,000/acre). In terms of scale, Large scale farmers received the highest gross margins (Ush 7,663,680/acre) than Medium scale farmers (Ush 6,812,750/acre) and Small scale farmers (Ush 5,978,442/acre). This is explained by the fact that there were yield differences with the large scale farmers having the highest yields of 220 bags per acre.

On average, fish farmers raising both types of fish (tilapia and catfish) received a gross margin of Ush 2,991 per sq meter of the pond. However, tilapia farmers earned higher gross margins (Ush 4,838 per sq meter) than the cat fish farmers with Ush 1,514 per sq meter. This can be explained by the fact that tilapia produces in the water and farmers could have sold more fish per sq meter than

they had stocked and thus, fetching higher gross margins. There were some economies of scale to fish farming. Small scale farmers earned higher gross margins (Ush 3,087 per sq meter), Medium scale farmers earned Ush 3,816 per sq. meter, while large scale farmers earned Ush 5,951 per sq. meter. The higher gross margins for large scale farmers can be attributed to higher yields obtained per square meter.

Cassava farmers in Kiryandongo earned higher gross margins (Ush 257,350/acre) compared to those in Apac who obtained Ush 195,834 per acre owing to higher prices prevailing in the former district. It was more profitable for farmers to grow improved than local varieties: local variety (Ush 130,600/acre); NASE 13 (Ush 186,500/acre); and NASE 14 (Ush 288,800/acre). Farmers who sold cassava chips generally received higher gross margins (Ush 410,911/acre) compared to their counterparts that sold fresh cassava with Ush 212,390 per acre. The higher gross margins for farmers that sold processed cassava were as a result higher unit prices charged. On average, farmers sold about 31 bags of fresh cassava (each bag weighing about 150 kg) at an average price of Ush 30,733/bag. While, farmers who dealt in cassava in processed form, sold 15 bags each bag weighing 100 kg, at an average unit price of Ush 55,000. There were economies of scale to cassava production. Large scale farmers received the highest gross margin (Ush 224,085/acre) compared to medium scale farmers with Ush182,051 per acre and small scale farmers who obtained Ush 90,171/acre.

Groundnut production was profitable in both Soroti district (Ush 354,530/acre) and in Dokolo district (Ush 269,970/acre). The attractiveness of groundnut production was because farmers had a bumper harvest in this season. Profitability of groundnut farmers significantly differed by the type of variety they grew. *Serenut 2* was the most profitable variety to grow fetching a gross margin of Ush 477,210/acre (Ush 28,575/bag), followed by *Red Beauty*

(Ush 178,500/acre or Ush 20,756/bag), and least by the local varieties (Ush 17,140/acre or Ush 1,823/bag). The only explanation to this finding is that *Serenut 2* was the highest yielding variety. Profitability of groundnut farmers also significantly differed by the size of acreage under groundnut production. Farmers who had more than 2 acres of groundnuts obtained a gross margin of Ush 494,340/acre (Ush 35,565/bag) while those with less than 1 acre got only Ush 253,400/acre (Ush 19,053/bag). With 1-2 acres of groundnuts, farmers were able to receive Ush 285,470 – Ush 298,530/acre (Ush 22,656 – 24,878/bag). These findings show that economies of scale accrue to groundnut production.

Poultry farmers who kept layers in Jinja generally earned significantly higher gross margins (Ush 10,596/bird) than those in Wakiso (Ush 8,874/bird). Likewise, broiler farmers in Jinja were more profitable than those in Wakiso, that is, Ush 1,922/bird versus Ush 742/bird. The reason for higher gross margins obtained by farmers who reared layers is the contribution of eggs and the relatively higher price for off-layers compared to broilers. On consideration of scale of farmer keeping layers (broilers), medium scale farmers earned the highest gross margins of Ush 12,502/bird compared to large scale farmers with Ush 9,896/bird and small scale farmers that earned the lowest margin of Ush 7,653/bird.

