Factors influencing successful inclusion of smallholder farmers in modern value chains in ACP countries: Lessons from pig, banana and fish value chains in Uganda

Project report submitted to

Technical Centre for Agricultural and Rural Cooperation (CTA)

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April 2015
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<td>African-Caribbean-Pacific</td>
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<tr>
<td>CAADP</td>
<td>Comprehensive Africa Agriculture Development Programme</td>
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<td>CBO</td>
<td>Community Based Organizations</td>
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<td>CGIAR</td>
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<td>DSIP</td>
<td>Development Strategy And Investment Plan</td>
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Executive summary

This report presents a study on factors influencing successful inclusion of smallholder farmers into value chains in Uganda. Value chains are considered ‘inclusive’ if they supply agri-food products from smallholder farmers. These inclusive value chains differentiate themselves from marketing channels where smallholder farmers are not producing for a clearly identified market outlet, whether they deliver commodities to markets in an ad hoc way, or are not selling their agri-food commodities because these are bartered within their community or consumed directly by the household. The research was done on three value chains that are relevant to the local context selecting and comparing control and treatment groups of farmers in each value chain. All three value chains already have some linkages between smallholder farmers and agribusinesses in the study area. The three value chains chosen were cooking bananas, one livestock (pigs) and aquaculture. The research endeavored to provide lessons to further understand the factors that influence smallholder farmers’ participation in inclusive value chains, the associated relationships within the value chains as well as and constraints.

To study farmers that are participating in the cooking banana (also referred to as matooke) inclusive value chains, the Consultant selected to focus the study in the Mbarara-matooke market area. Farmers participating in the inclusive fish value chains were already predetermined in the research proposal. These were the aquaculture farmers that are members of WAFICOS (Walimi Fish Farmers’ Cooperative Society). The research team already has a close working relationship with the Kati Farms. These were identified by comparing the list from WAFICOS with fish input dealers’ customers. Active members from the WAFISOS membership list formed the treatment sample population of interest while aquaculture farmers that were marketing their fish produce individually consisted of the control group.

For the pig value chain, the research was carried out in the same districts as the existing ILRI-led Uganda pig projects (IFAD-EU and Irish Aid funded Smallholder Pig Value Chain projects) under the CGIAR research program on Livestock and Fish in order to create synergies and build on the existing research findings.

The selected indicators for factors that have a potential to influence participation of smallholder farmers in inclusive value chains included Level of education of the farmer; Financial resources of the farmer; socio-economic factors affecting business relationship; Yield expectations; Organization of farmers in formal or informal groups; Location with respect to commercial buyer’s premises; Suitability of soils and climate; product supplied through the value chain; Ease of access to support services/inputs; Government infrastructure provision and policies; Contracts; and Client relationships.

The surveys on each of the value chains covered 100 farmers of whom 50 were involved in inclusive value chains and 50 were not. The following observations were made;

**The pig value chain**

Pig farmers did not depend on piggery alone for income. Most (65%) of them were also engaged in crop farming, some were either salaried employees of self-employed (30%). Many farmers ranked it as either the second or third (92%) most important source of income. Although men are important players, women were more involved than men in the piggery enterprises at home as shown in the Table 3.2. It is also notable that women were quite involved in pig farming, marketing and sale, as well as decision making in spending the proceeds from pig sales.
Pig farmers are usually smallholders. About 90% of them had sold no more than five pigs in the past year (last 12 months) and they usually sold one animal at a time. There are periods of high and low demand for pigs. The high demand usually coincides with the festive seasons of the Easter and Christmas/end of year. Sales also go up in times when schools are about to open for the new term. Pig farmers are usually price takers. 37% of the farmers indicated that they had received Ushs15,000-90,000 per animal; 53% had received between Ushs 100,000-200,000; while some 10% had received between Ushs.220,000-400,000. Payments are all made in cash. Although men usually take the lead in some of the key expenditure items like school fees, women also play a significant role in providing food, medical attention and clothing for their households.

Medium sized sows and finishers make up for most of the sales. They go for average price ranging between Ushs 100,000 to 250,000 per animal. There is no standard method of grading animals. The traders/buyers determine the price to pay the farmer arbitrarily, depending on the visual appearance of the animal. The premium price for good quality may reach Ushs 350,000 if sold to urban traders, farmers and NGOs. Some of the quality attributes buyers consider include; weight and height, breed, and physical health of the animal is important. Swine fever outbreaks are common and these usually wipe out the entire stock. Unfortunately such outbreaks are common and measures such as animal movement permits and quarantines are weak. Qualified Veterinary service providers are few and to fill the void there are also many unqualified personnel offering services to farmers. And because of the high risk involved in piggery, there are no financial institutions that are will lend to pig farmers. Farmers cope with the funding challenge by obtaining personal loans. The interest rates charged are in the range of 36% p.a. and payments are scheduled to be made weekly.

The correlation analysis of pig value chain farmers showed that the piggery farmers have a trusted ready market that pays them cash on time which negates the need to look for credit facilities. It also suggests that farmers keep pigs as a form of savings (current asset easy to liquidate). This observation probably explains the high sales farmers mentioned that occur during times of school fees and in the festive periods when they require cash. The Logit regression analysis showed that being a member of a credit or a good agricultural practices (GAP) group makes it less likely to be involved in an organized pig value chain. This surprising finding is explained by the multiple products produced on the same farm. By probing pig farmers further on this issue, it turned out that the credit and GAP groups had been created for their crop enterprise rather than the pig enterprise. The results of the regression model further indicate that farmers who had sold more animals tended to look out for bulk market channels, i.e. the urban traders.

**Banana Value Chain**

Analysis of the banana farmer households showed that all the banana farmers (100%) ranked the banana crop as their most important source of income. Crops like coffee and cattle rearing were also common sources of income mentioned. Other sources of income included self employment off the farm (21%) and salaried employment (14%). In the banana value chain, men are more involved in the overall production and management activities as well as decision making compared to the women. What is notable however is that in spite of their involvement in these activities, women do have a say in deciding how proceeds from the banana farm will be used.
Bananas are produced for both household consumption and for sale. A greater proportion of the production is sold. 75% of the farmers sell more than half of their production. Banana is a staple crop in Uganda and there are numerous traders of the product due to the high demand. Thus farmers are presented with several options of buyers that include local traders, local markets, and urban traders. There is no standard for grading system for bananas. The price of a bunch of bananas is determined arbitrarily and although prices may vary in the high and low supply seasons, most (81%) of farmers are paid Ushs.5000-10,000 per bunch. Payments are usually made in cash and in most cases; the traders buying from the farm gate do transport their purchases. Banana farmers meet several challenges in production and marketing of their produce. The crop is infested by a host of pest and diseases and the most devastating of these is the Banana Bacterial Wilt. The disease spreads very fast and can wipe out the entire plantation if not well managed. Indeed many farmers in Uganda have reported significant losses due to the disease.

Using Pearson’s Correlation Coefficient analysis of value chain participants it was found that there is a ready market for bananas with buyers readily available to purchase bananas. However, farmers seem to have developed a strong business relationship with buyers including exchange of information, trust, credit and satisfaction. Also, some indicators of inclusive value chains (a ready market outlet, trust and fair prices) do exist from the perspective of small householder banana farmers. However, the prevailing banana market is large enough to also readily absorb any available produce. The Logit regression analysis showed that there is open completion in the banana market; and farmers who are more educated, have suitable land for production and have a mobile phone connection/access are more likely to participate in an inclusive banana value chain. The analysis showed that investing to improve soil fertility to boost production and mobile phone connectivity to connect with the market can multiply by 2.5 the likelihood that banana farmers will be part of organized value chains.

**Fish Value Chain**

Analysis of the fish farmers showed that only 17% of the fish farmers ranked aquaculture as their main source of income. 8% ranked it as the second and the majority 75% of them ranked it as the third to fifth income source. Other sources of income mentioned included crop farming salaried employment and self employment income from the household head. In the aquaculture value chain, men are the predominant players (in over 80% of households) although women involvement (about 20%of households) is also visible.

Aquaculture fish prices are largely uniform nationwide, irrespective of the buyer. Currently the average farm gate price is Ushs6500 per Kg. The price may however rise to 8500 per Kg in times of scarcity. Aquaculture fish competes with the bigger traditional capture fish market, and hence its seasonal variations. Payments are made in cash at the farm gate. Farmers also reported isolated cases where buyers booked their fish and paid for it 2-3 months in advance. There are no set quality standards for fish. However, buyers prefer to buy large size fish that have reached at above 0.5 Kg for Tilapia and 1 Kg for Cat Fish at maturity. Tilapia with a dark shiny black colour is much more preferred, and may fetch a premium price of UShs 5000 above the normal price. Unfortunately farmers do not have the skills, knowledge and capacity to raise their fish to have the desired attributes.
Unlike in situations where fish is sold to local markets, the fish is usually sold in bulk to a single buyer. Ideally at harvest time, the fish is removed from the pond or cages in one lot, weighted, paid for, and transported through a cold chain. Normally the buyer pays for transportation of their produce. Transportation through a cold chain is one of the biggest challenges fish farmers face as such vehicles are rare and expensive to own or even hire. And still because aquaculture is not well developed in Uganda, suppliers of fish feeds are few and expensive; and so are the sources of reliable fingerling quality, tools and equipment. The fisheries legal framework also presents challenges for aquaculture farmers.

Fish farming has inherent risks to the extent that conditioning the fish natural environment i.e. water, to suit the commercial farming requirements and also maintaining the cold chain necessary to keep the fish fresh from harvest to the final consumer are rather costly undertakings for the ordinary Ugandan fish farmers. And also, because the fisheries sector is largely under-developed in Uganda with little government support, fish value chain players are very few and disjointed. Thus fish farmers have to fend for themselves to keep their businesses alive by all means. Other specific challenges include: high cost of feeds of doubted quality; lack of authentic sources of fingerlings and other inputs; inadequate production and management skills and extension services; high working capital; and an inadequate regulatory environment.

