

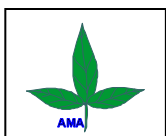
NATIONAL AGRICULTURAL ADVISORY SERVICES (NAADS)



FINAL REPORT ON GROSS MARGIN ANALYSIS OF FIVE (5) SELECTED ENTERPRISES UNDER THE ATAAS PROJECT

SUBMITTED

BY



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AMA	Agribusiness management Associates
DNC	District NAADS Coordinator
FGD	Focus Group Discussion
GM	Gross Margin
KII	Key Informant Interviews
NAADS	National Agricultural Advisory Services
SP	Selling price
TVC	Total variable cost
TR	Total Revenue
TY	Total Yield

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EXECUTIVE SUMMARY

This report provides findings on the research establishing the gross margin analysis of five selected enterprises (Dairy, Goats, Banana, Maize and Beans). The study was commissioned by National Agricultural Advisory Services (NAADS). The purpose of the study was to generate gross margin information for selected enterprises under different production packages. Specifically the research sought to achieve the following objectives;

- (i) Establish current production and marketing costs with a view to determining profitability of the enterprises
- (ii) Establish current levels and costs of inputs for the different factors of production including labor
- (iii) Establish cost estimations of other related activities of production, postharvest handling and marketing
- (iv) Establish current market prices
- (v) Conduct a sensitivity analysis for each of the selected enterprises along the different production packages and market prices
- (vi) Estimate gross margins and profitability measures of the selected enterprises

The research was conducted in 11 districts that were selected based on their well-known history of suitability for the selected enterprises. The research study used both qualitative and quantitative research designs, several research methods that included the following; document review, household survey, focus group discussions, key informant interviews and observations. The study findings indicated the under listed for each of the selected enterprises;

Overall, dairy gross margin across the study districts (Isingiro, Mbarara, Nakasongola and Sheema) under the three production practices varied significantly between 335,369 shillings per animal per year under tradition to 1,531,243 shillings per animal per year under high input technology package.

The goats' gross margin across the study districts were 41,636 shillings per goat per year. While under the low input practice, the gross margin more than doubled to give 83,545 shillings per

goat per year. It was observed that with good management practices and adequate investment, goat enterprise can be profitable.

Banana gross margin dramatically increased from traditional banana production through low input usage to high level input use. The gross margin under traditional practice increased more than 600% to reach the gross margin recorded under the low input use. From low input use to high input use, the figure more than doubled. It was observed that, banana is a profitable enterprise and given its perennial nature, the level of investment in inputs goes down with the age of the plantation. Banana production was found to be profitable at all the different production levels.

Maize gross margin significantly increased with increase in level of input use and management of the maize garden. Farmers practicing low input use were able to increase gross margin by more than 300% being a shift from traditional to low input usage with good crop husbandry management. In the same way, using high input level a farmer was able to more than double the gross margin returns gained under the low input usage.

Beans gross margin value of -19,013 was recorded under traditional production practices, implying that, under this production practice, the farmer made a loss and he/she spent more than the returns. The trend gradually improved with the highest value recorded under the high input use recording a gross margin value of 613,794 shillings per acre per season.

The study concluded that, there is a great potential of transforming the agricultural enterprises selected into variable commercial undertakings once the farmers are able to invest and remain keen to ensure good crop and or animal husbandry practices. Total yields are able to increase significantly and thus lowers the unit cost of production. This coupled with good postharvest practices and market linkages, farmers can be able to negotiate better prices and thus offers higher gross margin returns and returns on investment made.

Dairy farming was found to be a profitable agribusiness undertaking, this was observed by the positive gross margin values obtained in all the study districts and across the different

production practices. There is still a big room to increase milk production as farmers improve on the quality of their stock and general management.

Goat production as an independent enterprise is not well developed; the majority of farmers keep goats in a mixed livestock with cattle. Investment in goat rearing was found to be low and not so much promoted, with exception of some farmers who are now adopting the rearing of improved goats.

Maize enterprise was found to be grown by many farmers as a source of income but also as a food security crop. In many households, maize is intercropped with other crops like beans, banana, peas etc. Overall, maize production is profitable as observed by the gross margin values recorded. Improvement in utilization of inputs and crop husbandry practices could make bean production profitable.

The following were noted as key recommendations for each of the selected enterprises;

Dairy Enterprise

- (i) Dairy farmers should endeavor to improve the animal breeds kept so as to increase the animal's potential to produce milk, the improved animals respond well to improved feeds thus reducing the unit cost of milk production
- (ii) Dairy farmers should maintain a reasonable number of herd size so that appropriate management is given to each animal as a unit of production.
- (iii) Record keeping should be maintained for each animal, indicating the parentage as this helps to know the animals' history and plan for herd improvement
- (iv) Dairy farmers in particular areas of locality should seek to work together as a group, this will assist in collective procurement of inputs and marketing of their products
- (v) Farmers should maintain high milk quality high through investment in basic tools and facilities. As farmers' cooperatives they could invest in collection centers fully equipped with coolers to reduce milk spoilage
- (vi) Improve control of pests and diseases especially the ticks, with emphasis on counterfeit acaricides on the market.

Goat Enterprise

- (i) Improve the breeds kept by farmers emphasis should be put on fast growing breeds for beef
- (ii) Minimize in-breeding, farmers should be advised to use male goats to produce better siblings.
- (iii) Proper record keeping for individual animals should be maintained since each animal is known to be an entity
- (iv) Improvement of animal feeding should be encouraged especially those at fattening, lactating and mating stages
- (v) Local government especially at the district and sub/county levels should pass by laws to regulate movement of the animals and to punish severely those caught with stolen animals in order to reduce theft
- (vi) Goat farmers should seek to work together as a group, promote collective procurement of inputs and marketing of their animals.

Banana Enterprise

- (i) Control of diseases especially the notorious banana bacterial wilt (BBW) should be given priority because this can wipe out the whole plantation.
- (ii) Upon establishment of a banana plantation, management of soil fertility, suckers management and moisture levels in the garden should be given due attention
- (iii) Development of local compost manure making technology at homestead level will help to supplement the much needed soil nutrients replacement to match with the level of output.
- (iv) Farmers should keep records of all inputs and outputs to determine the most profitable levels of operation.
- (v) Farmers should seek to work together in matters of production and marketing of their produce.

Maize Enterprise

- (i) Farmers should use certified maize seeds from recommended seed dealers
- (ii) Farmers should ensure recommended plant spacing, fertilizer regimes like DAP at planting, urea application at knee-height and other crop husbandry practices
- (iii) Adoption of cost saving practices like use of conservation tillage should be encouraged in addition to improved soil structure and fertility measures
- (iv) Postharvest handling of maize seed is very important, it is well documented that between 15-30% of the maize seed get spoiled after harvest. Farmers should make sure that postharvest handling activities like drying, shelling and storage are done properly.
- (v) Farmers should work together as a group to carry out collective marketing to attain better prices

Beans Enterprise

- (i) Farmers should use high yielding certified seed varieties that are demanded on the market
- (ii) Adequate amount of additional inputs like fertilizers and pesticides are recommended to boost production and improved control of pests and diseases
- (iii) Postharvest handling should be given due attention to minimize postharvest crop losses
- (iv) Farmers should work together to establish stronger groups to enhance bean production through collective purchase of inputs and marketing
- (v) Farmers should keep proper records of the enterprise stock such as inputs, labor and outputs.

1.1 Study overview

The overall objective of the assignment by NAADS program was to promote and sustain profitable agriculture through providing valid information on profitability estimates of selected enterprises that are undertaken by farmers in various districts of Uganda. The consultants were aware of the different production scenarios being used by the different farmers or recommended technologies. The consultants used different production packages at varying market prices, using sensitivity analysis thus providing some level of margin of safety. Successful value chains are based on profitable returns at each chain segment and that motivation of an active participant in the value chain was based on the principle of positive returns on investment.

The exercise aimed at providing information to farmers and the overall objective of the study was to establish benchmarks in selected agricultural value chain actors on the profitability levels through generation of gross margins and other enterprise profitability measures. The study considered different production scenarios i.e. use of inputs and good management, good management without input use and subsistence levels and compare with the corresponding output levels.

The consultants defined gross margin as an estimate or a budget of the income and costs associated with a specific crop or animal enterprise activities considering labour costs, input costs and veterinary services in case of livestock farming business. Gross margin analysis was used to determine crops more profitable than others. The consultants were aware that gross margins vary based on the different production packages utilized and the market prices offered. This coupled with the techniques used during postharvest to minimize losses and selling of high quality products results into higher returns and thus improved gross margins.

1.2 Purpose of the study

The overall objective of the study was to generate gross margin information for selected enterprises under different production packages.

1.3 Specific objectives

Specifically the study sought to seek accomplishment of the following objectives;

- (vii) Establish current production and marketing costs with a view of determining profitability of the enterprises
- (viii) Establish current levels and costs of inputs for the different factors of production including labour
- (ix) Establish cost estimations of other related activities of production, postharvest handling and marketing
- (x) Establish current market prices
- (xi) Conduct a sensitivity analysis for each of the selected enterprises along the different production packages and market prices
- (xii) Estimate gross margins and profitability measures of the selected enterprises by farmers

1.4 Justification

Uganda's population growth rate is estimated to be 3.2% per annum, with an average total fertility rate of 6.2 children per woman, yet agricultural production and productivity does not match the fast human population growth rate. This is partially attributable to the majority of farmers over 80% engaged in subsistence agriculture leading to very low productivity. The agricultural technologies that support improved productivity are generally perceived to be expensive and less accessible by the majority of the farmers. Successful models reported elsewhere show that market pull approach can catalyze and stimulate investment in such technologies to increase productivity. In order for farmers and other value chain actors to make such decisions of investing and or not to invest are hinged on clear understanding of the profitability levels. Such information is generally lacking among the actors and more often than not, decisions are based on the current market prices. Developing gross margin values for the different enterprises under different production packages and market price scenarios are vital to stimulate farmers and other value chain actors to invest in enterprises and adopt technologies that optimize returns on investment. It is therefore; against this background that Agribusiness Management Associates (U) Ltd was awarded the contract to undertake this assignment.

1.5 Study outputs / deliverables

The following were the research outputs / deliverables;

- (i) Survey tools / instruments
- (ii) Inception report
- (iii) Draft report
- (iv) Final report

2.0

STUDY METHODOLOGY

2.1 Document review

Existing literature from NAADS Secretariat was reviewed and this included the following; Fact sheets on the target enterprises published by NAADS, Project Implementation manual for the Agricultural Technology and Agribusiness Advisory Services. Other documents that were reviewed included; Maize production in Uganda, Banana production manual for Uganda, Gross margin analysis of maize-based intercropping system and Uganda staple Foods Value Chain Analysis among others.

2.2 Study design

The research study utilized both the quantitative and qualitative designs. The quantitative design involved interviewing farmers at household level, while the qualitative design gathered data on the feelings, opinions, attitude especially about the figures on cost of production and resulting revenue from sale of products using Focus Group Discussions and Key Informant Interviews. The data collection methods included; field observation, semi-structured questionnaires, and focus group discussion and key informant interviews. Photography was another form of methods used to collect data. The results of the study generated gross margin values that were used to analyze enterprise profitability at the different production levels.

2.3 Study coverage

The study covered a total of 11 districts of Uganda focusing on five selected enterprises (Maize, Beans, Dairy, Goats and Bananas) (Table 2.1).