In order to improve the profitability of farmers, the following recommendations are forwarded:

4.2 Recommendations

- **Increase productivity of farmers.** Rise in productivity of farmers is necessary for the realization of larger surpluses for sale. This can be achieved through:

- There is need for government to widely distribute better yielding varieties for the enterprises under the study. Farmers complained of low yielding varieties especially for cassava that affected their gross margins.
 - The study established that there was a general problem of pests and diseases across the five enterprises. Yet, farmers did not know how to control some of the diseases, for example, yellow spot disease in citrus. Training of farmers about disease control mechanisms would lead to increased yields.
 - Most of the areas visited for the study (e.g. Bukedea, Soroti, Dokolo and Apac districts) were prone to climate change impacts – drought and flooding. Farmers need to be encouraged to adopt climate change mitigation strategies, such as early planting, soil and water conservation, planting drought resistant varieties. Also, need to be provided with timely and accurate production information. Establishment of early warning systems is very critical to guide farmers' decision making.
- **Increase the value of farmers' produce.** Farmer empowerment and value addition in all enterprises lead to higher prices obtained by farmers. This can be done through:
 - Government through its departments like NAADS should intensify farmers' trainings on value addition. Across all enterprises, farmers did not add value to their products before sale. This resulted into low prices offered to farmers which significantly reduced their gross margins.

- Provide farmers with primary processing equipment to add value to their produce at the farm level, for example: Citrus juice extractors, groundnut shellers, groundnut paste makers, cassava chip makers.
 - Establish modern processing plants for secondary and tertiary processing of farmers' produce, such as citrus juice extraction and packaging, cassava starch processing plant.
 - Most of the farmers reported that they received market information from fellow farmers. This information in many instances could turn out to be unreliable. Provision of farmers with timely and accurate market information would enable them to bargain for better prices and/or search for better paying markets for their produce.
 - Promote collective marketing among farmers to increase their bargaining power and access to higher paying markets.
 - Support farmers to produce high quality products that fetch higher market prices through: training in proper postharvest handling practices and provision of postharvest handling equipment, such as tarpaulins for cassava drying.
- **Decrease costs of production and marketing.** Production and marketing costs incurred by farmers can be reduced in various ways:
 - Expensive inputs like fertilizers, pesticides, herbicides, and feeds hindered the realisation of higher gross margins. Mechanisms that would reduce input prices for example reduced taxes, reduced electricity tariffs for production and other incentives should be put in place.

- Promote collective procurement and marketing among farmers. There is urgent need for organization of farmers into groups, which can be used as focal points for input supply and produce bulking that would ultimately lead to lower unit costs of input procurement and output marketing.
- Provide farmers with labour saving technologies to cut down on their production and marketing costs. These include: oxen/ox plough, ox carts etc.
- There is need for infrastructural development especially roads for easier and cheaper transportation of farmers' produce. Farmers are constrained by expensive and unreliable transport due to poor roads.

Appendix 1: Field Questionnaires

i. Household Assessment Tool for Ground Nut Enterprise in Soroti and Dokolo Districts

Name _____ of _____ enumerator _____
 Date _____

Farmer's level

1. Bio data

District	
Sub-county	
Parish	
Village	
Name of farmer	
Phone Number	

2. Costs of production and revenues

Give production costs and income (revenue) for ground nuts enterprise by category from land opening to marketing.

How many acres did you grow last completed season? _____ Acres

VARIABLE COSTS					
Input	Type	Unit of measure	Quantity	Unit cost (UShs)	Total cost (UShs)
A: Inputs					
Seed/seedlings					
Manure					
Fertilizers					
Herbicides					
Pesticides					
Transport					
Mulch					
Sub-total (A)					
B: Labour					
Land preparation	Family	____ day			
	Hired				
Ploughing	Family	____ day			

		s			
	Hired				
Planting	Family	____ day s			
	Hired				
Fertilizer application	Family	____ day s			
	Hired				
Weeding	Family	____ day s			
	Hired				
Herbicide application	Family	____ day s			
	Hired				
Harvesting	Family	____ day s			
	Hired				
Post-harvest handling ¹²	Family	____ day s			
	Hired				
Sub-total (B)					
C: Others					
Water					
Packaging material					
Advisory services					
Sub-total (C)					
Total Variable Costs (TVC) = (A+B+C)					
Total Variable Costs per season (TVCacre⁻¹) = (A+B+C)/Number of acres under the crop					
REVENUE (INCOME)					
Product	Form of product	Unit of measure	Quantity	Unit cost (UShs)	Total income (UShs)