The logit regression results showed that at farmer level, the likelihood of being part of an organised value chains went down with the lesser importance of fish farming in household income. Also the less educated the farmer was, the more likely they were to engage in organised fish value chains—every year spent in school leads to a 0.2 decrease in the odds of getting involved in an organised value chain. Further discussions with the farmers indicated that more educated people are more risk averse and will tend to shy away from aquaculture which is very risky.

The results of this study allow the identification of the following factors as significant in increasing the odds of smallholder farmers joining inclusive value chains:

- Soil fertility (positive impact)
- Amount of commodity produced (positive impact)
- Level of sophistication of the mode of transport used to reach market (positive impact)
- A good mobile phone network (positive impact)
- Membership of a credit group (negative impact)
- Members of a group on Good agricultural practices (negative impact)
- Share of the enterprise in the farm’s income generation (negative impact)
- Education level of the household head (positive or negative depending on commodity)
- Gender (men are more likely to be involved in inclusive value chains)

These findings require further research in order to qualify them and to identify the possible reverse effect that being part of an inclusive value chain could have on the variables that were hypothesized as explanatory in this study.

The study showed that support to inclusive value chain development is still critical in developing countries. In Uganda for example, the small and micro enterprises have specific needs that are often neglected in favor of top-down government policies that support medium and large businesses instead. The study results on pig, banana and fish smallholder
farmers show that investing to improve soil fertility and mobile phone connectivity can multiply by 2.5 the likelihood that banana farmers will be part of organized value chains. These results can help guide government and donor investment within the agricultural production, marketing and natural resources management systems. On the other hand, the fact that the likelihood of farmers joining organized value chains actually decreased with the lesser importance of fish as the main source of household income or with pig farmers' belonging to a GAP or credit group (indicators that farmers were investing in their other productions) is a reminder that the smallholder production systems in developing countries are very much intertwined and no intervention on one part of the system can be considered separately from the rest of the farmers' enterprises. By neglecting such specific needs, smaller enterprises particularly in agriculture tend to remain informal and produce below their growth potential.
1. Introduction

The Ugandan agriculture sector employs about 70% of the population in Uganda, its growth in recent years averaged 1.3% per annum between 2005–2012 has remained lower than the population growth rate estimated at 3.2% per annum over the same period. Recent studies in Uganda show that access to productive assets, including all types of livestock, can provide rural households with a tremendous opportunity to generate income and to move out of poverty. Not only do livestock and livestock products play an important role in income generation, they are also sources of high quality protein and contribute significantly to overall household nutrition. Livestock in Uganda is predominantly in the hands of smallholder farmers, with each rearing a few animals at household level.

This report presents a study on factors influencing successful inclusion of smallholder farmers into value chains in Uganda. Value chains are considered ‘inclusive’ if they supply agri-food products from smallholder farmers. The inclusive value chains studied are characterized by a definite sequence of actors involved, actors who collaborate at all stages of the chain to deliver the product that is being requested by its customers and the final consumers. These inclusive value chains differentiate themselves from marketing channels where smallholder farmers are not producing for a clearly identified market outlet, whether they deliver commodities to markets in an ad hoc way, or are not selling their agri-food commodities because these are bartered within their community or consumed directly by the household.

The smallholders involved in the value chains studied under this research are located within the Lake Victoria Basin in Uganda, which is characterized by a humid tropical highland agro-ecological environment. This research is linked to the CGIAR Research Programs on Humid Tropics and Livestock and Fish. The research will contribute to disseminating its findings to Humid tropics multi-stakeholder research-for-development platforms and to Livestock and Fish value chain actors, and to value chain actors and policy makers in other action sites in Africa and the Caribbean. This sharing of lessons learned is likely to contribute to CTA’s long-term development outcome of improved efficiency, inclusiveness and profitability of agricultural value chains in ACP countries.

The research was done on three value chains that are relevant to the local context. All three already have some value chain linkages between smallholder farmers and agribusinesses in the study area. The three value chains chosen were one crop (banana), one livestock (pigs) and aquaculture. The research endeavored to provide lessons to further understand the factors that influence smallholder farmers’ participation in inclusive value chains, the associated relationships within the value chains as well as bottlenecks and constraints. The value chains of focus are described briefly below:

1.1 Significance of the selected Value Chains

1.1.1 Pig value chain

In spite of its growth, the pig sector in Uganda has been quite neglected and is not among the priority enterprises selected under the Ugandan Agriculture Sector Development Strategy and Investment Plan for 2010-11 to 2014-15. Pig production has become an increasingly important livelihood activity over the past three decades in Uganda evidenced by the rapid rise in pig population from 0.19 to 3.2 million. The majority of the pigs are in the central and western regions. Most of the pig production, about 85%, is carried out as a
backyard activity in smallholder households (owning less than 5 pigs each) in peri-urban and rural areas. Pigs play an important role in the livelihoods of poor families, because they help to generate income to cover emergency needs and pay school fees. It is common that the women and children are the responsible household members for the management of pigs, whereas men are engaged in marketing. The demand for pork has been on the rise due to changes in tastes, rising urbanization, among other factors. In 2011, Uganda had the highest per capita consumption of pork (3.4 kg/person/year) in sub-Saharan Africa including South Africa\textsuperscript{1}. Most of the transactions of live pigs and pork products take place in informal markets that include on-farm exchanges, informal slaughter places, road side butcheries and informal ready to eat pork joints. Recently, formal markets have started dealing in good quality premium products for relatively well-off consumers. These formal markets include organized facilities that sell fresh cuts, fresh pork, and frozen pork products. Some of the smallholder producers are linked to these outlets through other traders and agents. The market for pork is still dominated by informal trade. Value addition in the live pigs and pig meat products is largely limited. About 98% of pigs are sold as live animals and are slaughtered for pork that is consumed with limited or no value addition\textsuperscript{2}. Given this context, the recently initiated CGIAR Research Program on Livestock and Fish identified the smallholder pig value chain in Uganda as a high-potential target to translate research into major interventions that can stimulate pro-poor transformation and generate benefits at scale\textsuperscript{3}.

Pork consumption, though popular, remains well below the levels needed to achieve adequate intake of the critical nutrients that meat can provide. The study conducted by ILRI in 2012 confirmed that pork is frequently consumed and consumption is highest during periods of low food availability hence increasing its potential to contribute to nutritional security (Tatwangire, 2013). Improving pork production among smallholder farmers is expected to increase availability of affordable pork to poor households through sales in rural communities and urban markets. Increased pork production strategies if combined with appropriate nutritional messages is expected to give poor households better access to this high-quality source of nutrients and promote increased consumption among the most nutritionally challenged households. During this study, several productivity, marketing and capacity related constraints were identified along the smallholder pig value chain. These constraints limit the chain’s potential to contribute to livelihoods of the poor. Thus, the pig value chain was selected for this study to complement the on-going value chain work and to draw lessons for other value chains.

1.1.2 Banana value chain

The highland cooking banana (\textit{Musa spp.}, AAA-EA genome), also called \textit{Matooke}, is an important staple crop in Uganda. The crop is the primary food and livelihood base for about 16 million people. (Kabahenda et al, 2010) in central, western and eastern Uganda. Historically bananas have been grown in Uganda where they were important in the Buganda region, from where cultivation spread further. In the western and further south west, bananas have in the last 20-50 years replaced millet as the main staple food. There has been a major shift, with banana cultivation moving to the Western region from its traditional


\textsuperscript{3}CGIAR Research Program 3. 2011. More Meat, Milk and Fish by and for the Poor.
central region, a situation largely caused by the severe soil exhaustion faced by farmers in the central region. Ugandans consume bananas at an annual per capita rate of 200-300 kg (NARO Banana Research, 2009), the highest rate in the world. Banana is one of the most expensive foods, retailing in Kampala markets at prices ranging from 10,000-50,000 shillings for a bunch. Between 1996-2006, banana production fell by 78% with a yield gap of 140% kg/ha on farmers’ fields as compared to research stations (MAAIF DSIP, 2010). This decline in production and productivity has been attributed largely to soil degradation as well as severe pest and disease outbreaks, (most notably of bacterial wilt, sigatoka and nematodes). Current estimates indicate that total local production is at 9.5 million MT annually (as at 2010), based on FAOSTAT data.

There is a strong focus on the part of government and other actors to facilitate innovations through several new product lines in part to deal with the perishability of the product, by processing it into longer lasting products and as a way to tap into regional and international export opportunities. The initiative on value addition is being spearheaded by several actors including development organizations. The biggest effort in this area is being driven by the Presidential Initiative on Banana Industrial development (PIBID). PIBID strives to bring about the establishment of ‘state of the art’ banana processing enterprises in Uganda, producing value added banana products with competitive market strength both locally and globally, manned by rural farmers and entrepreneurs (PIBID Report, 2010). The potential to tap into export markets to widen the market base for Banana exists, and provides great opportunities for well organized farmers to benefit. As part of the health food and organic movement, dried fruits like bananas are becoming increasingly popular. However, accessing International markets presents significant challenges, such as high operating costs, high volume requirements and specific logistical capabilities.

Banana originates from small scale individual farmers. These farmers are estimated to farm on plantations averaging 0.5-4 acres (0.2-1.6 hectares). Over 70% of bananas grown in Uganda consist of different types of highland cooking and beer bananas. An estimated 12 different types of banana cultivars are grown. A key challenge that farmers face is accessing well paying markets. When they sell individually, farmers find themselves at the lower end of a very long chain of agents. There are numerous middlemen between the farmer and the retailer, meaning that farmers get very low prices for their product.