Table 2.1: Study districts, sub-counties and parishes

District	Enterprise	Sub-county	Parishes
Isingiro	Dairy & Goats	Masha	Rwetango
			Nyamisingo
		Andiizi	Ndiizi Town board
	Bananas	Nyamuyanja	Kigaranga
			Nyamuyanja
		Rugaga	Ngarama
Shema	Dairy & Goats	Kyangyenyi	Kyampango
			Kashumba
			Muzira
			Kyangundu

	Bananas	Shuuku	Kasyozi
		Kigarama	Kishagya
		Masheruka	Kigarama
			Bwayegamba
Kamwenge	Maize & Beans	Kamwenge T/C	Buringo
		Nkoma	Kyabuharango
			Kitonzi
			Rwemirama
Mbarara	Dairy & Goats	Kakyika	Mabale
		Rwanyamaye mbe	Bisozi
	Bananas	Rugando	Kashaari
		Mwizi	Nyakayonjo
Bukomansimbi	Bananas & Dairy	Kibinge	Rubaya
		Kitenda	Bahaarwe
			Nyabikungu
			Nyakabaare
Kiboga	Maize & Beans	Kibinga	Mirambi
		Lwamata	Kiryasaaka
			Ndeebe
			Mitigyeera
Nakasongola	Dairy & Goats	Lwabyata	Degeya
		Nakitoma	Nkandwa
			Kasegere
			Kyekumbya
Kiryandongo	Maize & Beans	Kiryandongo	Kansira
		Mutunda	Namikka
			Bujjabe
			Kigwera
Lira	Maize & Beans	Agweng	Kyankende
		Agali	Kikuube
			Diima
			Nyamaha
Iganga	Maize & beans	Nawandala	Tee Oburu
		Makuutu	Orit
			Adyaka
			Okile
Kapchorwa	Maize & Beans	Kapchesombe	Namusisi
		Kapteret	Nawangaiza
			Makuutu
			Kigulamo
		Kapchesombe	Kapchesombe
			Kaplak
			Kapenguria
			Kaplelko

Source: Survey data

2.4 Sample determination

The study population included respondents from Central, Western, South-Western and Eastern Uganda. Within each region, a sample size of 30% of the total number of districts was chosen for the study based on the level of activity of the target enterprises. Within each selected district, two sub-counties were purposively selected during the pre-visit exercise. Two parishes were purposively selected from each sub-county, one village was purposively selected from each parish and 9 households were randomly selected from each village.

2.5 Data collection methods

2.5.1 Document review

Existing literature from published reports was reviewed throughout the process of the study period. Additional literature on the subject matter of investigation was gathered from the district reports, NGOs operating within the selected districts and from the internet search engine. This provided a clear understanding of the earlier works on profitability estimates for the target enterprises under varying production packages.

2.5.2 Household survey

All quantitative data on household was collected using a questionnaire in a household interview. A questionnaire was developed and questions were developed based on the set objectives of the study. The tool aimed at collecting production, postharvest costs and sales prices. The data collected was used in the computation of gross margin ratios and other profitability estimates.

2.5.3 Focus Group Discussions (FGDs) and Key Informant Interviews (KII)

In each study district, two focus group discussions (FGDs) were conducted to augment data collected from household interviews. Each FGD was composed of 6 to 12 participants, this provided rich information as a result of direct interaction between the researcher and the participants on issues of production, postharvest and sales.

The consultants interviewed separately key informants identified in each district and these included the following;

- (i) District NAADS Coordinator
- (ii) District Agricultural Officer
- (iii) District Commercial Officer

- (iv) Heads of some NGOs operating in the districts working on the selected enterprises.
- (v) Sub-county heads and Traders
- (vi) Church leaders, Clan heads and Opinion leaders in the sampled districts.

2.5.4 Development and pre-testing of study tools

Pre-testing of the tool was conducted during the training of research assistants and was used to gather information based on the following criteria: Ease or difficulty of statement of the questions, the ease of collecting quantitative data on production and revenue, comprehension of the responses, confidence in response, level of discomfort and social desirability. Focus group discussions were led by a facilitator and a note taker documented the participants' feedback. The pre-test assisted to check the suitability of all survey procedures and the constituency of the data collection instrument across the respondents. Administration of the KI and FGD Guides through face to face discussions were conducted and these interviewers aimed at recording the response during the interview exercise.

2.5.5 Data collection

Research Assistants identified for this exercise were able to communicate in the different language dialects spoken in the study districts. The consultants ensured that quality of the questionnaires filled was checked every evening before completion of the day's work

2.6 Data management and analysis

Data management: All filled questionnaires were entered using EPIDATA V.3.1 software fitted with a range of consistency checks. A team of trained and experienced data entrants based at AMA was used to enter data under the guidance of a qualified data manager. Observance of security and confidentiality of the data was strictly observed.

Data Analysis and Interpretation

Analyzing and interpreting data encompassed the application of standards to all information collected during all stages of research and thereafter used to generate appropriate statistics and content description. For this particular study, the methods of analysis and interpretation encompassed both quantitative and qualitative methodology, with emphasis on gross margin analysis and returns on investments.

Analysis of Qualitative Data

Qualitative data from the study was intended to gather information about the gross margins for the different farm enterprises in a more holistic approach as to capture the different production activities and their related financial investments. Analysis of information from focus group discussions and other open-ended questions was carried out based on content analysis to summarize all the discussions. Qualitative data was used to validate the quantitative data collected from household interviews.

Analysis of Quantitative Data

Quantitative data was coded, entered and analyzed using EPIDATA V.3.1 and Stata software. Descriptive statistics were used to analyze all quantitative data gathered during the study and served to generate the possible trends of events as they occurred along the value chain, all items included as critical in the value chain were explicitly described. The interpretation of quantitative data largely depended on the emerging patterns that were observed from the various statistical analyses as well as content analysis responses from qualitative data.

Frequencies and percentages were used to describe various components that lead to estimation of the gross margins, tabular and graphical forms were used to present data in a concise manner in order to capture the inherent distribution.

Gross margins were estimated for the selected farm enterprises using the formula below;

$$GM_e = \frac{TR_e - TVC_e}{TR_e} \text{----- (i)}$$

Where;

GM_e = Gross Margin for a given farm enterprise

TR_e = Total Revenue for a given farm enterprise (Total product output times market price in shillings)

TVC_e = Total variable cost; depended on the given level of output for a given enterprise and are computed as indicated in equation (ii)

$$TVC_e = \sum_{a=1}^n Y_a b_a \text{ where } a= 1, 2, 3 \dots n \dots \dots \dots \text{ (ii)}$$

Where

Y_a = unit cost of a given input for a particular enterprise

b_a = level of input use for a particular enterprise.

The consultants computed the following financial ratios to further elucidate the profitability and liquidity of the selected enterprises at the different production levels. These included the following;

(i) **Benefit-Cost ratio** (TR/TVC) = Total revenue in monetary terms/Total variable cost. The unit rate of returns on investment

(ii) **Returns to investment based on total variable cost** (TVC/TY) = Unit cost of production

(iii) **Marginal Returns on Investment** (SP-TVC/TY) = Unit price – Unit cost of production

A sensitivity analysis provided different scenarios of profitability estimates based on the assumptions used. The results of the sensitivity analysis were fundamental in guiding farmers in decision making on investment levels of production and marketing.

The sensitivity analysis took into consideration the following assumptions;

(i) The levels of technology application or utilization

(ii) The groups of farmers (Commercial, medium commercial and small commercial)

(iii) The marketing strategy adopted

(iv) Value addition to the product marketed

(v) Market price prediction based on the seasons

3.0

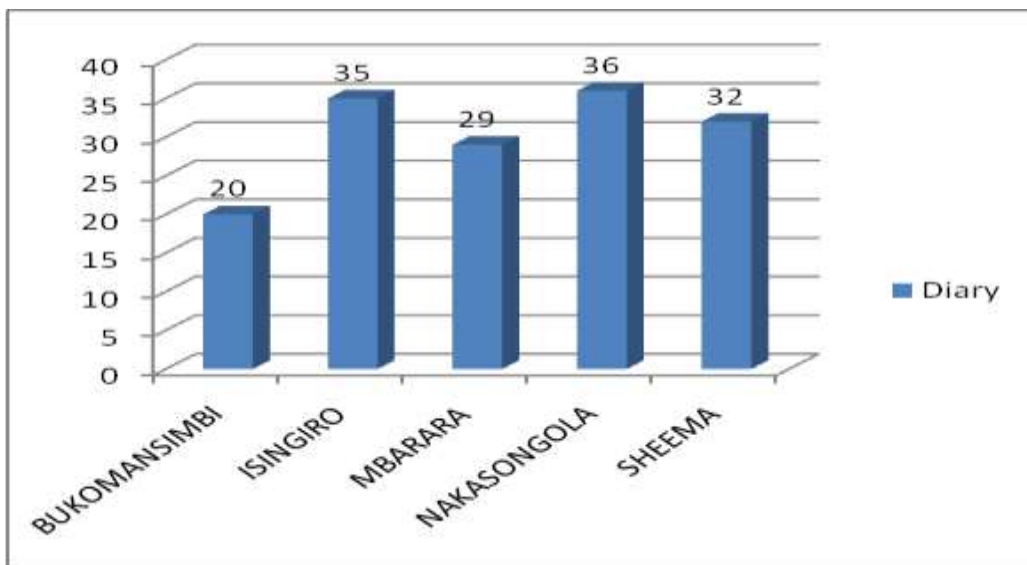
RESULTS AND DISCUSSIONS

3.1 Social-economic and demographic characteristics

3.1.1 Dairy

Gross Margin studies for Dairy were conducted in the districts of Bukomansimbi, Isingiro, Mbarara, Nakasongola and Sheema (Figure3.1). The sample size ranged between 20 in Bukomansibi to 36 in Nakasongola. The low response rate in Bukomansimbi was due to the fact that the study coincided with the onset of second season rains, the farmers devoted more time to their fields after a prolonged dry spell and they were eager to take advantage of early planting.

Figure 3.1: Number of respondents interviewed per District for Dairy Enterprise



Source: Survey data

The social-economic and demographic characteristics are presented in Table3.1. There were more male respondents (55%-91%) across all the study districts compared to female respondents (14%-45%), attributed to cultural issues that men are family heads. The majority of the respondents (74% - 97%) had a formal education of either primary level or secondary level, with fewer proportion respondents indicating having no formal and tertiary education. Farming was recorded as the major source of household income with over 80% respondents in all the study districts. Likewise, the majority of the respondents were reported being married and work

together as man and wife. This meant that they work as a family and could easily improve their income earning activity in presence of good advisory services.

Table 3.1: Social-economic and demographic characteristics (Dairy)

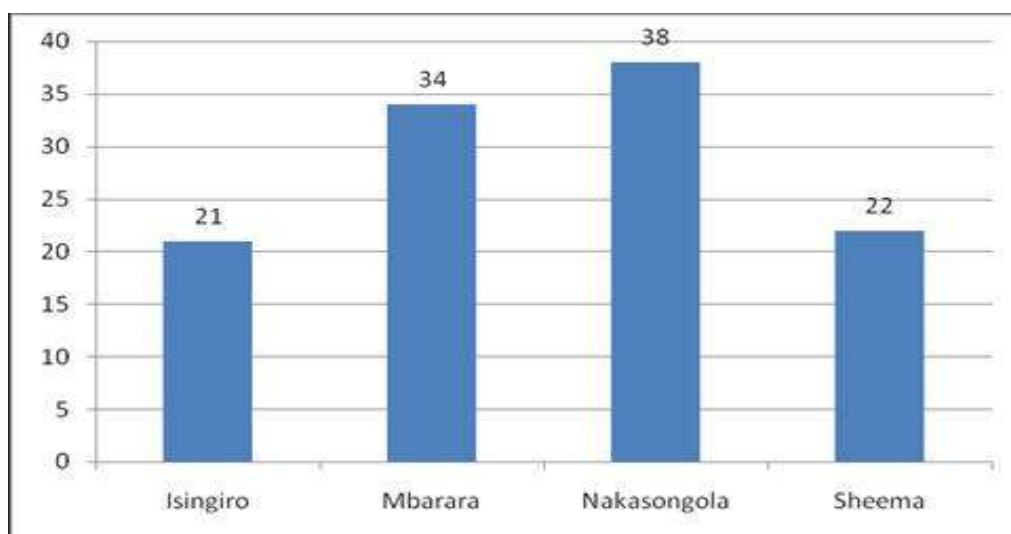
Variable	Response	Percentage response in the different districts under the survey					Overall sample
		Bukoma-nsimbi	Isingiro	Mbarara	Nakasongola	Sheema	
Gender of respondent	Male	85	91.4	55.2	86.1	75	79
	Female	15	8.6	44.8	13.9	25	21
Education level	None	5	26	3	8	6	10.5
	Primary	45	40	28	39	63	42.8
	Secondary	35	25	48	36	16	31.6
	Tertiary	15	9	21	17	16	15.1
Main source of income	Farming	100	91.4	82.8	81.7	90.6	78.8
	Trading	0	5.7	6.9	5.6	0.0	4.0
	Government	0	2.9	10.3	5.6	9.4	6.0
	Others	0	0	0	7.2	0	11.3
Relationship to household head	Household head	85	85.7	65.5	86.1	80.7	80.8
	Spouse	10	5.7	34.5	8.3	16.1	14.6
	Child	5	8.6	0	2.8	3.2	4.0
	Others	0	0	0	2.8	0	0.6
Marital status	Married	90	91.4	82.8	80.6	81.3	84.9
	Not married	5	8.6	3.5	8.3	6.3	6.5
	Divorced/ Separated	0	0	0	2.8	0	0.7
	Widowed	5	0	13.7	8.3	12.5	7.9

Source: Survey data

3.1.2 Goats

Figure 3.2 shows the response rate for the goat's enterprise survey in the study districts with Isingiro and Sheema having the lowest number of respondents. This was attributed to low numbers of goat farmers in the area.