¹² Sorting, bagging, drying

Total Revenue (TR)					
Total Revenue per acre (TRacre⁻¹) = TR/Number of acres					
Total Gross Margin (GM) for the farmer's crop enterprise = TR - TVC					
GM per acre = TRacre⁻¹ - TVCacre⁻¹					

3. Sources of Inputs

What are the main sources of the inputs? Tick as appropriate

	Home saved or generated	Nearest input dealer	Input dealer in the city/town	Other (specify)
Seed/seedlings				
Fertilizers/Manure				
Herbicides				
Pesticides				

4. Produce markets

What are the main markets for the produce? Tick as appropriate

Market	
Direct consumers	
Middle men (small scale)	
Wholesalers (bulk quantities)	
Processors	

5. Sources of Market Information

What are the main sources of market information? Tick as appropriate

Source	
Fellow farmers	
Media (e.g Newspapers, Radio)	
Private Extension workers	
Government staff	
Private Service providers (e.g mobile phones, out-grower contractors)	

6. Challenges

What are the three major challenges faced at different levels (production, processing, and marketing)?

Levels	Challenge
--------	-----------

Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

7. Recommendations

What do you suggest as measures for improvement at the different levels (production, processing, and marketing)?

Levels	Measure to address challenges in 6 above
Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

Thank you for your responses.

ii. Household Assessment Tool for Cassava Enterprise in Kiryandongo and Apac Districts

Enumerator's name _____

Date _____

Farmer's level

1. Bio data

District	
Sub-county	
Parish	
Village	
Name of farmer	
Phone number	

2. Costs of production and revenues

Give production costs and income (revenue) for ground nuts enterprise by category from land opening to marketing.

How many acres did you grow last completed season? _____ **Acres**

VARIABLE COSTS					
Input	Type	Unit of measure	Quantity	Unit cost (US\$)	Total cost (US\$)
A: Inputs					
Cassava cuttings					
Manure					
Fertilizers					
Herbicides					
Pesticides					
Transport					
Mulch					
Sub-total (A)					
B: Labour					
Land preparation	Family	____ days			
	Hired				
Ploughing	Family	____ days			
	Hired				

Planting	Family	____ day s			
	Hired				
Fertilizer application	Family	____ day s			
	Hired				
Weeding	Family	____ day s			
	Hired				
Herbicide application	Family	____ day s			
	Hired				
Harvesting	Family	____ day s			
	Hired				
Post-harvest handling ¹³	Family				
	Hired	____ day s			
Sub-total (B)					
C: Others					
Water					
Packaging material					
Advisory services					
Sub-total (C)					
Total Variable Costs (TVC) = (A+B+C)					
Total Variable Costs per season (TVCacre⁻¹) = (A+B+C)/Number of acres under the crop					
REVENUE (INCOME)					
Product	Form of product (Fresh, Chips or flour)	Unit of measure	Quantity	Unit cost (UShs)	Total income (UShs)

¹³ Sorting, bagging, drying

Total Revenue (TR)					
Total Revenue per acre (TRacre⁻¹) = TR/Number of acres					
Total Gross Margin (GM) for the farmer's crop enterprise = TR - TVC					
GM per acre = TRacre⁻¹ - TVCacre⁻¹					

3. Sources of Inputs

What are the main sources of the inputs? Tick as appropriate

	Home saved or generated	Nearest input dealer	Input dealer in the city/town	Other (specify)
Cassava cuttings				
Fertilizers/Manure				
Herbicides				
Pesticides				

4. Produce markets

What are the main markets for the produce? Tick as appropriate

Market	
Direct consumers	
Middle men (small scale)	
Wholesalers (bulk quantities)	
Processors	

5. Sources of Market Information

What are the main sources of market information? Tick as appropriate

Source	
Fellow farmers	
Media (e.g Newspapers, Radio)	
Private Extension workers	
Government staff	
Private Service providers (e.g mobile phones, out-grower contractors)	

6. Challenges

What are the three major challenges faced at different levels (production, processing, and marketing)?