From the farm gate, farmers may sell directly to the nearby aggregating markets/agents or to local consumers, or to itinerant traders that approach their farms to collect and bulk bananas for sale to larger aggregating markets through brokers. There are often numerous middlemen between the farmer and the retailer, resulting in low price margins to the farmers. There are farmers who join collective banana marketing groups and benefit by being able to supply to wholesale businesses directly through contractual arrangements. Markets in Kampala and its suburbs are usually the main destination of the produce from where sales are made to household consumers, hotels, restaurants and schools. Some of the major markets are Owino, Kalerwe and Nakawa, among others. The poor road infrastructure in the villages and scattered nature of farmers in the villages makes it unfeasible for lorry traders to transact directly with the farmers. Several challenges abound in the banana value chain. At the producer level, farmers are facing: declining soil fertility; increasing land pressure; perishability; fluctuating seasonal prices; post-harvest losses; Pest and Disease; among others. These challenges are discussed in detail in Section 3.2.
1.1.3 Aquaculture value chain

Ugandan aquaculture industry is slowly growing and is expected to expand rapidly in the next decade due to the widening supply-demand gap for domestically produced fish products resulting from over-fishing, compounded by environmental degradation and climate variability. There is widespread consensus among stakeholders that the gap can only be narrowed through aquaculture. The smallholder capture fisheries sector is extremely vibrant, but the smallholder aquaculture sector is still struggling. It remains difficult for aquaculture producers to make profits let alone break even because of competition from the relatively low wholesale prices of capture fish (largely from Lake Victoria), the high cost of production associated with aquaculture and absent or weak business development services. The aquaculture value chain is characterized by temporal spot markets that occasionally link small numbers of actors who generally operate in inefficient ways. Despite these challenges some smallholder aquaculture producers have formed a cooperative society called “Walimi Fish Farmers Cooperative Society (WAFICOS)” which aims to help members have access to essential services and inputs while also addressing marketing and value addition.

Recent market-oriented studies suggest that there is considerable potential for the development of markets for aquaculture products, both in Uganda and the East African region, largely due to rapidly declining catches of Nile perch and the high demand for fish. Efficient markets for the sale of wild fish exist, but very little farmed fish pass through these markets despite a large unmet demand for fish, and as a result the poor are in many places eating less fish. Very few small-scale fish farming enterprises have been shown to be profitable, and any profits are relatively small. There has so far not been enough production from aquaculture systems to make an impact on the Ugandan fish market and a sizeable portion of the fish produced goes to neighboring countries where markets are more lucrative.

Among the barriers to development of the sector are that the aquaculture value chain in Uganda and the East African region is currently disjointed and ineffective; some would argue that there is no value chain at all. Other challenges in the sector include; low volumes of production to allow markets to develop; lack of investments in medium and large-scale aquaculture enterprises; high investment costs for small scale producers; low profitability from the production of farmed fish; and low price of fish near lakes due to the availability of wild fish. These and other challenges are discussed further in Section 3.3.2.

1.2 Objectives of the value chain assessments

This research was undertaken to identify factors influencing successful inclusion of smallholder farmers into value chains in Uganda. The survey was conducted on smallholder farmers that are already involved in inclusive value chains and compared their characteristics with a control group of smallholders who are not involved in inclusive value chains, as defined above. The statistical analysis of the data allowed for the identification of the factors that have a statistically significant probability of increasing, and decreasing, the likelihood of smallholders’ joining value chains. The results from this research will be useful to organizations supporting the development of inclusive value chains, private sector actors interested in collaborating with smallholder farmers and agricultural policy makers through the identification of different enabling and deterring factors, over which they might have control. The research thus contributes directly to CTA’s objectives of equipping institutions

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and individuals in Uganda and similar African countries to promote more efficient, inclusive and sustainable value chains.
2 Methodology

2.1 Quantitative Data Sampling

The sampling process for each of the three value chains involved the following activities; Site Selection and Respondent Selection. Below is a description of the process for each of the value chains.

2.1.1 Banana Value Chain Sample Selection

(i) Banana Value Chain Site selection

To study farmers that are participating in the cooking banana (also referred to as *matooke*) inclusive value chains, the Consultant selected to focus the study in the Mbarara-*matooke* market area. Located in Western Uganda, Mbarara has the biggest aggregation market in Uganda that supplies *matooke* to Kampala and the neighboring towns of Mukono, Entebbe, Jinja and as far as Nakasongola on the Northern axis, among others.

As an aggregation point, the greater proportion of the bananas destined for Kampala and its environs starts from here. The market also serves as the collection point for the other neighboring *matooke* producing Districts of Ntungamo, Rukungiri, Ibanda and greater Bushenyi District.

Various forms of traders also operate in this market, and these include Kampala based traders, local aggregators and traders, brokers, middlemen, among others: The bananas sold in the Mbarara market come through various channels, that include;

- Individual smallholder farmers selling to Kampala based traders who in turn sell to outlets/retailers in Kampala;
- Smallholder farmers selling to rural based traders (e.g. on a bicycle or small truck/pick-up) who also bulk and sell to the Kampala based traders; or
- “Large scale” farmers selling directly to the traders. In this arrangement there is some form of unwritten agreement that, the trader will for a specific period of time, buy all the farmers’ banana produce for a given period (advance booking) at the prevailing market price on the day of harvest.

Because of this apparently established system of farmer – market linkage, we focused on the Mbarara banana market for this study.

(ii) Banana Value Chain Sampling

Below is a description of the respondent sample collection for the treatment and control groups for banana farmers.

a) Banana Value Chain Treatment Group

As described above, there is an already established system for farmers selling to a ready off-take market. Through consultation with the traders operating in the Mbarara market we selected sub-counties and villages from which we developed a list of farmers from the districts of Mbarara and Ntungamo. The farmers targeted were those selling bananas through the channels identified above. The list developed provided the population from which random samples of 50 farmers were drawn from the two districts of Mbarara and Ntungamo. Half the farmers interviewed were women.
b) Banana Value Chain Control Group

The farmers selected in the treatment group were used to identify farmers to be included in the control group. After interviewing each of the farmers in the treatment group category, this farmer was asked to name some 2-3 farmers they knew in their community who usually did not produce purposefully for the market, but rather sold directly to consumers in the market, or took their produce to the market in the hope of finding the best price of the day. The contacts of such farmers were obtained, and these formed the sample from which the 50 non-participating (control) farmers in the banana value chain were selected. If the selected respondent was not available for the survey, the next one on the list was interviewed as a substitute. Similarly, half the farmers in the control group were women.

2.1.2 Aquaculture Value Chain Sample Selection

Below is a description of the respondent sample collection for the treatment and control groups for fish farmers.

a) Fish Value Chain Treatment group

Farmers participating in the inclusive fish value chains were already predetermined in the research proposal. These were the aquaculture farmers that are members of WAFICOS (Walimi Fish Farmers’ Cooperative Society). The co-operative started in 2004, and currently has a membership of over 1,000 fish farmers, fish seed producers, breeders, trainers, fish feed manufacturers, processors, input suppliers and researchers. WAFICOS offers various member services, and one of these is to link fish farmers to markets. One successful linkage so far is that between WAFICOS fish producers to Kati Farms (U) Limited. Kati Farms (U) Limited is a fish agro-processing firm that makes fish sausages. Currently the company is a regular supplier of quality fish and fish products to 30 local supermarkets, 23 hotels, as well as several road-side fish vending outlets. The research team already has a close working relationship with the Kati Farms Managing Director.

The WAFICOS active fish farmer members constituted the treatment group for this study. These were identified by comparing the list from WAFICOS with fish input dealers’ customers. Active members from the WAFICOS membership list formed the treatment sample population of interest. A stratified random sample of 50 farmers, based on gender, was drawn from the list of WAFICOS active members.

b) Fish Value Chain Control Group

This consisted of aquaculture farmers that were marketing their fish produce individually i.e. not members of inclusive value chains. A list of such farmers was compiled from the customer lists of fish fry/fingerling dealers. These dealers provided the lists of their customers, who were classified into two – those already involved in the inclusive value chain described as the treatment group and those that are not. The list of farmers that were not involved in inclusive value chains then formed the population from which a stratified random sample of 50 farmers, based on gender was drawn.

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To avoid erroneous inclusion, double checking was done of the farmers in the control sample by including a question that asked if the farmer was involved in a value chain i.e. producing for an identified customer like a fish trader, fish processor or co-operative organized fish marketing or even direct marketing to customers through catch-your-own fish enterprise. If No, then we proceeded with the interview, and If Yes, the respondent name was noted and removed from the control group sample list.

2.1.3 Pig Value Chain Sample Selection

The research was carried out in the same districts as the existing ILRI-led Uganda pig projects (IFAD-EU and Irish Aid funded Smallholder Pig Value Chain projects) under the CGIAR research program on Livestock and Fish in order to create synergies and build on the existing research findings.

(i) Pig Value Chain Site selection

The process for identifying the project sites for the Livestock and Fish program involved 2 steps: The first was geographical targeting using GIS characterization with a focus on pig population density, poverty levels and market access variables in order to identify districts with potentials for improving livelihoods of the poor through the pig enterprise, and variations in the value chain domains. From the GIS characterization 10 potential districts located in Central, Western and Eastern regions were identified as potential sites for the pig value chain research work, and of these, Masaka District was selected.

The marketing channel for grown pigs is largely informal without any contracts and largely comprises 2 types of traders:

- a) Large traders who purchase pigs from farmers through brokers (who identify and bulk pigs) to transport to other districts or have them slaughtered at Wambizi abattoir or other slaughter slabs for pork retail in urban areas; and
- b) Small traders who purchase pigs directly from farmers for backyard slaughter and sale of pork to local retail outlets.

(ii) Pig Value Chain Sampling

In selecting the treatment group and control groups, farmers participating in the inclusive pig value chains were those selling largely through channel (a) above – those were identified as the treatment group while those selling through channel (b) above were assigned to the control group. The focus was the district of Masaka in the same sub-counties where the pig value chain project operates i.e. Kyanamukaaka and Kabonera. Lists of all pig farmers in each village and their main market outlets and clients were prepared by the pig co-operative and platform representatives in the respective sub-counties. From the list, a stratified random sample of 50 pig farmers, based on gender, was drawn for the control group, and another 50 for the treatment group.
2.2 The Research Process

The research process involved four activities as outlined below;

**Activity 1** of the research involved literature review to identify additional already-tested indicators for factors influencing the participation of smallholder farmers in inclusive value chains. This resulted in a sampling protocol and methods and tools for field data collection. The individual questionnaires had a mix of both close-ended and open-ended questions to gather quantitative and qualitative data on the products being studied and some of the explanatory factors. The questionnaire were also used to gather more subjective data on the perception of smallholder farmers relating to their business, marketing, socio-cultural and policy environments where respondents are asked for their level of approval to certain statements using 5-item Likert scales.