Figure 3.2: Number of respondents interviewed per District for Goat Enterprise



Source; Survey data

Most of the respondents (Table 3.2) on the goat enterprise were male (50-80%) farmers, representing the major social factor where most household heads are men and usually responsible for discussing farm enterprise issues. Farming remained the key source of income in all the study districts confirming the importance of the survey and its contribution to the livelihood of the respondents and their families. Most respondents had attained primary and secondary education; this meant that they could be easily trained in English and most local languages which could improve adoption of recommended technologies in addition to understanding business records.

Table 3.2: Social-economic and demographic characteristics (Goats)

Variable	Response	Percentage response in the different districts under the survey				Overall sample
		Isingiro	Mbarara	Nakasongola	Sheema	
Gender of respondent	Male	76.2	52.9	79.0	80.9	71.3
	Female	23.8	47.1	21.0	19.1	28.7
Education level	None	4.8	12.1	5.26	4.76	7.02
	Primary	57.1	42.4	39.47	52.38	45.61
	Secondary	28.6	33.3	36.84	14.29	29.82
	Tertiary	9.5	12.1	18.42	28.57	17.54
Main source of income	Farming	90.5	87.1	34.21	94.44	70.64
	Trading	0	0	0	0	0
	Government	9.5	9.7	7.89	5.56	8.26

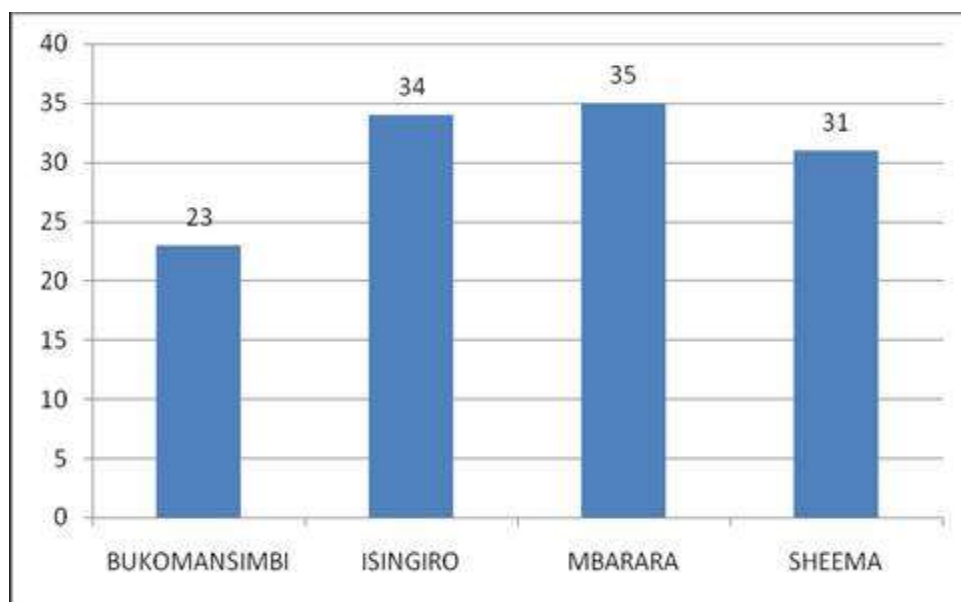
	Others	0	3.2	57.89	0	21.1
Relationship to household head	Household head	61.9	63.6	81.58	71.43	71.05
	Spouse	19.1	33.3	15.79	14.29	21.05
	Child	19.1	3.0	2.63	14.29	7.89
	Others	0	0	0	0	0
Marital status	Married	80.9	87.1	94.74	71.43	85.71
	Not married	19.1	3.2	2.63	19.05	8.93
	Divorced/separated	0	0	2.63	0	0.89
	widowed	0	9.7	0	9.52	4.46

Source: Survey data

3.1.3 Bananas

Figure 3.3 shows a high response rate apart from Bukomansimbi where most farmers were devoting more time in their fields after receiving rainfall following a long dry spell in the area.

Figure 3.3: Number of respondents interviewed per district for Banana Enterprise



Source: Survey data

The social, economic and demographic characteristics of the respondents is shown in table 3.3 having more men than women as respondents, about 8% having not attended any formal education and farming as the main source of income. These farmers are trainable and can easily

read and write, promising high technology adoption rates since they can easily evaluate the benefits of better farming practices.

Table 3.3: Social-economic and demographic characteristics (Banana enterprise)

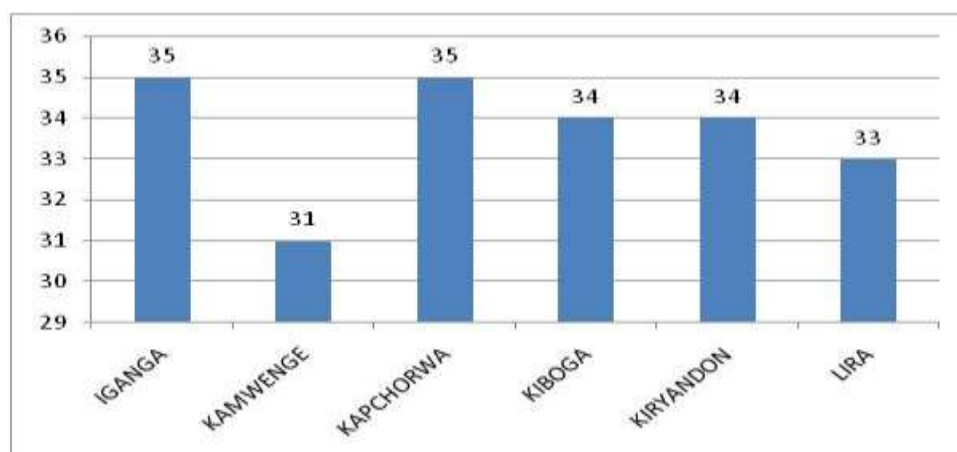
Variable	Response	Percentage response in the different districts under the survey				Overall sample
		Bukomansimbi	Isingiro	Mbarara	Sheema	
Gender of respondent	Male	56.5	85.3	74.3	61.3	70.7
	Female	43.5	14.7	25.7	38.7	29.3
Education level	None	8.3	5.9	17.1	12.9	11.3
	Primary	41.7	41.2	54.3	64.5	50.8
	Secondary	29.2	32.4	22.9	16.1	25.0
	Tertiary	20.8	20.6	5.7	6.5	12.9
Main source of income	Farming	91.7	82.3	100	100	93.4
	Government	8.3	5.9	0	0	3.3
	Others	0	11.8	0	0	3.3
Relationship to household head	Household head	87.5	91.2	77.1	64.5	79.8
	Spouse	12.5	5.9	22.9	29.0	17.7
	Child	0	2.9	0	6.5	2.4
Marital status	Married	66.7	88.3	94.3	80	83.7
	Not married	4.2	5.9	0	6.7	4.1
	Divorced/ Separated	8.3	2.9	0	0	2.4
	Widowed	20.8	2.9	5.7	13.3	9.8

Source: Survey data

3.1.4 Maize

Maize is grown in almost all the areas of the study districts but data collection was restricted to key growing districts. This enterprise had a high response rate, with similar social, economic and demographic characteristics with other enterprise respondents apart from the main source of income (Figure 3.4). This was in the area of male respondents being more than female, attaining primary and secondary making it ease to train them but with trading as the key source of income.

Figure 3.4: Number of respondents interviewed per District for Maize Enterprise



Source: Survey data

Table 3.4: Social-economic and demographic characteristics (Maize enterprise)

Variable	Response	Percentage response in the different districts under the survey						Overall sample
		Iganga	Kamwenge	Kapchorwa	Kiboga	Kiriadongo	Lira	
Gender of respondent	Male	48.57	80.65	45.71	76.47	73.53	78.79	66.83
	Female	51.43	19.35	54.29	23.53	26.47	21.21	33.17
Education level	None	5.71	6.45	2.86	14.71	2.86	12.12	7.39
	Primary	60	74.19	31.43	58.82	77.14	57.58	59.61
	Secondary	31.43	12.9	48.57	26.47	14.29	21.21	26.11
	Tertiary	2.86	6.45	17.14	0	5.71	9.09	6.9
Main source of income	Farming	0	3.23	8.57	0	0	0	1.98
	Trading	94.12	93.55	88.57	97.06	97.14	100	95.05
	Government	0	3.23	2.86	2.94	0	0	1.49
	Others	5.88	0	0	0	2.86	0	1.49
Relationship to household head	Household head	57.14	83.87	48.57	73.53	80	76.67	69.5
	Spouse	40	16.13	45.71	23.53	20	23.33	28.5
	Child	2.86	0	5.71	2.94	0	0	2
	Others							
Marital status	Married	80	100	88.57	91.18	91.43	93.94	90.64
	Not married	5.71	0	8.57	5.88	0	3.03	3.94
	Divorced/separated	2.86	0	2.86	2.94	2.86	0	1.97
	widowed	11.43	0	0	0	5.71	3.03	3.45

Source: Survey data

3.2 Production and Husbandry Practices

Production cost was grouped under three (3) main technology packages namely; Traditional, low input and high input. The characteristics of each technology are described below;

Banana Enterprise

Traditional	Low Input	High Input
<ul style="list-style-type: none"> • No use of external inputs • Minimal cultural practices like weeding, splitting of pseudostem, desuckering and deleafing • No mulching • Use of local non treated suckers 	<ul style="list-style-type: none"> • Mulching is done • No pesticide use • No fertilizer use • Application of recommended practices • Use of local suckers 	<ul style="list-style-type: none"> • Mulching • Use of pesticides • Use of both organic and inorganic fertilizers • Application of recommended cultural practices • Use of tissue culture or treated suckers

Dairy Enterprise

Traditional	Low Input	High Input
<ul style="list-style-type: none"> • Use of local breeds • No or intermittent spraying • Communal grazing 	<ul style="list-style-type: none"> • Use of cross breeds • Spraying of animals • Use of paddocks or zero grazing • Moderate use of veterinary services like treatment of animals and administration of drugs 	<ul style="list-style-type: none"> • Use of exotic breeds • Spraying of animals • Supplementary feeding • Controlled grazing (Paddocks) • Use of veterinary services (AI, Vaccination and administration of drugs)

Goats Enterprise

Traditional	Low Input
<ul style="list-style-type: none"> • Communal grazing • Use of local breeds • No use of veterinary services 	<ul style="list-style-type: none"> • Use of cross breed • Confined / paddock grazing • Use of veterinary services (De-worming, vaccination and administration of drugs) • No use of supplementary feeding

Maize Enterprise

Traditional	Low Input	High Input
<ul style="list-style-type: none"> • Use of home saved seed • No pesticide nor herbicide usage • No fertilizer nor manure usage 	<ul style="list-style-type: none"> • Use of certified seeds • Use of pesticides and herbicides 	<ul style="list-style-type: none"> • Use of certified seed • Use of pesticides and herbicides • Use of organic and Inorganic fertilizers

Beans Enterprise

Traditional	Low Input	High Input
<ul style="list-style-type: none"> • Use of home saved seed • No pesticide nor herbicide usage • No fertilizer nor manure usage 	<ul style="list-style-type: none"> • Use of certified seeds • Use of pesticides and herbicides 	<ul style="list-style-type: none"> • Use of certified seed • Use of pesticides and herbicides • Use of organic and Inorganic fertilizers

3.2.1 Dairy Cost of Production and Gross margin estimations

Dairy cost of production and gross margin estimates under traditional technology in the four districts of Isingiro, Mbarara, Nakasongola and Sheema are presented in Table 3.5. Under the traditional production practice, the farmers incurred very low costs in production, this was observed in all the four districts. The average total variable cost for looking after one lactating

animal per year was estimated at Ugx 23,956. The average milk production was estimated at 482 liters, at an average of Ugx 737.5 per liters, this gave total revenue of Ugx 355,475 per animal per year. The average rate of returns on investment in production of milk, every shilling invested in variable costs yielded on average, 14.98 shillings. The average unit cost of production of milk was averaged at 50.3 shillings per liter of milk produced.