Levels	Challenge
Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

7. Recommendations

What do you suggest as measures for improvement at the different levels (production, processing, and marketing)?

Levels	Measure to address challenges in 6 above
Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

Thank you for your responses.

iii). Household Assessment Tool for Citrus in Bukedea and Soroti Districts

Name _____ of _____ enumerator _____
Date _____

Farmer's level

1. Bio data

District	
Sub-county	
Parish	
Village	
Name of farmer	
Phone number	

2. Costs of production and revenues

Give production costs and income (revenue) for each enterprise, by category from land opening to marketing.

How many acres did you grow/have last completed season?
_____ **Acres**

VARIABLE COSTS					
Input	Type	Unit of measure	Quantity	Unit cost (US\$)	Total cost (US\$)
A: Inputs					
Seed/seedlings					
Manure					
Fertilizers					
Herbicides					
Pesticides					
Transport from the garden					
Transport to the market					
Mulch					
Sub-total (A)					
B: Labour					
Land preparation	Family	____ days			
	Hired				
Ploughing	Family	____ days			

	Hired				
Planting	Family	___ day s			
	Hired				
Fertilizer application	Family	___ day s			
	Hired				
Weeding	Family	___ day s			
	Hired				
Herbicide application	Family	___ day s			
	Hired				
Harvesting	Family	___ day s			
	Hired				
Post-harvest handling ¹⁴	Family	___ day s			
	Hired				
Sub-total (B)					
C: Others					
Water					
Packaging material					
Advisory services					
Sub-total (C)					
Total Variable Costs (TVC) = (A+B+C)					
Total Variable Costs per Acre (TVCacre⁻¹) = (A+B+C)/Number of acres under the crop					
REVENUE (INCOME)					
Product	Form of product	Unit of measure	Quantity	Unit cost (UShs)	Total income (UShs)
Total Revenue (TR)					

¹⁴ Sorting, bagging, drying

Total Revenue per acre (TRacre⁻¹) = TR/Number of acres					
Total Gross Margin (GM) for the farmer's crop enterprise = TR - TVC					
GM per acre = TRacre⁻¹ - TVCacre⁻¹					

3. Sources of Inputs

What are the main sources of the inputs? Tick as appropriate

	Home saved or generated	Nearest input dealer	Input dealer in the city/town	Other (specify)
Seed/seedlings				
Fertilizers/Manure				
Herbicides				
Pesticides				

4. Produce markets

What are the main markets for the produce? Tick as appropriate

Market	
Direct consumers	
Middle men (small scale)	
Wholesalers (bulk quantities)	
Processors	

5. Sources of Market Information

What are the main sources of market information? Tick as appropriate

Source	
Fellow farmers	
Media (e.g Newspapers, Radio)	
Private Extension workers	
Government staff	
Private Service providers (e.g mobile phones, out-grower contractors)	

6. Challenges

What are the three major challenges faced at different levels (production, processing, and marketing)?

Levels	Challenge
Production	1
	2
	3

Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

7. Recommendations

What do you suggest as measures for improvement at the different levels (production, processing, and marketing)?

Levels	Measure to address challenges in 6 above
Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

Thank you for your responses

***iv) Household Assessment Tool for Aquaculture (Tilapia and Cat Fish)
Enterprises in Mukono and Wakiso Districts***

Name _____ of _____ enumerator _____
Date _____

Farmer's level

1. Bio data

District	
Sub-county	
Parish	
Village	
Name of farmer	
Phone number	

2. Costs of production and revenues per cycle

Give production costs and income (revenue) for each enterprise, by category from pond construction to marketing.