**Activity 2** of the research entailed conducting focus group discussions and key informant interviews with farmers, the respective value chain actors and local knowledge holders in the study area. These preliminary interviews deepened our understanding of any local factors influencing inclusiveness of smallholder farmers and power relations within the value chains so as to add those indicators. A sample of the questionnaire used is in Appendix 4.

**Activity 3** of the research consisted of sampling of respondents: 50 smallholder farmers involved in an organized value chain with an agribusiness for the product under study for three of the selected value chains – fish, banana and pigs (50 farmers x 3 value chains = 150 farmers) and 50 smallholder farmers not involved in an organized value chain to sell their product, or currently not selling the product under study (50 farmers x 3 value chains = 150 farmers). The sampling procedures took gender into consideration. After pre-testing the questionnaires on six smallholder farmers, comprising 2 farmers for each of the three value chains (one involved in inclusive value chains and another as control), 300 individual smallholder farmers were interviewed in total through individual surveys. The data collected was entered into Microsoft Excel and analyzed using IBM SPSS.

**Activity 4** of the research involved data analysis using logit regressions. Logit regression is a common statistical tool that allows the identification of factors explaining the probability of the binary distribution of a variable (in this case: involved in inclusive value chains or not). A workshop was organized for the research team to work together on data analysis and writing of the report.

2.3 Selected Indicators For Assessing Influencing Farmer Behavior

Below are some indicators for factors that have a potential to influence participation of smallholder farmers in inclusive value chains. These were taken from past research experiences of ILRI experts. The factors included:

- Level of education of the farmer
- Financial resources of the farmer
- Existing products produced and other income-earning opportunities
- Cash flow
- Risk taking capacity
- Farming and farm management skills
- Land tenure and security
- Other socio-economic factors affecting ability to comply with business relationship.
- Yield expectations and availability of cost-benefit analyses:
• Organization of farmers in formal or informal groups.
• Location with respect to commercial buyer’s premises.
• Suitability of soils and climate, access to water, potential impact on environment
• Type of product supplied through the value chain.
• Quantities required by the buyers, price fluctuations commonly experienced.
• Ease of access to support services and inputs.
• Government infrastructure provision and policies.
• Contracts.
• Client relationships

2.4 Data collection and analysis

Quantitative data was collected using the individual respondent questionnaires (see Appendix 2). Responses were captured onto a questionnaire form and entered into the computer. On completion of data entry, the captured data was converted into the Statistical Package for Social Scientists (SPSS), which was the main data analysis support tool.

Focus Group Discussions - FGDs, and Key Informant interviews - KIs were the main sources of qualitative data. During qualitative data collection, field notes were taken during the KI interviews and FGDs based on the guide questionnaire in Appendix 3. The notes from the various respondents/meetings, and response were compiled. A summary of key messages and themes were identified as well as the explanations/arguments given. By comparing and correlating the qualitative and quantitative data. On that basis, suitable conclusions and recommendations were made.

2.5 Data Limitations

Some of the questions in the qualitative and quantitative data collection tools required the respondents to make estimates and to use their memory as many farmers do not usually keep farm records. This affected their ability to provide accurate responses to some questions and hence the data accuracy. Therefore the findings of this study may be limited to the extent of the ability of the respondent to answer consistently deriving from his estimates and memory.
3. Results Presentation, analysis and discussion

3.1 Pig Value Chain

The survey of pig farmers covered 100 farmers of whom 50 were involved in inclusive value chains and 50 were not. Table 3.1 is a summary of the selected demographic characteristics of the households surveyed.

3.1.1 Pig Farmer Household Data

Below is a presentation of the characteristics and observations of the pig farmer data as well as their general behavior in relation to their pig enterprises.

Table 3.1 Selected Demographic Characteristics of Pig Farmers Surveyed (N=100)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size (No.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-3</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>4-6</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>7-10</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>&gt;10</td>
<td>2</td>
</tr>
<tr>
<td>Gender of Household Head</td>
<td>Male</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>27</td>
</tr>
<tr>
<td>Age of Household Head (Years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21-30</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>&gt;60</td>
<td>24</td>
</tr>
<tr>
<td>Years spent in school by Household Head</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-7</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>8-13</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>14-15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>15-20</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>&gt;20</td>
<td>0</td>
</tr>
<tr>
<td>Ranking of Pig farming as Household income source</td>
<td>Rank 1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Rank 2</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>Rank 3</td>
<td>1</td>
</tr>
<tr>
<td>Primary activity of Household Head</td>
<td>Crop farming</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Pig farming</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Salaried employment</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Self-employment</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>

17
Analysis of the pig farmer households showed that:

- Pig farmers did not depend on piggery alone for income. Most (65%) of them were also engaged in crop farming, some were either salaried employees of self-employed (30%). Many farmers ranked it as either the second or third (92%) most important source of income.
- Most (73%) of the pig farmers own their land as Kibanja owners. Under this tenure system, they have full rights on the land they own although they do not hold land titles. A few (18%) have titles to their land while the rest (19%) rent their land for Ushs 10,000-30,000 per month. Survey results also showed that the male household head owned the land in almost all cases. The land sizes farmed are small. 23% of the farmers had less than 1 acre; 74% of them had 1-3 acres; while 6% had more than 3 acres.
- On gender involvement in the piggery enterprise at household level, we observe that although men are important players, women were more involved than men in the piggery enterprises at home as shown in the Table 3.2. It is also notable that women were quite involved in pig farming, marketing and sale, as well as decision making in spending the proceeds from pig sales.

Table 3.2 Men/women involvement in piggery enterprises at home (N=100)

<table>
<thead>
<tr>
<th>Piggery farm activities</th>
<th>Percentage of men/women involved in Enterprise activities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Who decided to start the enterprise</td>
<td>42</td>
<td>58</td>
</tr>
<tr>
<td>Who provided initial capital</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>Who does daily tending</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Who pays management costs</td>
<td>37</td>
<td>63</td>
</tr>
<tr>
<td>Who decides on marketing</td>
<td>34</td>
<td>66</td>
</tr>
<tr>
<td>Who decides on how to use proceeds</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

- Pig farmers are usually smallholders. About 90% of them had sold no more than five pigs in the past year (last 12 months) and they usually sold one animal at a time. There are periods of high and low demand for pigs. The high demand usually coincides with the festive seasons of the Easter (March-April) and Christmas/end of year (November-January). Sales also go up in times when schools are about to open for the new term, that is January to February; and July to August. The proceeds at this time usually go into paying school fees.
- And indeed farmers usually sell their pigs to meet household needs like school fees and essentials, and for emergencies like medical attention. A few (19%) mentioned that they are involved in pig farming as a business. Some sell their animals when they do not look healthy or when curling. The majority (60%) of farmers sell mainly to the nearby butcheries. Some sell to pig traders/agents (15%) while others (24%) sell to individuals and fellow farmers.
- Pig farmers are usually price takers. 37% of the farmers indicated that they had received Ushs15,000-90,000 per animal; 53% had received between Ushs. 100,000-
200,000; while some 10% had received between Ushs.220,000-400,000. Payments are all made in cash.

- In the pig business, animal purchasing is normally done at the farm gate and the buyer is responsible for transporting his animal to its destination. Pig farmers spend most of their income on food, school fees, medical attention and clothing. Table 3.3 shows distribution of household expenditure.
- The tables also shows that at the household level, although men usually take the lead in some of the key expenditure items like school fees, women also play a significant role in providing food, medical attention and clothing for their households.

Table 3.3 Distribution of pig farmer household expenditure (N=100)

<table>
<thead>
<tr>
<th>Expenditure item</th>
<th>% of men/women who provided the money at home</th>
<th>Non responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Food</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>School fees</td>
<td>68</td>
<td>29</td>
</tr>
<tr>
<td>Medical</td>
<td>55</td>
<td>29</td>
</tr>
<tr>
<td>Clothing</td>
<td>7</td>
<td>16</td>
</tr>
</tbody>
</table>

3.1.2 Pig Farmers' Production Inputs and Market Behavior

Figure 3.1 is an illustration of the major inputs pig farmers need in the production of their animals and their sales channels. The diagram also attempts to explain why farmers behave in the ways observed.

The various inputs farmers need included – Cash to purchase the inputs, feeds, veterinary services, veterinary drugs, green fodder supplied from their gardens, extension services, water, and shelter for the animals.

Five channels were identified through which farmers sell their animals, namely;

Channel 1 – These are locally based pig traders who consist of individuals, middlemen or agents of other traders. They may hold on to the animals bought for a few days before selling it on to a bigger trader.

Channel 2 – are the regular butcheries in the locality, such as trading centre, drinking areas and restaurants, where pigs are slaughtered in their backyards and sold on to the final consumers. In addition to selling fresh meat, local butcher may also operate small restaurants where pork is prepared as roasted or deep-fried meat ready to eat.
Figure 3.1

Major pig farmer inputs and sales channels

Channel 3 – consists of pig traders that are usually based in the major urban centres like Kampala. These traders are not regular and may appear once or twice a month. They drive through the rural areas with trucks looking for pigs available for sale. They may also have agents who inform them about availability and also bulk animals for them before they trek to the villages. Examples of such traders are in the slaughter areas of Wambizzi and Nakulabye in Kampala. More experienced traders such as Mr. Deogratius Yiga have developed links with high end meat outlets e.g. Quality cuts and supermarkets that sell specialized meat/pork cuts. These are fairly sophisticated, quality cautious markets that the ordinary farmer cannot easily penetrate.

Channel 4 – these are farmers who may buy an animal from a fellow farmer for fattening or for breeding purposes.

Channel 5 – consists of the NGOs and government programs operating in the area. These usually buy pigs from local farmers for redistribution to other farmers and animal multiplication schemes.

Below are the highlights of the pig farmer market interactions;

Sales
Medium sized sows and finishers make up for most of the sales. They go for average price ranging between Ushs 100,000 to 250,000 per animal in channel 1 and Ushs 70,000 in Channels 2 and 3. Channel 4 buyers pay an average price of Ushs 30,000 for piglets. However farmers are at times forced to sell at a lower price when they are desperate for cash. Such cases include domestic emergencies, shortage of feeds and disease outbreaks. In such cases the farmers may sell off animals to avoid losing them.