Table 3.5: Production cost and gross margin analysis for Dairy Enterprise under Traditional Technology by District per animal per year

Input cost/Vet services	Isingiro	Mbarara	Nakasongola	Sheema
	Ug shs	Ug shs	Ug shs	Ug shs
Salt	0	0	0	0
Supplementary feeds	0	0	0	0
De-worming	2,500	2,425	3,333	2,191
Dehorning	0	0	0	0
Castration	0	0	0	0
Animal treatment/Injectables	5,750	5,500	4,760	5,900
Spraying	5,300	4,082	4,900	4,382
Vaccination	600	600	600	600
Total input/Vet services	14,150	12,607	13,593	13,073
Labour				
Weeding pastures	0	0	0	0
Fence maintenance	0	0	0	0
Grazing animals (labour)	10,800	12,000	9,600	10,000
Total labour costs	10,800	12,000	9,600	10,000
Total Variable cost (TVC)	24,950	24,607	23,193	23,073
Average milk yield (TY) in Litres	450	540	414	522
Average price per litre (Ug shs)	800	800	550	800
Total revenue (TR)	360,000	432,000	227,700	417,600
Gross margin (TR-TVC)	335,050	407,393	204,507	394,527
Benefit-Cost-Ratio (TR/TVC)	14.4	17.6	9.8	18.1
Unit cost of production (TVC/TY)	55.4	45.6	56.0	44.2
Marginal returns on investment (Unit price-Unit cost of production)	744.6	754.4	494.0	755.8

Source; Survey data

Milk production costs and gross margin estimates across the four surveyed districts under low input production practice are presented in Table 3.6. The total input costs across the districts remained low as 43,539 shillings per lactating cow per year. Total variable costs did not vary significantly across the districts; overall average was 76,100 shillings per animal per year. Milk production increased across the study districts averaged at 1,395 litres per animal per year. The overall gross margin ranged between 701,254 for Nakasongola district to 1,113,858 shillings for Mbarara district. The average price per litre of milk was higher in the districts of Mbarara, Isingiro and Sheema being 800 shillings and the lowest in Nakasongola at 550 shillings per litre. The average rate of returns for every shilling invested in variable costs earned between 18.0 to 30.20 shillings in Nakasongola and Mbarara districts, respectively. Mbarara district was recorded as the lowest cost producer of milk, while Sheema was the highest cost producer, though the figures did not vary significantly.

Table 3.6: Production cost and gross margins for Dairy Enterprise under Low Input Technology by District per animal per year

Input cost/Vet services	Isingiro	Mbarara	Shillings	Sheema
	Ug shs	Ug shs	Ug shs	Ug shs
Salt	8,400	8,333	8,000	8,414
Supplementary feeds	0	0	0	0
De-worming	7,500	5,250	4,800	7,191
Dehorning	3,000	3,406	2,800	3,000
Castration	1,500	1,762	1,565	1,550
Animal treatment/Injectables	10,000	12,450	9,255	10,250
Spraying	12,000	15,196	11,933	13,382
Vaccination	4,461	4,195	2,893	4,118
Total input/Vet services	46,861	38,142	41,246	47,905
Labour				
Weeding pastures	10,460	11,799	11,143	11,412
Fence maintenance	9,412	9,478	8,286	8,294
Hired labour	12,882	12,628	11,925	12,529
Total labour costs	32,754	33,905	31,354	32,235
Total Variable cost (TVC)	79,615	72,047	72,600	80,140
Average yield (TY) Litres	1404	1,440	1350	1386
Average price (Ug shs)	800	800	550	800

Total revenue (TR)	1,123,200	1,152,000	742,500	1,108,800
Gross Margin (TR-TVC)	1,076,339	1,113,858	701,254	1,060,895
Benefit -Cost-Ratio (TR/TVC)	24.0	30.2	18.0	23.1
Unit cost of production (TVC/TY)	33.4	26.5	30.6	34.6
Marginal returns on investment (Unit price-Unit cost of production)	766.6	773.5	519.4	765.4

Source; Survey data

Milk production costs and gross margin estimates under high input technology are presented in Table 3.7. It was observed that, in Nakasongola district, farmers do not practice this technology package only practice traditional and low input technology practices. Farmers using this type of technology package incur substantial amounts of costs in purchase of inputs, payment for veterinary services and labor. On average, the total variable costs ranged between 435,910 shillings to 454,615 shillings per animal per year. The average gross margin ranged between 1,489,385 shillings in Isingiro to 1,567,453 shillings in Mbarara district. The unit rate of returns on every shilling invested did not vary significantly and ranged between 4.28 to 4.53 shillings per every 1 shilling invested in variable costs.

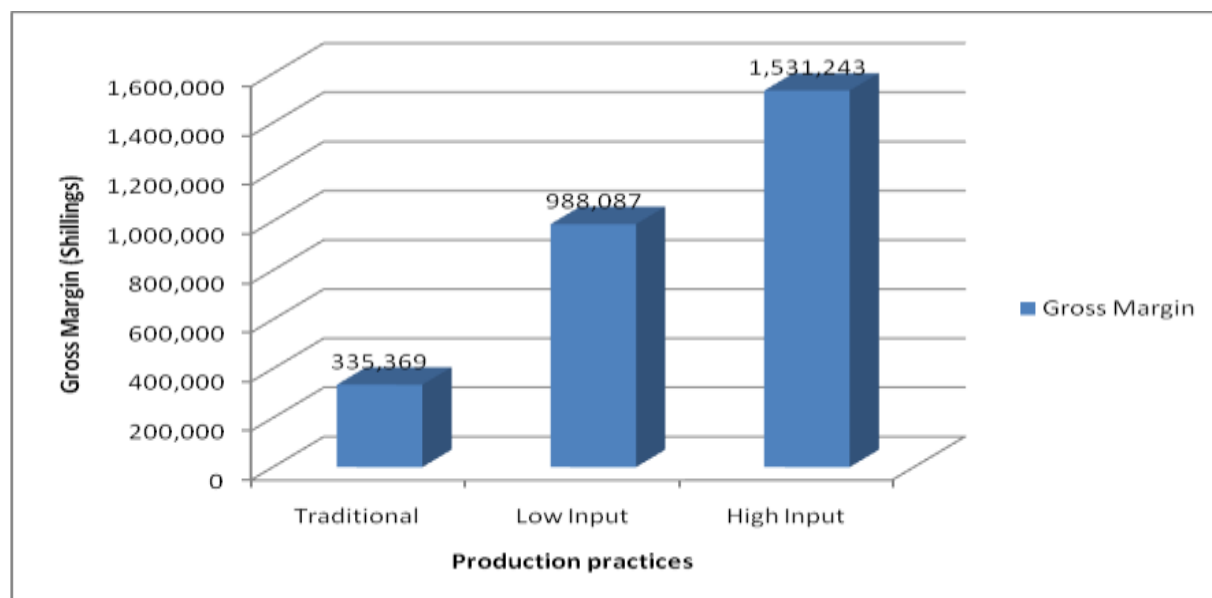
Table 3.7: Production cost and gross margins for Dairy Enterprise under High Input Technology by District per animal per year

Input cost/Vet services	Isingiro	Mbarara	Nakasongola	Sheema
	Ug shs	Ug shs	Ug shs	Ug shs
Salt	8,400	8,333	0	8,414
Supplementary feeds	375,000	376,500	0	355,770
De-worming	7,500	5,250	0	7,191
Dehorning	3,000	3,406	0	3,000
Castration	1,500	1,762	0	1,550
Animal treatment/Injectables	10,000	12,450	0	10,250
Spraying	12,000	15,196	0	13,382
Vaccination	4,461	4,195	0	4,118
Total input/Vet services	421,861	414,642	0	403,675
Labour				
Weeding pastures	10,460	11,799	0	11,412
Fence maintenance	9,412	9,478	0	8,294

Hired labour	12,882	12,628	0	12,529
Total labour costs	32,754	33,905	0	32,235
Total Variable cost	454,615	448,547	0	435,910
Average yield (TY) Litres	2430	2,520	0	2466
Average price (Ug shs)	800	800	0	800
Total revenue (TR)	1,944,000	2,016,000	-	1,972,800
Gross Margin (TR-TVC)	1,489,385	1,567,453	0	1,536,890
Benefit -Cost-Ratio (TR/TVC)	4.28	4.49	0	4.53
Unit cost of production (TVC/TY)	187.1	178.0	0	176.8
Marginal returns on investment (Unit price-Unit cost of production)	612.92	622.01	0	623.23

Source; Survey data

Figure 3.5: Gross margin values for Dairy under three Production Practices in Dairy Production Districts surveyed



Source: Survey data

Overall, the gross margin across the study districts (Isingiro, Mbarara, Nakasongola and Sheema) under the three production practices varied significantly between 335,369 shillings per animal per year under tradition to 1,531,243 shillings per animal per year under high input technology package.

3.2.2 Goats

Goat production costs and gross margin estimates under the traditional goat production practice is presented in Table 3.8. Under this production practice, which is the most widely spread method of goat rearing; the production costs were very low across all the study districts. The total variable cost per goat per year was not more than 15,000 shillings. This was due to the fact that, goats are not reared independently as a single enterprise. The marginal returns per animal per year ranged between 39,969 shillings to 44,958 shillings in Mbarara district.

Table 3.8: Production costs and gross margins for Goat Enterprise under Traditional Technology Level by District per goat per year

	Isingiro	Mbarara	Nakasongola	Sheema
Inputs/service cost				
Vaccination	0	0	0	0
Goat treatment (Minor)	1,200	1,250	1,000	1,233
Deworming	550	580	430	567
Salt	300	330	270	297
Total inputs/service cost	1,750	1,830	1,430	1,800
Labour cost				
Fence maintenance	0	0	0	0
Sowing pastures	0	0	0	0
Slashing the paddocks	0	0	0	0
Grazing the animals	12,984	13,212	12,720	13,231
Total labor costs	12,984	13,212	12,720	13,231
Total variable cost	14,734	15,042	14,150	15,031
Average yield (TY)	1	1	1	1
Average price (Ug shs)	57,000	60,000	53,500	55,000
Total revenue (TR)	57,000	60,000	53,500	55,000
Gross Margin (TR-TVC)	42,266	44,958	39,350	39,969
Benefit -Cost-Ratio (TR/TVC)	3.9	4.0	3.8	3.7
Unit cost of production (TVC/TY)	14,734	15,042	14,150	15,031
Marginal returns on investment (Unit price-Unit cost of production)	42,266	44,958	39,350	39,969

Source: Survey data

Goat production costs and gross margin estimates under low input production practice across four study districts are presented in Table 3.9. The total variable costs were between 32,029 to 38,487 shillings per goat per year. Across the study districts, average production was one goat per year that could be marketed thus providing a gross margin of between 81,560 to 86,236 shillings per goat per year. The unit rate of returns on every shilling invested in variable costs averaged at 3.43 shillings.