How many ponds did you have last year _____

What area of fish pond(s) did you have last year? _____ (Number of square metres)

VARIABLE COSTS					
Input type	Type	Unit of measure	Quantity	Unit cost (UShs)	Total cost (UShs)
A: Inputs					
Breeding stock (fingerlings)					
Feeds					
Transport					
Sub total (A)					
B: Labour					
Sampling	Familys	___day			
	Hired				
Harvesting	Familys	___day			
	Hired				

Clearing around the ponds	Family	____ day			
	Hired				
Sub-total (B)					
C: Others					
Harvesting gear					
Tools & Equipment					
Advisory services					
Sub-total (C)					
Total Variable Costs (TVC) =(A+B+C)					
Total Variable Costs per square metre (TVCm⁻²) = (A+B+C)/Number of square metres					
REVENUE (INCOME)					
Product	Form of product	Unit of measure	Quantity	Unit cost (US\$)	Total income (US\$)
Tilapia					
Cat fish					
Total Revenue (TR)					
Total Revenue per square metre (TRm⁻²) = TR/Number of Squares metres of the pond(s)					
Total Gross Margin (GM) for the farmer's aquaculture enterprise= TR - TVC					
GM per m² = TRm⁻² - TVCm⁻²					

3. Sources of Inputs

What are the main sources of the inputs? Tick as appropriate

	Home saved or generated	Nearest input dealer	Input dealer in the city/town	Other (specify)

4. Produce markets

What are the main markets for the produce? **Tick as appropriate**

Market	
Direct consumers	
Middle men (small scale)	
Wholesalers (bulk quantities)	
Processors	

5. Sources of Market Information

What are the main sources of market information? **Tick as appropriate**

Source	
Fellow farmers	
Media (e.g Newspapers, Radio)	
Private Extension workers	
Government staff	
Private Service providers (e.g mobile phones, out-grower contractors)	

6. Challenges

What are the three major challenges faced at different levels (production, processing, and marketing)?

Levels	Challenge
Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

7. Recommendations

What do you suggest as measures for improvement at the different levels (production, processing, and marketing)?

Levels	Measure to address challenges in 6 above
Production	1
	2
	3

Processing/ addition	Value	1
		2
		3
Marketing		1
		2
		3

Thank you for your responses

v) Household Assessment Tool for Poultry Enterprises (Broilers and Layers) in Wakiso and Jinja Districts

Name _____ of _____ enumerator _____
Date _____

Farmer's level

1. Bio data

District	
Sub-county	
Parish	
Village	
Name of farmer	
Phone number	

2. Costs of production and revenues

Give production costs and income (revenue) for each enterprise, by category from land opening to marketing.

How many birds did you rear last year? _____ (Broilers)
_____ Layers

VARIABLE COSTS					
Input type	Type	Unit of measure	Quantity	Unit cost (UShs)	Total cost (UShs)
A: Inputs					
Chicks bought (Broilers)					
Chicks bought (Layers)					
Feeds (Broilers)					
Feeds (Layers)					
Acaricides (Broilers)					
Acaricides (Layers)					
Vaccines (Broilers)					
Vaccines (Layers)					
De-worming (Broilers)					
De-worming (Layers)					
Transport (Broilers)					
Transport (Layers)					
Sub total (A-Broilers)					

Sub total (A-Layers)					
B: Labour					
Feeding (Broilers)	Family	____ day s			
	Hired				
Feeding (Layers)	Family	____ day s			
	Hired				
Cleaning (Broilers)	Family	____ day s			
	Hired				
Cleaning (Layers)	Family	____ day s			
	Hired				
Sub-total (B-Broilers)					
Sub-total (B-Layers)					
C: Others					
Water					
Coffee husks					
Drinkers & feeders					
Tools & Equipment					
Charcoal					
Packaging material					
Advisory services/Vet services					
Sub-total (C)					
TOTAL VARIABLE COSTS- Broilers (A+B+C)					
TOTAL VARIABLE COSTS-Layers (A+B+C)					
Total Variable Costs per Bird (TVCb⁻¹) = (A+B+C)/Number of birds-Broilers					
Total Variable Costs per Bird (TVCb⁻¹) = (A+B+C)/Number of birds-Layers					
REVENUE (INCOME)					
Product	Form of	Unit of measur	Quant ity	Unit cost	Total inco

	product	e		(UShs)	me (UShs)
Eggs					
Broilers					
Off-layers					
Total Revenue (TR)					
Total Revenue per bird (TRb ⁻¹) = TR/Number of birds					
Total Gross Margin (GM) for the farmer's broiler enterprise = TR - TVC					
Total Gross Margin (GM) for the farmer's Layer enterprise = TR - TVC					