Quality
There is no standard method of grading or weighing animals. The traders/buyers determine the price to pay the farmer arbitrarily, depending on the visual appearance of the animal. The premium price for good quality may reach Ushs 350,000 if sold to urban traders, farmers and NGOs. Under proper management the weight of the animal should match its age and this is usually related to a proper feeding regime. However in many instances the farmers cannot
afford to feed the animals adequately to reach their full potential. Some of the quality attributes buyers consider include;

*Weight and height.* Buyers usually prefer an animal that has put on good weight. A taller animal is usually preferred as it is perceived to have less fat and leaner meat.

*Breed.* Some traders prefer the exotic breeds because they potentially have tender meat and are less fatty. Some traders prefer local breeds. Some farmers consider skin colour as a proxy for animal breed. Farmers however noted that there were no reliable sources of good animal breeds nor breeding programmes where they could get marketable breeds.

*Physical health* of the animal is important. Many buyers prefer good looking healthy animals, although some are indifferent. The condition of the sty is also a quality attribute because buyers relate better looking sties to animal quality. It was observed that only local butcheries and urban traders did not buy animals from areas suspected to have outbreaks or animals that are too fat or too thin. Local butcheries normally reject very fatty animals.

**Animal Health Services**
Swine fever outbreaks are common and these usually wipe out the entire stock. Unfortunately such outbreaks are common and measures such as animal movement permits and quarantines are weak. Other common diseases include intestinal worms, skin diseases and wounds, foot rot, common fevers and respiratory diseases. Farmers usually keep basic antibiotics and deworming drugs at home as well as herbs as the first line of treatment. In cases where symptoms persist they may either sell off the animal for slaughter or call in a veterinary service provider.

Veterinary service providers usually take the form of a Veterinary technician. Institutionally there is one veterinary doctor assigned to a sub-county by the district for extension services and all animal health services as well as meat and pork inspection. There is thus a personnel shortage and to fill the void there are also many unqualified personnel offering services to farmers in the absence of qualified veterinary doctors. This casts doubt on the quality of the service and the drugs provided. There are no standard prices for animal treatment and fees are arbitrarily set at Ushs 1000 to Ushs 5000 per animal visit.

**Financial Services**
Because of the high risk involved in piggery, there are no financial institutions that are will lend to pig farmers. Farmers cope with the funding challenge by obtaining personal loans. The interest rates charged are in the range of 36% p.a. and payments are scheduled to be made weekly.
Pig Farmer Challenges and risks

The challenges in the pig sector arise from the fact that the sector is not well developed to attract suitable players to smoothen operations throughout the value chain. Organizations such as NGOs, research, development projects and line ministries of the Central government play limited supporting roles in various nodes of the value chain. Thus farmers encounter structural challenges right from production to the time of selling their animals. Traders too encounter similar challenges in bringing the product to the final consumer.

- Production is dominated by small scale farmers each with just a few animals (less than 5), although there are some other with over 10 animals. We also observed that nearly all the farmers were involved in other agricultural activities with piggery being one of them. These observations suggest that investment and prioritization of piggery by farmers is low.

- It was also observed that pig value chain players at all levels are disjointed. There is weak coordination in the pig value chain with few actors engaged in some form of formal or informal contractual arrangements.

- Animal feeding is one of the main constraints in smallholder pig production systems, largely due to the cost. For example, the cost of commercial pig meal is in the range of Ushs 3,000 per kg. The availability and price of feeds are also affected by seasonal variability as well as quality of feeds. The situation is not helped by the lack of skills to develop nutritionally balanced low cost rations and fodder-based diets by the farmers. The common planted fodder is potato vines which are not sufficient in terms of nutritive value and are highly susceptible to destruction by drought. And indeed in the extended dry seasons farmers are forced to sell off their animals because they cannot afford to feed them. Some farmers try to supplement their feeds with swill feeding, by feeding animals on kitchen left overs. However depending on the feeds source, these feeds carried the risk of potentially transmitting African swine fever. Also being in the rural areas, farmers experienced challenges in availing enough water to the animals especially in the dry seasons.

- Availability of veterinary services was also a notable challenge. Farmers observed that veterinary service costs were high. Farmers also noted that the quality of both the veterinary drugs and personnel was doubtful. Farmers also expressed challenges in animal husbandry, pig health and poor housing and lack of knowledge on good management practices. African Swine Fever was the highest risk disease that farmers feared. Other diseases included parasites and helminthes which are common parasites.

- The breeding challenges identified by farmers included abortions and low piglet survival. Farmers also mentioned that they do not have reliable sources for obtaining good quality breeding animals. As a result farmers buy piglets from each other or hire a boar from a neighbor to service their sows.

- Farmers indicated that there are locally available buyers for pigs. However they felt that the buyers do not offer competitive prices. Furthermore, most pig farmers sell their pigs at about the same time when they require cash e.g. festive periods and during the time to re-opening of schools leads to an over-supply thereby depressing
the market prices. In such cases, some farmers do accept any price offered to be able to solve their financial obligations.

- It was also observed that in order to keep prices low, pig traders operated cartels and colluded in setting prices thereby hindering pig farmers from negotiating for better prices. This challenge is linked to lack of market information on prices, alternative market, outlets and market preferences.
- Other challenges and risks in the pig value chain included; high cost of labor; lack of extension services; inadequate capital to operate a piggery business; lack of suitable transport facilities to transport animals to the market, lack of a standard system for grading animals for sale; and animal thefts.

### 3.1.3 Pig Value Chain Correlations

Diagram 3.2 illustrates the correlated statements made by the pig farmers.

Diagram 3.2 Correspondences between variables representing the components of the business relationships between pig farmers and their buyers.

Using the Pearson Correlation Coefficients it was found that the following statements are positively correlated;

- H1 – “I get a fair price from my buyer”
- H2 – “I trust my buyer”
- H7 – “My buyer helps me improve quality”

This suggested that in the buyer-farmer relationship, fair price, trust and quality improvement are positively correlated. These factors are also positively correlated with the following statements;

- H5 – “My buyer helps me to obtain credit” and
- H4 – “I call my buyer for market information”
In the above 2 cases, the buyer is supporting the farmer with market and credit information. Close observation of the above 2 instances suggest that farmers tend to associate themselves more with the buyers who show interest in their farming business. Such buyers may provide market and credit information that empowers them to improve their product quality and hence a better market price.

In addition, the following statements were found to be positively correlated with regards to markets

- H3 – “My buyer buys when I’m ready to sell”
- H6 – “My buyer pays on time”
- H9 – “My buyer does NOT reject my product”

This finding suggests that there is a ready standing market for all the pigs available for sale mostly on cash basis.

However, the following statement

- H5 – “My buyer helps me to obtain credit” was found to be negatively correlated with the three following statements:
  - H3 – “My buyer buys when I’m ready to sell”,
  - H6 – “My buyer pays on time” and
  - H9 – “My buyer does NOT reject my product”.

These statements are negatively correlated probably because pig farmers do not usually actively search for credit facilities as they normally sell small quantities (one pig at a time) to readily available buyers who pay them cash on sale.

In conclusion the above correlations imply that the piggery farmers have a trusted ready market that pays them cash on time which negates the need to look for credit facilities. It also suggests that farmers keep pigs as a form of savings (current asset easy to liquidate). This observation probably explains the high sales farmers mentioned that occur during times of school fees and in the festive periods when they require cash.

3.1.4 Pig Value Chain Logistic Regression Model

In developing the regression model, factors that were found not to be correlated were regressed to investigate their influence on the participation of pig farmers into inclusive pig value chains or not. The final model included the following additional variables:

1. Membership to a credit group
2. Membership in a Good Agricultural Practices and Advisory group
3. Pig Equivalent (the standardized number of pigs sold)
4. The marketing channel used by the farmer

These factors provided a logistic regression model of best fit with a Chi-Square Value of 52.158 and a \( p < 0.001 \).
Table 3.4 Results Of The Pig Value Chain Logistic Regression Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio(^a)</th>
<th>p-value</th>
<th>95% confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membership to a credit group (Reference = Not belonging to a credit group)</td>
<td>0.25</td>
<td>0.034</td>
<td>-0.39 – 0.90</td>
</tr>
<tr>
<td>Membership to a GAP group (Reference = Not belonging to a GAP group)</td>
<td>0.15</td>
<td>0.027</td>
<td>-0.71 – 1.01</td>
</tr>
<tr>
<td>Total pig equivalent (Reference = 0)</td>
<td>2.86</td>
<td>0.000</td>
<td>2.61 – 3.11</td>
</tr>
<tr>
<td>Marketing channel (Reference = Butcher)</td>
<td>1.79</td>
<td>0.001</td>
<td>1.61 – 1.97</td>
</tr>
<tr>
<td>My buyer helps me with Technical information (Reference = Strongly disagree)</td>
<td>1.47</td>
<td>0.243</td>
<td>1.14 – 1.80</td>
</tr>
<tr>
<td>&quot;My buyer will buy my products whenever I am ready to sell&quot; (Reference = Strongly disagree)</td>
<td>0.83</td>
<td>0.622</td>
<td>0.45 – 1.21</td>
</tr>
<tr>
<td>&quot;I call my buyer to obtain information about the market&quot; (Reference = Strongly disagree)</td>
<td>1.09</td>
<td>0.823</td>
<td>0.70 – 1.48</td>
</tr>
<tr>
<td>&quot;the policies implemented by Government in my area are preventing me from producing the products efficiently&quot; (Reference = Strongly disagree)</td>
<td>1.23</td>
<td>0.612</td>
<td>0.82 – 1.63</td>
</tr>
</tbody>
</table>

From the Table 3.4 we observe that;

i. Involvement in a credit group was found to be significantly \((p=0.027)\) influencing involvement in an organized pig value chain. The farmer who belonged to a credit group had 0.25 chances \((CI =-0.38 – 0.88)\) of also belonging to an organized pig value chain.

ii. Similarly, farmer involvement in a GAP group had significant \((p = 0.04)\) influence and involvement in an organized pig value chain. The farmer who belonged to a GAP group had 0.20 chances \((CI = -0.63 – 1.02)\) of belonging to an organized pig value chain.

iii. Pig equivalent was the standardization method used to calculate the numbers of pigs sold in the last 12 months, taking into consideration the animal type i.e. sow, boar, gilt and piglet. In calculating the Pig Equivalent, piglet units sold were multiplied by 0.3; boar by 1.2; sow by 1 and gilt by 0.6.