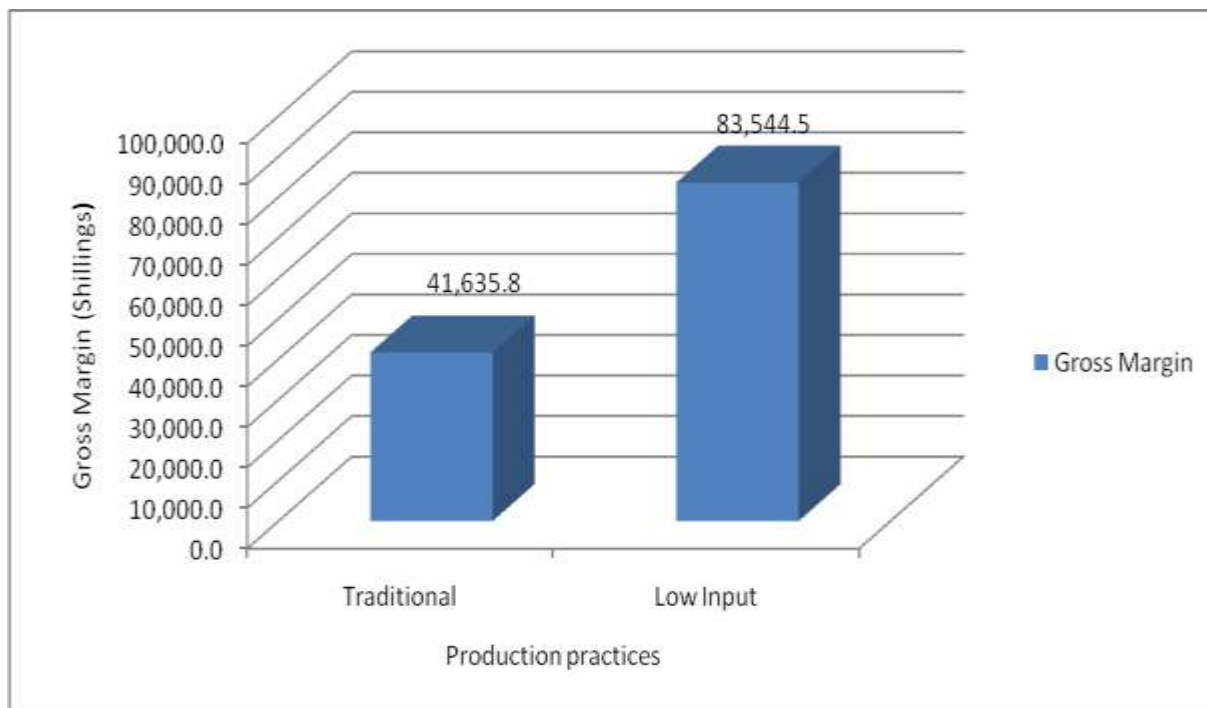
Table 3.9: Production costs and gross margins for Goat Enterprise under Low input Technology Level by District per goat per year

	Isingiro	Mbarara	Nakasongola	Sheema
Inputs/service cost				
Vaccination	3,971	4,383	2,987	3,135
Animal treatment	6,625	6,770	4,536	6,350
Salt	3,200	3,500	2,900	3,150
De-worming	1,977	1,892	1,646	1,929
Spraying chemicals	4,400	4,390	4,350	4,211
Total inputs/service cost	20,173	16,545	16,419	15,625
Labour				
Fence maintenance	2,714	2,869	2,130	2,436
Slashing the paddocks	1,200	1,297	1,217	1,228
Hired labor	14,400	13,823	12,263	14,000
Total labor costs	18,314	17,989	15,610	17,664
Total Variable cost (TVC)	38,487	34,534	32,029	33,289
Average yield (TY)	1	1	1	1
Average price (Ug shs)	120,047	120,770	115,600	116,100
Total revenue (TR)	120,047	120,770	115,600	116,100
Gross Margin (TR-TVC)	81,560	86,236	83,571	82,811
Benefit -Cost-Ratio (TR/TVC)	3.12	3.50	3.61	3.49
Unit cost of production (TVC/TY)	38,487	34,534	32,029	33,289
Marginal returns(Unit price-Unit cost)	81,560	86,236	83,571	82,811

Source; Survey data

The overall gross margin for the goat enterprise across the study districts under two production practices (Traditional and Low input) are presented in Figure 3.6. The gross margin recorded under traditional practice was 41,635.8 shillings per goat per year. While under the low input practice, the gross margin more than doubled to give 83,545 shillings per goat per year.

Figure 3.6: Gross margin values for Goats under two Production Practices in surveyed Districts



Source: Survey data

3.2.3 Bananas

Production costs and gross margin estimates for banana under three production practices (Traditional, Low Input and High Input) for the districts of Sheema and Isingiro, are presented in Table 3.10. Total variable costs were lowest under traditional practice being 284,750 and 323,100 shillings per acre per year in the two districts. Under the low input production practice, the total variable cost increased to 1,519,740 and 939,050 shillings per acre annually, in Sheema and Isingiro districts, respectively. Under high input production practice, the total variable cost increased significantly to 4,138,098 and 3,447,213 shillings in Sheema and Isingiro districts respectively. The gross margin dramatically increased from traditional, low input to high input

across. Returns on investment across the production practices was above 1.5 shillings gained per one shilling invested.

Table 3.10: Production costs and gross margins for Banana Enterprise under the three Production Technology Levels in Sheema and Isingiro Districts

Input	Sheema district			Isingiro district		
	Traditional	Low input	High input	Traditional	Low input	High input
Suckers (Depreciated)	0	135,000	135,000	0	112,500	90,000
Fertilizers	0	0	270,850	0	0	270,000
Animal manure	0	0	685,700	0	0	545,700
Support poles	25,600	289,800	342,000	45,000	135,000	270,000
Mulch	0	0	685,600	0	0	650,000
Herbicides	0	0	155,850	0	0	150,000
Sub-total	25,600	424,800	2,275,000	45,000	247,500	1,975,700
Labour costs						
land clearing	45,600	25,000	25,000	35,000	40,000	40,000
First ploughing	54,800	45,600	45,680	75,000	75,000	75,000
Second ploughing	0	42,320	43,350	0	44,500	35,000
Digging holes	45,000	135,000	135,000	45,000	112,500	112,500
Planting	22,500	45,000	67,500	22,500	22,500	22,500
Weeding	65,650	24,670	25,850	75,600	45,000	45,000
Application of manure	0	0	225,680	0	0	50,000
Mulching	0	0	305,600	0	0	150,000
Fertilizer and pesticide application	0	0	194,400	0	0	150,000
Desuckering and deleafing	25,600	40,000	72,000	25,000	45,000	135,000
Removal of rhizomes, splitting pseudostems	0	60,000	240,000	0	65,800	185,600
Staking banana plants bearing fruits	0	450,000	85,800	0	20,000	45,000
Banana weevil trapping	0	85,600	172,800	0	120,000	265,600
Harvesting	0	141,750	224,438	0	101,250	160,313
Sub-total						

	259,150	1,094,940	1,863,098	278,100	691,550	1,471,513
Total Variable Cost (TVC)	284,750	1,519,740	4,138,098	323,100	939,050	3,447,213
Marketable yield	3,698	13,156	25,055	2,734	12,211	28,364
Average price (Ug shs/kg)	230	246	270	200	250	265
Total Revenue (TR)	849,240	3,238,321	6,764,937	546,750	3,052,688	7,516,399
Gross margin (TR-TVC)	564,490	1,718,581	2,626,840	223,650	2,113,638	4,069,187
Benefit-cost ratio (TR/TVC)	2.98	2.13	1.63	1.69	3.25	2.18
Unit cost of production	87	71	138	104	124	146
Marginal returns on investment (Unit price-Unit cost of production)	143	175	132	96	126	119

Source; Survey data

Banana production costs and gross margin estimates under three production practices (Traditional, Low input and High input) in Mbarara and Bukomansimbi districts are presented in Table 3.11. The total variable costs were lowest under the traditional production practice and gradually increased as the level of input use increased. This observation was recorded in the two districts. The gross margin in Mbarara district ranged between 273,050 shillings under traditional practice to 3,883,935 shillings per acre per year under high input use. However, in Bukomansimbi district, a loss of 69,850 shillings was recorded under the traditional practice and dramatically increased with increase in input usage. The unit rate of returns on every shilling invested in variable costs in Mbarara district was highest under low input use being 3.32 followed by high input usage. A similar trend was observed in Bukomansimbi district, where under traditional practice, a loss of 17 shillings for every 100 shillings invested was recorded. Under low input usage, a highest returns of 184 shillings per 100 shillings invested was recorded, this was gradually decreased with increase in input usage to 141 shillings per 100 shillings invested.

Table 3.11: Production costs and gross margins for Banana Enterprise under the three Production Technology levels in Mbarara and Bukomansimbi Districts

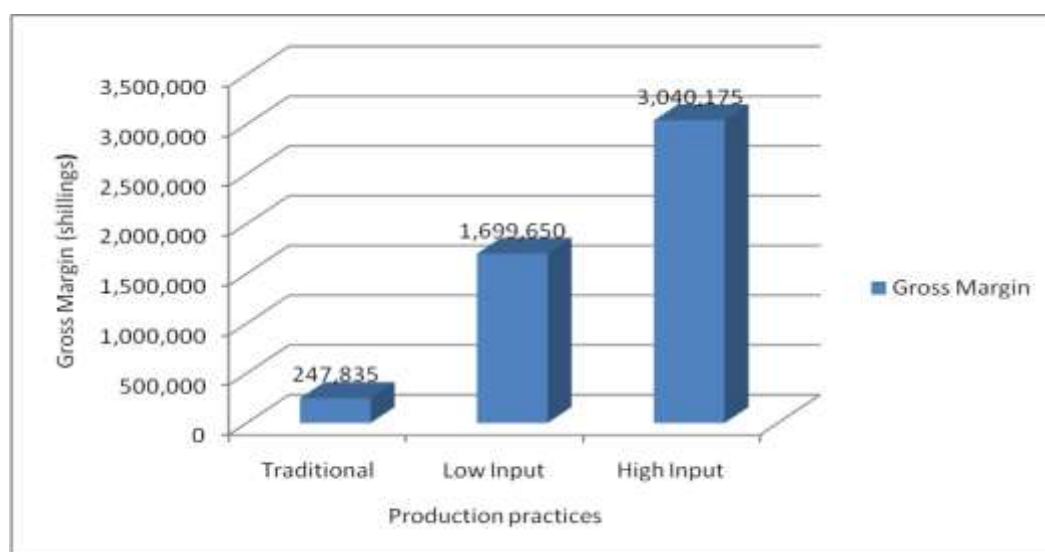
Input	Mbarara district			Bukomansimbi district		
	Traditional	Low input	High input	Traditional	Low input	High input
Suckers (Depreciated)	0	168,750	135,000	0	135,000	135,000
Fertilizers	0	0	265,800	0	0	245,000
Animal manure	0	0	456,800	0	0	835,714
Support poles	30,000	162,000	324,000	45,600	65,800	150,182
Mulch	0	0	685,600	0	0	578,267
Herbicides	0	0	175,850	0	0	124,000
Sub-total	30,000	330,750	2,043,050	45,600	200,800	2,068,163
Labour costs						
land clearing	35,000	25,000	25,000	45,000	45,000	45,000
First ploughing	50,000	50,000	50,000	70,000	70,000	70,000
Second ploughing	0	46,800	45,250	0	70,000	70,000
Digging holes	45,000	90,000	90,000	45,000	112,500	112,500
Planting	22,500	45,000	45,000	45,000	45,000	45,000
Weeding	65,650	25,670	20,850	120,000	60,000	30,000
Application of manure	0	0	125,600	0	0	20,000
Mulching	0	0	245,600	0	0	150,000
Fertilizer and pesticide application	0	0	180,000	0	0	120,000
Desuckering and deleafing	25,600	40,000	120,000	30,000	50,000	90,000
Removal of rhizomes, splitting pseudostems	0	60,000	240,000	0	40,000	120,000
Staking banana plants bearing fruits	0	20,000	65,800	0	25,600	46,400
Banana weevil trapping	0	85,600	144,000	0	120,000	240,000
Harvesting	0	101,250	192,375	0	150,000	675,000
Sub-total	243,750	589,320	1,589,475	355,000	788,100	1,833,900
Total Variable Cost (TVC)	273,750	920,070	3,632,525	400,600	988,900	3,902,063
Marketable yield	2,734	12,211	28,364	1,890	9,113	24,368

Average price (Ug shs/kg)	200	250	265	175	200	225
Total Revenue (TR)	546,800	3,052,750	7,516,460	330,750	1,822,600	5,482,800
Gross margin (TR-TVC)	273,050	2,132,680	3,883,935	-69,850	833,700	1,580,737
Benefit-cost ratio (TR/TVC)	2.0	3.32	2.07	0.83	1.84	1.41
Unit cost of production	100.13	75.35	128.07	211.96	108.52	160.13
Marginal returns on investment (Unit price-Unit cost of production)	99.87	174.65	136.93	(36.96)	91.48	64.87

Source: Survey data

The overall gross margin estimates for banana production per acre annually across the four banana production districts (Isingiro, Mbarara, Sheema and Bukomansimbi) are presented in Figure 3.7. There was a dramatic increase in gross margin from traditional banana production through low input usage to high level input use. The gross margin under traditional practice increased more than 600% to reach the gross margin recorded under the low input use. From low input use to high input use, the figure more than doubled (Figure 3.7).