3. Sources of Inputs

What are the main sources of the inputs? Tick as appropriate

	Home saved or generated	Nearest input dealer	Input dealer in the city/town	Other (specify)
Chicks				
Feeds				
Vaccines				

4. Produce markets

What are the main markets for the produce (chicks)? **Tick as appropriate**

Market	
Direct consumers	
Middle men (small scale)	
Wholesalers (bulk quantities)	
Processors	

5. Sources of Market Information

What are the main sources of market information? **Tick as appropriate**

Source	
Fellow farmers	
Media (e.g Newspapers, Radio)	
Private Extension workers	
Government staff	
Private Service providers (e.g mobile phones, out-grower contractors)	

6. Challenges

What are the three major challenges faced at different levels (production, processing, and marketing)?

Levels	Challenge
Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

7. Recommendations

What do you suggest as measures for improvement at the different levels (production, processing, and marketing)?

Levels	Measure to address challenges in 6 above
Production	1
	2
	3
Processing/ Value addition	1
	2
	3
Marketing	1
	2
	3

Thank you for your responses

Appendix 2: Conset Form

Consent Form

Date _____

Profitability Analysis of Agricultural Enterprises (Citrus, G.nuts, Cassava, Fish farming and Poultry) in Ten Districts in Uganda.

Principal investigators

Dr. Gabriel Elepu, Prof. Theodora Hyuha, Dr William Ekere, Dr Peter Walekwa and Mr Julius Twinamasiko.

The interviewer needs to explain the following to the respondent(s).

Purpose

The overall aim of the study is to establish profitability of agricultural enterprises so as guide NAADS in providing appropriate agricultural advisory services.

Procedure

If you agree to participate in this study, you will be asked to complete an interview with a trained interviewer and/or participate in a focus group discussion. This interviewer will record your answers with utmost confidentiality. You, therefore, are required to be as truthful as possible in your responses. The interviewer will ask about farming enterprises and the challenges faced at production, processing/value addition and marketing levels.

Benefits

You will benefit from this study by getting to critically analyze the profitability of your farming enterprises and the challenges faced at different levels and sharing experiences with other farmers and NAADS staff. Your opinions will feed into future improvement of your farming enterprises and appropriate extension from NAADS.

Risks

No risk will be posed to your life as a result of participating in this study. The interviewer will ask some sensitive questions about your farming enterprises and challenges as well as opinions about addressing the challenges.

Reimbursement: You will not be paid for participating in this study.

Right to refuse or withdraw from the survey: Your participation in this study is entirely voluntary and you are free to take part or withdraw at any time without jeopardizing your relationship with NAADS. You are also at liberty to answer all, or some of the questions posed.

Confidentiality: The responses you will give during the study will be kept strictly confidential, and used only for program improvement purposes. Your identity will be kept confidential in so far as the law allows. All information will be kept on coded forms.

If you have any questions, I can answer them now.

iii. Statement of Consent

The interviewer has discussed this information with me and offered to answer my questions. If I have further questions,

The interviewer_____ (write name) has also described to me what is going to be done during this study, the risks, the benefits involved and I will be available for the interview.

I understand that my decision to participate in this study will not alter my usual working relations with my colleagues and farmers' group members. During the utilization of any information obtained from me during this study, my identity will remain anonymous.

I am aware that I may withdraw from this study at any time. I understand that by signing this consent form, I do not waive any of my legal and human rights but merely indicate that I have been informed about the study in which I am voluntarily agreeing to participate. A copy of this consent form will be provided to me.

Signature of Participant_____

Age_____ Date_____

Signature of interviewer_____

Date_____