The number of pigs sold by a farmer, in the past 12 months was found to be significantly \((p= 0.000)\) influencing involvement of farmers in an organized pig value chain. An increase in the number of pigs sold by 1 unit raised the chances of belonging to an organized pig value chain by 2.90 times \((CI=2.66–3.14)\).

\(^{a}\) Odds ratio is a measure of effect size, describing the strength of association or non-independence between two binary data values.
From the regression analysis we observe that farmers who were found to be in a credit or GAP group were less likely to belong to an organized pig value chain. This is probably because credit and GAP groups were formed for other purposes other than pig farming. For example the common credit groups e.g. Bataka Twezike, Munno Mukabi were set-up purposely as community self help groups, while other groups were set-up through NAADS and other NGOs for collective extension service delivery, bulking and produce marketing.

The results of the regression model further indicate that farmers who had sold more animals tended to look out for bulk market channels, i.e. the urban traders. Urban traders have the capacity i.e. cash to buy large quantities; they have transport means to reach the farmer; and as discussed in the FGDs, the urban traders were less sensitive to the pig quality (size, fatty, age, breed, etc) as compared to the local buyers.

### 3.2 Banana Value Chain

The household survey of banana farmers covered 100 farmers. These included 50 farmers involved in inclusive value chains and 50 who were not.

#### 3.2.1 Banana Farmer Household Data

Table 3.5 is a summary of the selected demographic characteristics of the households, their general characteristics and behavior in relation to their banana enterprises.

Table 3.5 Selected Demographic characteristics of Banana Farmers Surveyed (N=100)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size (No.)</td>
<td>1-3</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>4-6</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>7-10</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>&gt;10</td>
<td>13</td>
</tr>
<tr>
<td>Gender of Household Head</td>
<td>Male</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>21</td>
</tr>
<tr>
<td>Age of Household Head (Years)</td>
<td>21-30</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>&gt;60</td>
<td>20</td>
</tr>
<tr>
<td>Years spent in school by Household Head</td>
<td>0-7</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>8-13</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>14-15</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>15-20</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>&gt;20</td>
<td>4</td>
</tr>
</tbody>
</table>
Analysis of the banana farmer households showed that:

- All the banana farmers (100%) ranked the banana crop as their most important source of income. Crops like coffee and cattle rearing were also common sources of income mentioned. Other sources of income included self employment off the farm (21%) and salaried employment (14%).

- In the banana value chain, men are more involved in the overall production and management activities as well as decision making compared to the women. What is notable however is that in spite of their involvement in these activities, women do have say in deciding how proceeds from the banana farm will be used; Table 3.6 shows that in 47% of the households surveyed, women made the decision on the use of farm proceeds compared to 53% households where men made the decisions.

Table 3.6 Men/ women involvement in banana enterprise at home (N=100)

<table>
<thead>
<tr>
<th>Banana Farm Activities</th>
<th>Percentage of men/women involved in enterprise activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
</tr>
<tr>
<td>Who decided to start the enterprise</td>
<td>82</td>
</tr>
<tr>
<td>Who provided the initial capital</td>
<td>83</td>
</tr>
<tr>
<td>Who does daily tending</td>
<td>65</td>
</tr>
<tr>
<td>Who pays management costs</td>
<td>74</td>
</tr>
<tr>
<td>Who decides on marketing</td>
<td>70</td>
</tr>
<tr>
<td>Who decides how to use the proceeds</td>
<td>53</td>
</tr>
</tbody>
</table>

- The banana yield per farmer is quite varied. Over the past year, 14% of the farmers produced up to 100 bunches; 21% of them produced between 100-200 bunches; 11% of them produced 201-300 bunches; 5% produced 301-400 bunches; 21% produced 401-600 bunches; and 13% produced between 600-1000 bunches, 15% of the farmers produced between 1,000-2,000 bunches. Banana sales usually increase in the months of November, December, January and February, March and August when production is high and reduce in the months of April, May, June, and July when production is low. Being a perishable, all the bunches that mature must be harvested.
This leads to price falls in the months of high production when there is abundant supply on the market.

- Bananas are produced for both household consumption and for sale. A greater proportion of the production is sold. 75% of the farmers sell more than half of their production. Banana is a staple crop in Uganda and there are numerous traders of the product due to the high demand. Thus farmers are presented with several options of buyers that include local traders, local markets, and urban traders. There is no standard for grading system for bananas. The price of a bunch of bananas is determined arbitrarily and although prices may vary in the high and low supply seasons, most (81%) of farmers are paid Ushs.7000-10,000 per bunch. Payments are usually made in cash and in most cases; the traders buying from the farm gate do transport their purchases.

- The majority (69%) of the banana farmers are small holders owning 0.25-5 acres of land. Some 20% have between 5-10 acres while 11% of them have between 10-30 acres. Although they have property rights over the land, many (75%) do not have land titles.

### 3.2.2 Banana Farmers’ Production Inputs and Market Behavior

Figure 3.3 shows the major inputs banana farmers need for production and their sales channels.

The various inputs farmers need included – Cash to purchase the inputs and labor, advisory services and land. Six channels were also identified through which farmers sell their bananas, namely;

- **Channel 1** – These are urban traders located in the main towns and cities. They usually have a network of suppliers that include farmers, local traders and supply agents. Urban traders usually have ready buyers/retailers that they supply. Urban traders usually have their own trucks that collect the bananas from the farmers and collections centres in the villages.

- **Channel 2** – are the local institutions in the area like schools and hospitals that prepare meals for their students or patients.

- **Channel 3** – consists of local consumers. These are usually residents of the local communities and villages that buy from the farmer food for home consumption.

- **Channel 4** – these are traders in the local trading centres. They usually sell to the local community and travelers/passers-by.

- **Channel 5** – these are traders who move around the villages, they buy bananas from the farmers and may either sell it to other traders or may find consumers to buy it in the trading centres.

- **Channel 6** – these are located in the villages, usually operating in makeshift shelters within the communities.
Below are the highlights of the banana farmer market interactions;

**Prices**

The urban trader and institutions usually pay a higher price, followed by the local consumers. These buyers are usually less price sensitive buyers; they buy in bulk and pay a uniform price per bunch. The local markets, bicycle traders and local markets pay lower prices and are quite price sensitive.

Using Figure 3.2 above as reference, the current typical prices paid for an average sized bunch of banana are Ushs 15000, 10000, 7000, in Channels 1, 2, 3 respectively and Ushs 8000 in Channels 4, 5 and 6. These prices rise and fall by about Ushs 5000 in the high and low price seasons respectively. There is however a gender bias in the market as women tend to be paid lower prices compared to men across all Channels.

**Quality**

Size measured arbitrarily is the only grading system in place for bananas. Thus Small, Medium and Large bunches. All traders prefer large sized bunches with big banana fingers as these will fetch a better price from their customers, and will reject very small bunches. Among the traders, a premium price of Ushs 10000 can be paid for a very large bunch. The local institutions will buy any bunch size.

**Payment**

Although credit is not common in banana purchases at the farm gate, some farmers have had long standing relationships with their customers. There are therefore isolated instances of farmers selling bananas to urban traders and local institutions on credit. Traders are expected to pay back within a week while schools may take up to a month. Credit to other types of buyers is not common. It was also observed that even where long farmer-buyer relationships exist, there are no formal contracts or agreements. If they exist, they are informal.
Challenges and risks in the Banana Value Chain
Banana farmers meet several challenges in production and marketing of their produce. Some of the risks and challenges faced include the following;

- Banana plants are infested by a host of pest and diseases and the most devastating of these is the Banana Bacterial Wilt. The disease spreads very fast and can wipe out the entire plantation if not well managed. Indeed many farmers in Uganda have reported significant losses due to the disease. Although government and several NGO farmer support organizations have been advising and training farmers on management and control of the Banana Bacterial Wilt disease spread, the threat still remains. This challenge is coupled with the low access to plant chemical and pesticides.

- Farmers usually use cow dung, different forms of compost manure and mulching to preserve soil fertility. However the manure and chemical fertilizers are expensive, for example a 50kg bag of NPK costs between Ushs 150,000-200,000. This is out of reach for an ordinary farmer, also given that loans structured for agricultural production are lacking. In addition to this there is a shortage of labourers to work in the banana plantations, and if found it is expensive. For example, the labour cost of applying cow dung compost manure to an acre of land is Ushs 300,000. All these tend to raise the cost of production.

- Because of the high demand and ready market for bananas, thefts of the crop from the fields are common. Thus farmers live in constant fear of loss of their produce to thieves. In addition, the geographical area covered during this study is also a cattle zone. Because of the free grazing system still practiced the banana fields are often at risk of destruction by the freely roaming animals.

- Banana production is mainly suitable for the climatic and soil conditions in western Uganda. And indeed many farmers in the area are finding it a worthwhile business, and would like to expand their plantations. However they face the challenge of limited land available for expansion and if found, the land is expensive. For example an acre of land in Mbarara area is 3,000,000-5,000,000.

- In spite of the numerous efforts by the Government and NGO extension service providers in training farmers on good agronomical practices, many farmers continue to realize low yields due to inappropriate crop husbandry techniques like thinning, timely weeding, spacing, pruning, among others. Farmers also feel that the training received is inadequate.

- The changing weather patterns and adverse weather conditions continue to threaten banana farmers. The dry periods are longer than usual, threatening the survival and productivity of the plantations; and at the same time when the rains come they are so
heavy and bring along with them storms, floods, lightening and hail stones which all damage crops in the field.

- At the time of marketing, farmers located deep in the countryside cannot easily access markets where they can get better prices. They do not have the means of transport, a situation that is exacerbated in the wet season when roads are impassable; they therefore end up selling their produce at lower prices to traders and middlemen. However, even when the farmers are able to reach the markets, there are market dues and other forms of taxes awaiting to be paid.