Figure 3.7: Gross margins per acre for Bananas under three Production Practices across the study Districts Annually



Source: Survey data

3.2.4 Maize

Maize production costings and gross margin estimates under different production practices in the districts of Lira and Kiryandongo are presented in Table 3.12. The total variable costs of maize production in Lira district ranged between 243,905 shillings to 841,078 shillings per acre per season under traditional and high input production practice, respectively. While in Kiryandongo, the variable costs varied between 257,345 and 702,070 shillings per acre per season. The gross margin in Lira district under both traditional and low input recorded negative values, implying that, the farmers made losses as the total variable costs incurred exceeded the revenue generated from the sale of the maize. It was noted however, that conservation tillage and high input usage recorded positive gross margins implying that, farmers were able to make a profit margin of 264,122 and 108,035 shillings per acre per season.

In Kiryandongo district, under the traditional production practice, the gross margin recorded was negative, implying that farmers made losses. However, farmers were able to make a margin under the low input and high input production practices.

Table 3.12: Maize production costs and gross margins under three Production Practices for Lira and Kiryandongo Districts per acre per season

	Lira district				Kiryandongo		
	Traditional	Low input	High input	Conservation tillage	Traditional	Low input	High input
Labor costs							
Land clearing	56,038	50,038	46,038	40,000	35,800	35,840	35,840
First ploughing	35,600	35,800	35,856	0	43,938	35,800	35,800
Second ploughing	36,167	35,600	38,650	0	36,167	36,760	38,650
Herbicide use	0	5,600	7,450	6,000	0	12,000	12,680
Digging holes, add fertilizer and planting	25,000	32,800	33,400	60,000	35,560	36,700	35,600
1st weeding / Spot weeding	52,500	40,250	45,000	45,600	64,500	65,600	56,840
Application of fertilizer	0	0	30,000	0	0	0	35,840
2nd weeding	0	50,000	50,234	42,500	0	0	45,850
Pesticide application	0	12,340	24,000	6,000	0	12,000	18,460
Harvesting	8,000	12,000	15,600	10,000	10,500	15,600	18,450
Transporting home/ store	6,000	16,000	24,800	7,500	5,000	14,860	22,680

Drying	8,500	12,000	15,000	12,000	6,800	11,400	18,560
Shelling	6,000	9,000	20,800	4,500	6,000	9,840	23,786
Cleaning, sorting Grading, bagging	5,600	11,580	22,460	20,000	6,540	12,560	17,234
Total Labor Cost	239,405	323,008	409,288	254,100	250,805	298,960	416,270
Costs of inputs							
Hired land	0	66,900	74,500	73,705	0	56,450	34,650
Seed	0	40,000	40,000	43,560	0	40,000	40,000
Fertilizers	0	0	254,600	120,000	0	0	132,400
Herbicides	0	27,840	28,450	25,000	0	27,840	30,650
Inorganic insecticides	0	15,600	18,600	15,800	0	18,460	24,650
Bags	4,500	10,000	15,640	15,000	6,540	14,750	23,450
Total Input cost	4,500	160,340	431,790	293,065	6,540	157,500	285,800
Total Variable cost	243,905	483,348	841,078	547,165	257,345	456,460	702,070
Total Yield (TY)	524	956.87	2,456	1,456	426	1,434	2,240
Average price (Ug shs/kg)	350	450	450	450	320	450	450
Total Revenue (TR)	183,400	430,592	1,105,200	655,200	136,320	645,300	1,008,000
Gross margin (TR- TVC)	-60,505	-52,757	264,122	108,035	-121,025	188,840	305,930
Benefit-cost ratio (TR/TVC)	0.75	0.89	1.31	1.20	0.53	1.41	1.44
Returns to investment based on total cost of production (TVC/TY)	465.47	505.13	342.46	375.80	604.1	131.69	136.58
Marginal returns on investment (Unit price-Unit cost of production)	(115.47)	(55.13)	107.54	74.20	(284.10)	318.31	313.42

Source; Survey data

Maize production costs and gross margins under the three different production practices in Kiboga and Kamwenge districts are presented in Table 3.13. The total variable costs in Kiboga district were in the range of 224,012 shillings per acre per season under traditional production practice to 818,293 shillings per acre per season under high input use. The gross margin therefore followed a similar trend, with a negative figure under traditional practice.

In Kamwenge district, the total variable costs varied between 259,643 shillings under traditional production practice to 871,237 shillings under the high input production practice per season per acre. A loss was recorded under the tradition practice of 7,853 shillings. A profit of 305,930 shillings was made for maize production in Kamwenge while using high input usage.

Table 3.13: Maize production costs and gross margins under three Production Practices for Kiboga and Kamwenge Districts per acre per season

	Kiboga district			Kamwenge district		
	Traditional	Low input	High input	Traditional	Low input	High input
Labor costs						
Land clearing	62,318	65,318	68,400	45,670	52,340	50,650
First ploughing	56,364	45,650	44,659	67,850	62,560	65,205
Second ploughing	0	48,680	46,870	0	0	54,650
Herbicide use	0	12,340	15,400	0	0	0
Digging holes, add fertilizer and planting	14,560	38,657	40,690	35,600	32,250	33,925
1st weeding / Spot weeding	54,450	66,845	45,657	40,650	45,865	43,258
Application of fertilizer	0	0	29,571	0	0	24,000
Second weeding	0	0	34,800	0	0	51,667
Pesticide application	0	13,400	24,500	0	0	18,654
Harvesting	6,840	12,656	18,450	11,256	16,453	32,450
Transporting home/ store	5,000	12,360	21,846	12,456	18,657	30,456
Drying	3,840	7,560	18,560	11,636	18,000	32,765
Shelling	8,560	15,962	23,786	12,634	19,564	32,867
Cleaning, sorting Grading, bagging	6,540	10,640	21,324	13,241	19,834	31,500
Transport to market	0	0	0	0	0	0
Total Labor Cost	218,472	350,068	454,513	250,993	285,523	502,047
Costs of inputs						
Hired land	0	102,560	98,675	0	132,400	99,654
Seed	0	56,400	58,640	0	40,658	58,450
Fertilizers	0	0	132,400	0	0	134,600
Herbicides	0	0	30,650	0	0	25,430
Inorganic insecticides	0	12,840	24,650	0	0	18,600
Bags	5,540	12,965	18,765	8,650	16,540	32,456
Total Input cost	5,540	184,765	363,780	8,650	189,598	369,190
Total Variable cost (TVC)	224,012	534,833	818,293	259,643	475,121	871,237
Total Yield (TY)	426	1,434	1,867	654	1,125	2,243
Average price (Ug shs/kg)	350	475	500	385	470	560
Total Revenue(TR)	149,100	681,150	933,500	251,790	528,750	1,256,080
Gross margin (TR-TVC)	-74,912	146,317	115,207	-7,853	53,629	384,843
Benefit-cost ratio (TR/TVC)	0.67	1.27	1.14	0.97	1.11	1.44
Unit cost of production						

(TVC/TY)	525.85	372.97	438.29	397.01	422.33	388.42
Marginal returns on investment (Unit price- Unit cost of production)	(175.85)	102.03	61.71	(12.01)	47.67	171.58

Source; Survey data

Maize production costs and gross margins under the three production practices in Iganga and Kapchorwa districts are presented in Table 3.14. The total variable costs in Iganga district varied between 187,119 shillings an acre to 764,829 shillings per season. The gross margin too varied between 48,681 shillings under the traditional production practice to 708,771 under the high input use. The unit rate of returns on investment varied from 1.11 under low input production to 1.93 under the high input use.

Kapchorwa district recorded the highest costs of production among all the six districts selected for maize enterprise (Table 3.12, 3.13, 3.14). The total variable cost varied significantly from 309,948 shillings under the traditional to 1,117,044 shillings an acre. Likewise, the gross margin in this district was high under all the three production practices.

Table 3.14: Maize production costs and gross margins under three Production Practices for Iganga and Kapchorwa Districts per season per acre

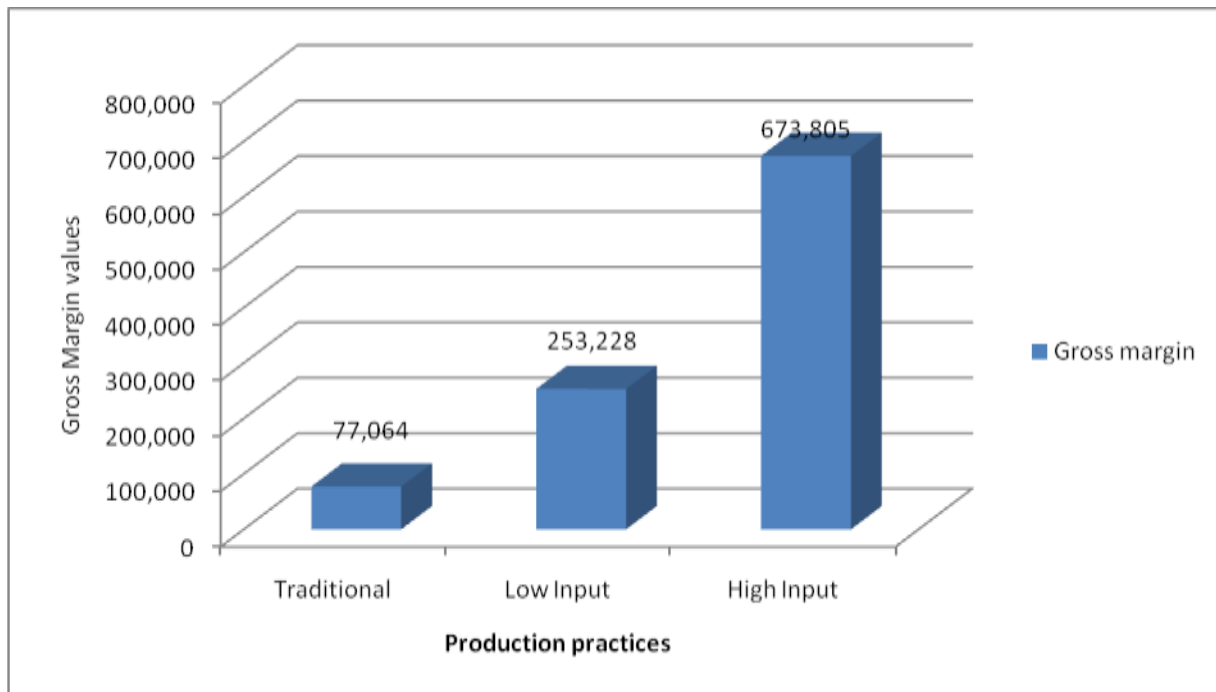
	Iganga district			Kapchorwa district		
	Traditional	Low input	High input	Traditional	Low input	High input
Labor costs						
Land clearing	38,560	39,217	40,456	28,375	27,654	28,015
First ploughing	46,095	51,098	50,556	64,560	75,333	69,947
Second ploughing	0	0	40,000	58,519	54,654	50,438
Herbicide use	0	0	17,500	0	0	16,000
Digging holes, add fertilizer and planting	29,867	39,348	40,128	37,182	36,700	35,658
1st weeding / Spot weeding	36,560	42,500	45,650	32,783	35,678	34,231
Application of fertilizer	0	0	24,560	0	0	21,750
2nd weeding	0	0	37,133	0	0	35,560
Pesticide application	0	15,650	22,456	0	12,340	13,600
Harvesting	8,000	12,340	14,860	15,876	37,500	52,500
Transporting home/ store	6,400	12,670	18,780	9,876	15,876	25,259
Drying	6,750	11,864	11,636	16,083	30,340	53,654