- The price of bananas tends to fluctuate following the low and high supply seasons. These price fluctuations affect the profitability and planning of the banana farmers. And much as farmers see the value of collective action for example in marketing, the spirit and drive of co-operatives among banana farmers is weak.

3.2.3 Banana Value Chain Correlations

Diagram 3.4 illustrates the correlated statements made by the banana farmers.

**Diagram 3.4 Correspondences Between Variables Representing The Components Of The Business Relationship Between Ugandan Cooking Banana Farmers And Their Buyers**
Using Pearson’s Correlation Coefficient it was found that the following statements were positively correlated:
- H1 – “I get a fair price from my buyer”
- H3 – “My buyer buys when I’m ready to sell”
- H2 – “I trust my buyer”
- H10 – “I’m generally satisfied with my buyer”

But the statements are negatively correlated with:
- H8 – “I do not feel obliged to sell to my buyer”

This correlation suggests that there is a ready market for bananas with buyers readily available to purchase bananas. However, farmers seem to have developed a business strong business relationship with buyers including exchange of information, trust, credit and satisfaction. This can explain that farmers may feel some kind of obligation to sell their bananas to their buyers.

Nevertheless, the statements:
- H6 – “My buyer pays on time”
- H4 – “I call my buyer for market info”
- H9 – “My buyer does NOT reject my product”

were found to be negatively correlated with statement
- H8 – “I do not feel obliged to sell to my buyer”

This correlation can be explained by the fact that farmers are not obligated to sell to a particular buyer because they are informed about the available markets and traders that readily pay for any banana produce that is up for sale.

The above results suggest that some indicators of inclusive value chains (a ready market outlet, trust and fair prices) do exist from the perspective of small householder banana farmers. However, the prevailing banana market is large enough to also readily absorb any available produce.

3.2.4 Banana Value Chain Logistic Regression Model

In the regression model, factors that were found not to be correlated were regressed to investigate their influence on the participation of banana farmers in inclusive value chain. The final model also included the following variables:
1. Education level of the household head
2. Suitability of soil for banana production
3. Availability of phone network

The above factors provided a logistical regression model of best fit for the banana value chain with a Chi-Square Value of 41.557 and \( p < 0.001 \).
### Table 3.6 Results Of The Banana Value Chain Logistic Regression Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio(^7)</th>
<th>p-value</th>
<th>95% confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education level of household head (Reference = 0 Years in school)</td>
<td>1.31</td>
<td>0.000</td>
<td>1.25 – 1.38</td>
</tr>
<tr>
<td>The soil of my farm is suitable to produce bananas (Reference = Strongly disagree)</td>
<td>2.50</td>
<td>0.021</td>
<td>2.10 – 2.89</td>
</tr>
<tr>
<td>&quot;I have good access to a mobile phone network from my farm&quot; (Reference = Strongly disagree)</td>
<td>2.48</td>
<td>0.008</td>
<td>2.14 – 2.83</td>
</tr>
<tr>
<td>Percentage sales of bananas in the past 12 months (Reference = 2 Bunches)</td>
<td>0.99</td>
<td>0.527</td>
<td>0.98 – 1.00</td>
</tr>
</tbody>
</table>

From the table, we observe that:

i. The education level of the household head, who is also the main proprietor of the banana enterprise, was found to be significantly \((p < 0.001)\) influencing the involvement in an inclusive Banana value chain. The model shows that a unit increase (years spent in school) leads to 1.31 chance \((CI = 1.25 – 1.38)\) of involvement in an inclusive value chain.

ii. Suitability of the soils for banana production was found to be significantly \((p = 0.021)\) influencing farmer involvement in an inclusive banana value chain. The odds of a farmer who has suitable soils for banana production are 2.50 times \((CI = 2.10 – 2.89)\) greater of being in an inclusive banana value chain compared to a farmer with poor soils.

iii. Availability of a mobile phone connection of the farm was found to be significantly \((p = 0.008)\) influencing involvement of a farmer in an inclusive banana value chain. This is signified by the observation that farmers who have a mobile phone connection on their farm have 2.48 chances \((CI = 2.14 – 2.83)\) of participation in an inclusive banana value chain compared to their counterparts that have no mobile phone connection.

The correlation results and regression model show that there is open competition in the banana market; and farmers who are more educated, have suitable land for production and have a mobile phone connection/access are more likely to participate in an inclusive banana value chain.

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\(^7\)Odds ratio is a measure of effect size, describing the strength of association or non-independence between two binary data values
3.3  Fish value chain

The survey of fish farmers covered 100 farmers of whom 50 were involved in inclusive value chains and 50 were not. Table 3.7 is a summary of the selected demographic characteristics of the households surveyed.

3.3.1 Fish Farmer Household Data

Below is a presentation of the characteristics and observations of the fish farmers as well as their general behavior in relation to their fish enterprises.

Analysis of the fish farmers showed that;

- Only 17% of the fish farmers ranked aquaculture as their main source of income. 8% ranked it as the second and the majority 75% of them ranked it as the third to fifth income source. Other sources of income mentioned included crop farming salaried employment and self employment income from the household head.

Table 3.7 Selected Demographic Characteristics of Fish Farmers Surveyed (N=100)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size (No.)</td>
<td>1-3</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>4-6</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>7-10</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>&gt;10</td>
<td>35</td>
</tr>
<tr>
<td>Gender of Household Head</td>
<td>Male</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>14</td>
</tr>
<tr>
<td>Age of Household Head (Years)</td>
<td>21-30</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>&gt;60</td>
<td>21</td>
</tr>
<tr>
<td>Years spent in school by Household Head</td>
<td>0-7</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>8-13</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>14-15</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>15-20</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>&gt;20</td>
<td>13</td>
</tr>
<tr>
<td>Ranking of Fish farming as Household income source</td>
<td>Rank 1</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Rank 2</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Rank 3</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Rank 4</td>
<td>4</td>
</tr>
<tr>
<td>Primary activity of Household Head</td>
<td>Crop farming</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Salaried employment</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Self-employment</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>12</td>
</tr>
</tbody>
</table>
In the aquaculture value chain, men are the predominant players (in over 80% of households) although women involvement (about 20% of households) is also visible. This is probably due to the high investment costs involved in fish farming that are beyond the reach of most women, fish farm sites are usually located far from the homestead that women cannot easily access and the risk of working in water a factor that deters many women. Table 3.8 is a summary of involvement in fish enterprise by gender.

### Table 3.8 Involvement In Fish Enterprise By Gender

<table>
<thead>
<tr>
<th>Fish farm activities</th>
<th>Percentage of men/women involved in enterprise activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who decided to start the enterprise</td>
<td>Men: 81        Women: 19</td>
</tr>
<tr>
<td>Who provided the initial capital</td>
<td>Men: 84        Women: 16</td>
</tr>
<tr>
<td>Who does daily tending</td>
<td>Men: 81        Women: 19</td>
</tr>
<tr>
<td>Who pays management costs</td>
<td>Men: 82        Women: 18</td>
</tr>
<tr>
<td>Who decides on marketing</td>
<td>Men: 84        Women: 16</td>
</tr>
<tr>
<td>Who decides how to use the proceeds?</td>
<td>Men: 83        Women: 17</td>
</tr>
</tbody>
</table>

Two types of fish are mainly farmed. The majority (85%) of the respondents farm the Tilapia–*Oreochromis Niloticus* species. 15% farmed the Cat Fish *Ictalurus Punctatus* species. Over the past 12 months 45% of the farmers had harvested less than 1 ton of fish from their farms. 12% had harvested between 0.1-1.0 tons; 17% had harvested 1.5-2.0 tons 26% had harvested more than 2 Tons. On average more than 95% of the fish is sold off leaving about 5% for home consumption.

Fish farmers mentioned that they sold fish through the following as their main market channels: 52% - local markets; 10% - Co-operatives; 5% - individuals; 9% - local markets; and 24% - urban traders. These findings show that most of the aquaculture fish is consumed locally through local markets, local traders and individuals. Urban traders are also an important channel, and these usually process it for export or sold locally. Co-operatives support farmers by linking them to the markets/buyers.

### 3.3.2 Fish Production Inputs And Marketing Channels

Figure 3.5 illustrates the major inputs fish farmers need for production and their sales channels. The various inputs farmers need included – supplies of fish fingerlings; fish feeds, transportation of produce in refrigerated trucks to markets and specialized aquaculture tools and equipment. Three channels were also identified through which farmers sell their fish, namely;

- **Channel 1** – These are traders, exporters and fish processors located in the main towns and cities. These buyers usually have ready buyers/retailers that they supply, and they have their own trucks to move their merchandise from the farmers.
• Channel 2 – are buyers in the local markets and nearby trading centres and towns. They may also be individuals buying for home consumption or bicycle hawker operating in the neighborhood.

• Channel 3 – consists of locally based traders, middlemen and agents. They buy in bulk and sell the stock on to other traders. Consumers: These are usually residents of the local communities and villages that buy from the farmer food for home consumption.

Figure 3.5 Major aquaculture farmer inputs and sales channels

Below are the highlights of the aquaculture farmer market interactions;

**Prices**
Aquaculture fish prices are largely uniform nationwide, irrespective of the buyer. Currently the average farm gate price is Ushs6500 per Kg. The price may however rise to 8500 per Kg in times of scarcity. Aquaculture fish competes with the bigger traditional capture fish market, and hence its seasonal variations. The low price seasons are the rainy weather months of March to May when lake fish supplies increase; and the high price seasons are the dry weather months of December to February and from June to August the time when the fish supplies are low. Payments are also made in cash at the farm gate. Farmers also reported isolated cases where buyers booked their fish and paid for it 2-3 months in advance.

**Quality**
There are no set quality standards for fish. However, buyers prefer to buy large size fish that have reached at above 0.5 Kg for Tilapia and 1 Kg for Cat Fish at maturity. Tilapia with a dark shiny black colour is much more preferred, and may fetch a premium price of UShs 5000
above the normal price. Unfortunately farmers do not have the skills, knowledge and capacity to raise their fish to have the desired attributes.