Shelling	5,460	12,780	22,250	18,600	32,456	54,543
Cleaning, sorting Grading, bagging	4,860	12,540	20,654	12,340	21,356	36,547
Transport to market	0	0	0	0	0	0
Total Labor Cost	182,552	250,007	406,619	294,194	379,887	527,701
Costs of inputs						
Hired land	0	102,564	99,654		149,389	150,034
Seed	0	40,658	58,450	0	52,319	65,876
Fertilizers	0	0	134,600	0	0	265,786
Herbicides	0	27,840	28,450	0	12,456	30,650
Inorganic insecticides	0	15,600	18,600	0	18,460	24,650
Bags	4,567	12,345	18,456	15,754	32,456	52,347
Total Input cost	4,567	199,007	358,210	15,754	265,080	589,343
Total Variable cost (TVC)	187,119	449,014	764,829	309,948	644,967	1,117,044
Total Yield (TY)	524	956.87	2,456	1124	2,034	3,675
Average price (Ug shs/kg)	450	520	600	650	875	920
Total Revenue(TR)	235,800	497,572	1,473,600	730,600	1,779,750	3,381,000
Gross margin (TR-TVC)	48,681	48,558	708,771	420,652	1,134,783	2,263,956
Benefit-cost ratio (TR/TVC)	1.26	1.11	1.93	2.36	2.76	3.03
Unit cost of production (TVC/TY)	357.10	469.25	311.41	275.75	317.09	303.96
Marginal returns on investment (Unit price - Unit cost of production)	92.90	50.75	288.59	374.25	557.91	616.04

Source; Survey data

Maize gross margin values under the three production practices across all the six districts sampled for maize production are presented in Figure 3.8. The gross margin significantly increases with increase in level of input use and management of the maize garden. Farmers practicing low input use are able to increase gross margin by more than three times being a shift from traditional to low input usage with good crop husbandry management. In the same way, using high input level a farmer is able to increase yields by more than double the gross margin returns gained under the low input usage.

Figure 3.8: Gross margin values for Maize under three Production Practices across the survey Districts



3.2.5 Beans

Bean production costs and gross margins under the three different production practices (Traditional, Low input and High input) for Lira and Kiryandongo districts are presented in Table 3.15. The average total variable cost under the three production practices across the two districts ranged between 261,576 shillings to 777,469 shillings under high input usage. The gross margin in Lira district was between 39,424 to 385,458 shillings under high input usage.

On the other hand, in Kiryandongo district under both traditional and low input, gross margin values recorded were negative. This indicates that the farmers made losses as the total variable costs exceeded the total revenue generated from sale of the beans produced under traditional and low input levels respectively. However, under high input technology, the gross margin of 422,781 shillings per acre per season was recorded.

Table 3.15: Beans production costs and gross margins under three Production Practices for Lira and Kiryandongo Districts per acre per season

	Lira district			Kiryandongo district		
	Traditional	Low input	High input	Traditional	Low input	High input
Labor costs						
Land clearing	49,342	50,124	49,733	53,450	56,540	58,520
First ploughing	47,526	45,653	46,789	55,600	58,760	60,450
Second ploughing	43,657	45,230	44,567	50,560	52,340	52,346
Herbicide use	0	0	0	0	0	0
Digging holes, add fertilizer and planting	14,256	28,100	32,400	23,450	45,670	54,350
1st weeding / Spot weeding	35,688	36,876	36,282	34,260	43,578	56,240
Application of fertilizer	0	0		0	0	
Second weeding	0	0	0	0	34,360	38,700
Pesticide application		0	10,000	0	0	13,500
Harvesting	12,340	20,000	20,000	8,760	23,567	33,667
Transporting home/ store	12,345	18,762	24,567	12,456	14,579	18,765
Drying	15,625	20,345	22,654	9,876	19,071	20,567
Shelling	16,234	24,650	28,543	13,452	18,675	21,538
Cleaning, sorting grading, bagging	10,000	15,432	18,654	6,750	13,969	12,345
Transport to market						
Total Labor Cost	257,013	305,172	334,189	268,614	381,109	440,988
Costs of inputs						
Hired land	0	65,436	65,867	0	65,600	64,700
Seed	0	105,000	105,000	0	96,500	98,765
Fertilizers	0	0	123,670	0	0	134,000
Herbicides	0	0	0	0	0	0
Inorganic insecticides	0	15,654	24,560	0	16,654	25,560
Bags	4,563	7,560	12,456	4,563	7,560	13,456
Total Input cost	4,563	193,650	331,553	4,563	186,314	336,481
Total Variable cost (TVC)	261,576	498,822	665,742	273,177	567,423	777,469
Total Yield (TY)	215	356	657	156	324	687
Average price (Ug shs/kg)	1,400	1,520	1,600	1,500	1,600	1,750
Total Revenue(TR)	301,000	541,120	1,051,200	234,000	518,400	1,202,250
Gross margin (TR-TVC)	39,424	42,298	385,458	-39,177	-49,023	424,781
Benefit-cost ratio (TR/TVC)	1.15	1.08	1.58	0.86	0.91	1.55

Unit cost of production	1,217	1,401	1,013	1,751	1,751	1,132
Marginal returns on investment (Unit price - Unit cost of production)	183	119	587	-251	-151	618

Source: Survey data

Bean production costs and gross margins under the three different production practices (Traditional, Low input and High input) for Kamwenge and Kiboga districts are presented in Table 3.16. The average total variable cost under the three production practices across the two districts varied with the lowest being recorded under traditional practice being 328,788 shillings and the highest recorded under the high input use being 862,498 shillings per acre per season. The gross margin under traditional practice in both districts recorded a loss of 100,554 and 55,288 shillings in Kamwenge and Kiboga districts respectively. Highest gross margins were recorded under the high input use being 567,142 shillings and 389,772 shillings per acre per season in Kamwenge and Kiboga districts, respectively.

Table 3.16: Beans production costs and gross margins under three Production Practices for Kamwenge and Kiboga Districts per acre per season

Labor costs	Kamwenge district			Kiboga district		
	Traditional	Low input	High input	Traditional	Low input	High input
Land clearing	45,650	42,560	41,670	44,276	41,667	42,550
First ploughing	39,577	45,650	42,210	33,456	42,583	44,650
Second ploughing	30,560	40,543	38,650	32,333	45,450	44,360
Digging holes, add fertilizer and planting	32,540	45,876	45,900	35,600	45,650	48,860
1st weeding / Spot weeding	42,310	44,678	42,896	32,500	37,968	38,650
Application of fertilizer	0	0	52,340	0	0	46,667
2nd weeding	34,560	43,670	56,750	24,867	45,670	44,860
Pesticide application	0	0	28,800	0	0	27,800
Harvesting	22,400	35,678	43,260	23,650	34,678	54,196
Transporting home/ store	16,540	24,560	40,654	15,000	24,630	44,630
Drying	17,700	22,456	31,560	15,806	23,456	32,560
Shelling	18,567	23,546	35,571	18,000	28,200	33,320
Cleaning, sorting Grading, bagging	8,650	12,345	24,567	11,000	20,345	25,565

Total Labor Cost	309,054	381,562	524,828	286,488	390,297	528,668
Costs of inputs						
Hired land	0	60,540	60,876	0	54,560	52,340
Seed	0	105,000	105,000	0	90,560	96,400
Fertilizers	0	0	123,760	0	0	123,000
Inorganic insecticides	0	12,546	32,567	0	12,546	24,560
Bags	42,300	8,560	15,467	42,300	8,560	14,360
Total Input cost	42,300	186,646	337,670	42,300	166,226	310,660
Total Variable cost	351,354	568,208	862,498	328,788	556,523	839,328
Total Yield (TY)	165	356	824	185	412	723
Average price (Ug shs/kg)	1520	1650	1735	1500	1650	1700
Total Revenue(TR)	250,800	587,400	1,429,640	277,500	679,800	1,229,100
Gross margin (TR-TVC)	-100,554	19,192	567,142	-51,288	123,277	389,772
Benefit-cost ratio (TR/TVC)	0.71	1.03	1.66	0.84	1.22	1.46
Unit cost of production	2,129	1,596	1,047	1,777	1,351	1,161
Marginal returns on investment (Unit price - Unit cost of production)	-609	54	688	-277	299	539

Source: Survey data

Bean production costs and gross margins for Iganga and Kapchorwa under three different production practices are presented under Table 3.17. The total variable cost varied between 270,113 shillings per acre per season under traditional practice to 803,479 shillings per acre per season under high input use. Likewise gross margin values increased following a similar pattern to level of investment in input use. Under traditional practice in Iganga district, a negative value of 8,270 was recorded, while the highest value of 980,696 shillings under high input use was recorded in the same district. In Kapchorwa district, the lowest gross margin value of 45,787 shillings per season per acre was recorded and the highest being 934,913 shillings per acre per season.

Table 3.17: Beans Production costs and gross margins under three Production Levels in Iganga and Kapchorwa Districts per acre per season

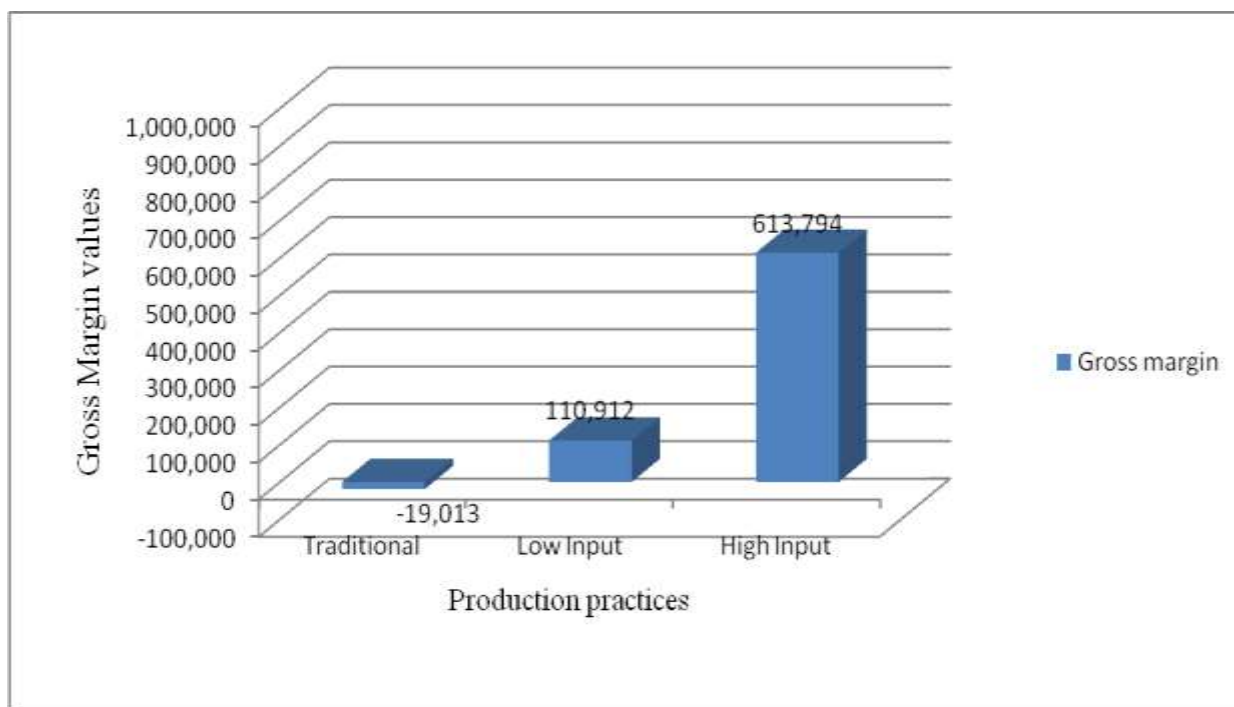
Labor costs	Iganga district			Kapchorwa		
	Traditional	Low input	High input	Traditional	Low input	High input
Land clearing	34,458	35,467	35,000	34,458	34,729	35,000
First ploughing	46,200	47,328	48,456	48,670	53,456	56,200
Second ploughing	43,077	42,256	38,167	26,881	36,865	38,167
Digging holes, add fertilizer and planting	39,043	40,567	45,345	29,567	34,560	38,900
1st weeding / Spot weeding	43,640	49,155	54,670	35,931	42,500	45,987
Application of fertilizer	0	0	38,670	0	0	36,560
2nd weeding	37,444	44,972	52,500	31,214	35,670	38,568
Pesticide application	0	0	22,857	0	0	23,500
Harvesting	19,800	26,032	32,263	14,056	23,450	32,850
Transporting home/ store	20,824	18,765	30,833	20,824	18,765	30,833
Drying	6,211	15,650	24,350	8,340	12,207	24,350
Shelling	8,333	16,875	24,654	6,379	15,678	22,567
Cleaning, sorting Grading, bagging	5,460	12,567	21,789	9,150	12,567	23,456
Transport to market						
Total Labor Cost	304,490	349,634	469,554	265,470	320,447	446,938
Costs of inputs						
Hired land	0	50,678	54,876	0	65,680	65,450
Seed	0	98,567	10,540	0	102,400	105,460
Fertilizers	0	0	124,500	0	0	136,500
Inorganic insecticides	0	12,546	32,567	0	24,399	35,675
Bags	42,300	8,560	15,467	4,643	7,560	13,456
Total Input cost	42,300	170,351	237,950	4,643	200,039	356,541
Total Variable cost	346,790	519,985	707,504	270,113	520,486	803,479
Total Yield (TY)	186	349	734	156	356	678
Average price (Ug shs/kg)	1,820	2,000	2,300	2025	2450	2564
Total Revenue(TR)	338,520	698,000	1,688,200	315,900	872,200	1,738,392
Gross margin (TR-TVC)	-8,270	178,015	980,696	45,787	351,714	934,913
Benefit-cost ratio (TR/TVC)	0.98	1.34	2.39	1.17	1.68	2.16
Unit cost of production						

(TVC/TY)	1,864.46	1,489.93	963.90	1,731.49	1,462.04	1,185.07
Marginal returns on investment (Unit selling price - Unit cost of production)	(44.46)	510.07	1,336.10	293.51	987.96	1,378.93

Source: Survey data

Gross margin values for bean production across the study districts under three production practices are presented in Figure 3.9. Under traditional practice, the gross margin value of -19,013 was recorded, implying that, under this production practice, the farmer can only make a loss and he/she spends more than the returns. The trend gradually improved with the highest value recorded under the high input use recording a gross margin value of 613,794 shillings per acre per season.

Figure 3.9: Gross Margin values for Beans under three Production Practices across the survey Districts per season per acre



Source: Survey data

3.4 Key Enterprise marketing aspects

3.4.1 Dairy

Dairy enterprise marketing challenges in study districts

- Price fluctuations during low and peak seasons causing market instability
- Poor rural access roads contributing to high transport costs
- Few central coolers installed in rural collection centers
- Power fluctuations leading to high cost of running generators
- Organized theft of animals by people from urban areas
- Lack of testing kits by dairy farmers to ascertain quality before delivery

3.4.2 Goats

Goat enterprise marketing challenges in study districts

- Price fluctuations causing market instability
- Poor rural access roads contributing to high transport costs
- Organized theft by people from urban areas

3.4.3 Bananas

Banana enterprise marketing challenges in study districts

- Price fluctuations causing market instability
- Poor rural access roads contributing to high transport costs
- Lack of organized farmers marketing groups to undertake collective banana marketing
- Low working capital for the traders exacerbated by high bank interest rates

3.4.4 Maize

Maize enterprise marketing challenges in study districts

- Price fluctuations during low and peak seasons causing market instability
- Poor rural access roads contributing to high transport costs
- Quality is generally poor due to poor postharvest handling and management
- Low working capital for the traders exacerbated by high bank interest rates
- Many intermediaries who buy maize grains at high moisture content thus leading to poor quality maize

3.4.5 Beans

Bean enterprise marketing challenges in study districts

- Price fluctuations during low and peak seasons causing market instability
- Poor rural access roads contributing to high transport costs
- Quality is generally poor due to poor postharvest handling and management
- Low working capital for the traders exacerbated by high bank interest rates

4.1 Study Conclusions

The study on cost of production and gross margin analysis of five selected enterprises (Dairy, Goats, Maize, Beans and Bananas) in eleven selected districts of Uganda was successfully completed. The study considered production under different production practices being traditional, low input and high input use. Farmers engaged in subsistence farming were categorized as traditional and their level of input use and management was found to be very low. Very little output under this category was reserved for sale, in most times the gross margins were negative meaning the farmers were making losses.

The study concluded that, there is a great potential of transforming the agricultural enterprises selected into viable commercial undertakings, once the farmers are able to invest and remain keen to ensure good crop and or animal husbandry practices. Total yields could be increased significantly thus lowering the unit cost of production. This coupled with good postharvest management practices and market linkages, farmers can be able to negotiate better prices and thus attain higher gross margin returns and returns on investment made.

The following conclusions were made on each of the selected enterprises as listed below;

4.1.1 Dairy Enterprise

Dairy farming is a profitable agribusiness undertaking, this was observed by the positive gross margin values obtained in all the study districts and across the different production practices. It was recorded that, under traditional methods of animal keeping, the gross margin value remained high at 335,369 shillings earned per lactating animal per year. Generally, the unit cost of production per lactating cow across the three production practices is very low and thus making the marginal returns positive and high.

Returns on investment progressively increased from traditional being 14.98 shillings for every one shilling invested and subsequently weaned off. Unit cost of production should be carefully

watched as one increases investment as this might subsequently eat away the gains from investing such additional resources.

Milk production increased by more than 300% by improving the type of animal breeds, increased input and animal care. There is still a big room to increase milk production as farmers improve on the quality of their stock and general management.

4.1.2 Goats Enterprise

Goat production as an independent enterprise is not well developed; the majority of farmers keep goats in a mixed livestock with cattle. Investment in goat rearing was found to be low and not so much promoted, with exception of some farmers who are now adopting the rearing of improved goats. During the study, goat enterprise was grouped into two major categories being traditional and low input. On average, it was established that a female goat can give birth to only one kid within a period of one year. The unit cost of production under the traditional practice was recorded as 14,739.3 shillings, with a gross margin of 41,635.8 shillings per goat per year.

Under low input, the gross margin improves due to improved care of the animals, investment in purchase of inputs and use of veterinary services, thus giving a gross margin of 83,544.5 shillings. However, the unit cost of production goes up to an average of 38,487 shillings per animal per year. Goat rearing is a profitable undertaking, it requires identifying the right breeds, provide adequate inputs and improve on the economies of scale by having a number of farmers within a given area rearing goats and can seek market as a farmer organization rather than as an individual.

4.1.3 Banana Enterprise

Banana production was found to be profitable at all the different production levels as given by the gross margin values recorded being 247,835 shillings, 1,699,650 shillings and 3,040,175 shillings being under traditional, low input and high input production practices, respectively. Banana yields were estimated to increase by more from traditional practices to low input production practice and subsequently the gross margin increases by more than 680%. Increasing input levels from low to high increased gross margin to 3,040,175 shillings per acre per year and yields could go up to 26.54 metric tons.

4.1.4 Maize Enterprise

Maize enterprise was found to be grown by many farmers as a source of income but also as a food security crop. In many households, maize is grown as an intercrop with crops like beans, banana, peas etc. Overall, maize production was profitable as observed by the gross margin values recorded. Under traditional production practice, a gross margin value of 77,064 shillings per acre per season was recorded and this subsequently increased with increase in use of inputs. Under low input use, the gross margin values increased to 253,228 shillings per acre per season and increased to 673,805 shillings per season per acre. Likewise, maize yields averaged to about 7 bags of 100 kgs per acre under traditional, to 14 bags under low input and 26 bags under high input.

The rate of returns on investment gradually increased as farmers moved away from traditional to more commercial orientation. Under traditional production practice, an average of 1.32 shillings realized as a return on every one shilling invested was recorded, 1.56 shillings and 1.89 shillings were recorded under low input and high input production practices, respectively. This observation shows the potential in increasing maize production per unit by manipulating variable factors of production like input levels and general crop husbandry practices.

4.1.5 Beans Enterprise

Bean production under tradition production practices was found to be unprofitable as provided by the negative gross margin value of 19,013 shillings per acre per season. Also the rate of returns on investment under tradition was found to be less than 1, meaning that, every shilling invested earned less than a shilling and thus leading to losses. However, with improvement in input use and general crop husbandry practices, the gross margin values and crop yield improved. At high input use, a gross margin of 613,794 shillings was recorded being generated from a crop yield of 717.2 kg. The return on investment ration recorded was 1.80 almost double every shilling invested in bean production. Improvement in utilization of inputs and crop husbandry practices could make bean production profitable.

4.2 Study Recommendations

The following are recommendations for the five selected enterprises that were studies to ascertain the gross margin values. Overall, all the five enterprises can be profitable, however the attitude of commercialization by the farmers, utilization of the inputs, the purchasing power

of the farmers, existence of enterprise clusters that brings together different actors and supports within a unit is critical and sure be promoted. Proper market linkage is critical to ensure that farmers produce for a particular market and all efforts are geared towards satisfying the market requirements. This provides confidence to farmers while investing in the production of the enterprises.

Specifically the following are recommendations for each of the five selected enterprises that were studied;

4.2.1 Dairy Enterprise

- (i) Dairy farmers should endeavor to improve the animal breeds kept so as to increase the animal's potential to produce milk, the improved animals respond well to improved feeds thus reducing the unit cost of milk production
- (ii) Dairy farmers should maintain a reasonable number of herd size so that appropriate management is given to each animal as a unit of production.
- (iii) Record keeping should be maintained for each animal, indicating the parentage as this helps to know the animals' history and plan for herd improvement
- (iv) Dairy farmers in particular areas of locality should seek to work together as a group, this will assist in collective procurement of inputs and marketing of their products
- (v) Farmers should maintain high milk quality high through investment in basic tools and facilities. As farmers' cooperatives they could invest in collection centers fully equipped with coolers to reduce milk spoilage
- (vi) Improve control of pests and diseases especially the ticks, with emphasis on counterfeit acaricides on the market.

4.2.2 Goat Enterprise

- (i) Improve the breeds kept by farmers emphasis should be put on fast growing breeds for beef
- (ii) Minimize in-breeding, farmers should be advised to use male goats to produce better siblings.
- (iii) Proper record keeping for individual animals should be maintained since each animal is known to be an entity
- (iv) Improvement of animal feeding should be encouraged especially those at fattening, lactating and mating stages
- (v) Local government especially at the district and sub/county levels should pass by laws to regulate movement of the animals and to punish severely those caught with stolen animals in order to reduce theft

- (vi) Goat farmers should seek to work together as a group, promote collective procurement of inputs and marketing of their animals.

4.2.3 Banana Enterprise

- (i) Control of diseases especially the notorious banana bacterial wilt (BBW) should be given priority because this can wipe out the whole plantation.
- (ii) Upon establishment of a banana plantation, management of soil fertility, suckers management and moisture levels in the garden should be given due attention
- (iii) Development of local compost manure making technology at homestead level will help to supplement the much needed soil nutrients replacement to match with the level of output.
- (iv) Farmers should keep records of all inputs and outputs to determine the most profitable levels of operation.
- (v) Farmers should seek to work together in matters of production and marketing of their produce.

4.2.4 Maize Enterprise

- (i) Farmers should use certified maize seeds from recommended seed dealers
- (ii) Farmers should ensure recommended plant spacing, fertilizer regimes like DAP at planting, urea application at knee-height and other crop husbandry practices
- (iii) Adoption of cost saving practices like use of conservation tillage should be encouraged in addition to improved soil structure and fertility measures
- (iv) Postharvest handling of maize seed is very important, it is well documented that between 15-30% of the maize seed get spoiled after harvest. Farmers should make sure that postharvest handling activities like drying, shelling and storage are done properly.
- (v) Farmers should work together as a group to carry out collective marketing to attain better prices

4.2.5 Beans Enterprise

- (i) Farmers should use high yielding certified seed varieties that are demanded on the market
- (ii) Adequate amount of additional inputs like fertilizers and pesticides are recommended to boost production and improved control of pests and diseases
- (iii) Postharvest handling should be given due attention to minimize postharvest crop losses
- (iv) Farmers should work together to establish stronger groups to enhance bean production through collective purchase of inputs and marketing
- (v) Farmers should keep proper records of the enterprise stock such as inputs, labor and outputs.