**Transportation**

Unlike in situations where fish is sold to local markets, the fish is usually sold in bulk to a single buyer. Ideally at harvest time, the fish is removed from the pond or cages in one lot, weighted, paid for and transported through a cold chain. Normally the buyer pays for transportation of their produce. Pond fish farmers unlike the cage farmers have the option of harvesting small quantities at a time, and in case they have to sell to market vendors, the farmer is responsible for transporting his fish to the vendor’s outlets. Otherwise anyone buying from the farm gate is responsible for transporting their purchases. Fish is a fast perishable item and must thus be kept and transported through a cold chain.

Transportation through a cold chain is one of the biggest challenges fish farmers face as such vehicles are rare and expensive to own or even hire. And still because the aquaculture is not well developed in Uganda, suppliers of fish feeds are few and expensive; and so are the sources of reliable fingerling quality, tools and equipment. The fisheries legal framework also presents challenges for aquaculture farmers.

**Challenges and risks in the fish value chain**

Fish farming has inherent risks to the extent that conditioning the fish natural environment i.e. water, to suit the commercial farming requirements and also maintaining the cold chain necessary to keep the fish fresh from harvest to the final consumer are rather costly undertakings for the ordinary Ugandan fish farmers. And also, because the fisheries sector is largely under-developed in Uganda with still little government support, fish value chain players are very few and disjointed. Thus fish farmers have to fend for themselves to keep their businesses alive by all means. Below are some of the fish farmer challenges;

- **Lack of feeds.** Fish have to be fed entirely on formulated feed if they are to reach market weight/size in the scheduled time. However there are very few fish feed manufactures in Uganda. This limits competition in the manufacturing business. In such a situation, farmers have few options to select from for the most competitive supplies – best price, quality, etc. Furthermore, the farmers are not exposed to any knowledge of alternative low cost formulations and guidelines. At the current market price of Ushs 6000 per Kg, commercial fish feeds are very expensive. Many farmers also complained of the quality of the fish feeds.

- **Aquaculture fish competes with capture fish for the same market and buyers, yet the capture fish harvest is much higher.** Capture fish will therefore drive the market forces. Comparatively, however, the investment cost for capture fish is very low. Short or abundant supply, and hence the price of captured fish, fluctuates depending at times on weather changes. Unfortunately the buyers pay a uniform price for all fish irrespective of the production method. Thus price fluctuations may lead to losses for fish farmers because they have fixed production costs. In the same breath the market channels for fish are limited. Farmers have to rely on selling to the local market vendors and middlemen, and the few processors in the country, and sell at the prevailing price. Information about linkage to markets and market options is limited which exposes farmers to dealing with middlemen rather than the ultimate buyers.
• Fish farmers in Uganda hardly receive any extension services due to the shortage of aquaculture experts in the country. In addition, because the sector is largely new in Uganda, so standards have been developed and commissioned as the guiding aquaculture fish production and husbandry policies for Uganda.

• Many farmers have complained about the quality of the fingerlings they buy. Because they lack skills, they are not able to know the quality of the final fish species, and other characteristics based on the appearance of the fingerlings supplied to them. There have been many cases of farmers complaining about the number of fingerlings received versus the number paid for, the sex of the fish bought etc. in relation to the fish pond size. These factors affect the population in the pond or cage, the quantity of feeds to be given, pond aeration and water flow rates, and ultimately growth rate and final fish size/weight.

• Farmers lack reliable supplies of fish farming equipment offered at reasonable prices. Such equipment includes- fish cages, fishing nets and oxygen pumps, among others. Expert personnel for fish pond construction are also rare.

• The maturity period for fish Tilapia—*Oreochromis Niloticus* and Cat Fish—*Ictalurus Punctatus* is about 6-8 month. This is along waiting period for most small scale farmers who at the same time have to invest in fish feeds for all that time. This presents a strain on the farmers’ cash flow. Furthermore, financial institutions are not willing to lend to fish farmers as the business is perceived to be too risky.

• Fish farmers especially cage farmers who use the natural water bodies are exposed to the risk of theft of their fish especially at night by the capture fishermen. Malicious acts like poisoning fish ponds have also been experienced in the past.

• Aquaculture is a high investment venture. The high cost is a hindrance for many farmers who may want to expand and develop their fish farms.

### 3.3.3 Fish Value Chain Correlations

Diagram 3.5 illustrates the correlated statements made by the fish farmers.

Diagram 3.5 Correspondences Between Variables Representing The Components Of The Business Relationship Between Ugandan Fish Farmers And Their Buyers
Using Pearson’s Correlation Coefficient it was found that among the fish farmers, the following statements were positively correlated:

- F 2.1. “I am aware of the latest production techniques for producing fish”
- G 2.7 “I am satisfied with the interactions I have with government officials in charge of fisheries”
- F2.2 “I practice the latest production techniques for producing fish”

This correlation suggests that the kind of interaction fish farmers have with the government fisheries officials is awareness building about the latest fish production techniques and that farmers have adopted the new production techniques taught. In addition to this, the statements:

- D2G2 “Mode of transport to the market”
- D2E2 “Farmers’ marketing channel used in the last 12 months”

are both correlated with

- F2.2 “I practice the latest production techniques for producing fish”

Which suggests that fish farmers who have adopted the latest production techniques tend to use the most appropriate means of transporting their fish produce to the market.

3.3.4 Fish Value Chain Logistic Regression Model

The resultant logistic regression model results of best fit showed that involvement in fish inclusive value chain was significantly (Chi Square = 73.91, p-value = 0.000) associated with factors such as rank of Fish farming as household’s most important source of income during the last 12 months, Amount of fish harvested, mode of fish transportation, education level and gender of the fish enterprise proprietor. Majority of farmers who gave Rank 1 to fish farming as the most important source of income during the last 12 months were also most likely to be involved in an inclusive value chain. A unit increase in number of rank of fish farming as the most important source of income during the last 12 months led to 0.3 odds of getting involved in an inclusive value chain.
### Table 3.9 Results Of The Fish Value Chain Logistic Regression Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio(^a)</th>
<th>p-value</th>
<th>95% confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank of Fish farming as household's most important source of income during the last 12 months (Reference = 1)</td>
<td>0.30</td>
<td>0.004</td>
<td>-0.12 – 0.72</td>
</tr>
<tr>
<td>Categorized total Fish harvested in the last 12 months (Reference = &lt;1,000 Kilograms of fish)</td>
<td>22.95</td>
<td>0.000</td>
<td>22.13 – 23.76</td>
</tr>
<tr>
<td>Transport mode Reference = Foot/bicycle)</td>
<td>2.40</td>
<td>0.002</td>
<td>2.12 – 2.69</td>
</tr>
<tr>
<td>Education level of household head (Reference = &lt;11 Years in school)</td>
<td>0.80</td>
<td>0.018</td>
<td>0.71 – 0.89</td>
</tr>
<tr>
<td>Who decided to start the enterprise? (Reference = Female)</td>
<td>9.59</td>
<td>0.040</td>
<td>8.49 – 10.69</td>
</tr>
</tbody>
</table>

i. More educated farmers had lower odds of involving themselves in an inclusive value chain as compared to those who had acquired only up to primary level of education. The findings indicate that a unit increase in number of years spent in school by farmers leads to 0.8 odds of getting involved in an inclusive value chain; this translates as a 0.2 decrease in the likelihood of joining an organized fish value chain. Indeed during the FGD meetings, farmers mentioned that the educated people in most cases are more risk averse, they earn a steady income from other sources (e.g. salaried jobs and businesses) as the primary source of income, and not their farm enterprises. The farms they set-up (whether fish farms or otherwise) provide additional income and are rarely run as serious businesses. Typically, such farmers will hire a caretaker to do the day to day tending, will visit the farm once in a while, and will make decisions on phone. A farmer of this nature is less likely to give the due attention to the business and to participate in an inclusive value chain.

On the other hand however, less educated people with fewer income opportunities will view the farming businesses as an important investment and source of income. They will thus strive to run it as a successful business and make the highest returns from it.

ii. Farmers who were using better modes of transport to transport their fish produce to the market, like motorcycle, car, pickup or truck had better chances (2.40 times) of involving themselves in an inclusive value chain compared to those who used foot or bicycle. This is likely to be linked to the amount of fish being produced, together with the indicator below.

iii. Total fish harvested in the last 12 months significantly influenced farmers' involvement in an inclusive value chain. The model in Table 4.3 above shows that farmers who had harvested more than 1,000 kilograms of fish in the last 12 months

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\(^a\)Odds ratio is a measure of effect size, describing the strength of association or non-independence between two binary data values.
had 22.95 times chances of getting involved in an inclusive value chain compared to those who had harvested less than 1,000 kilograms of fish in the last 12 months. In addition, enterprises where decision to begin fish farming was by a male had about 9.59 times chances of getting involved in an inclusive value chain compared to those where decision to begin fish farming was by a female.

Based on the results of the model therefore, getting involved in fish inclusive value chain can be enhanced through involving male, less educated farmers who consider fish farming highly as a source of income.
4. Conclusions

With regards to the pig value chain it is observed that the pig farmers are predominantly smallholders. The main challenges faced in pig production include high feeding costs which compromises animal growth rate and final gate prices; as well as animal health service provision, poor breeds and breeding. The majority of them sell less than 5 animals per day. Although men are the dominant players in the pig business at household level there is prominence of women involvement in owning, management and selling of pigs. Most of the pigs are bought by locally based buyers, and as such, these buyers present a ready market for pig farmers. The lack of standards on quality assessment and a rewarding system for quality is a major disincentive for investment in quality production and probably involvement of farmers in inclusive value chains.

The Logit regression analysis showed that among pig farmers, being a member of a credit or a good agricultural practices (GAP) group makes it less likely to be involved in an organized pig value chain. This surprising finding is explained by the multiple products produced on the same farm. By probing pig farmers further on this issue, it turned out that the credit and GAP groups had been created for their crop enterprise rather than the pig enterprise. Also, the piggery farmers have a trusted ready market that pays them cash on time which negates the need to look for credit facilities. It also suggests that farmers keep pigs as a form of savings. However, farmers that sell more animals tend to have access to the high and lucrative markets. But although urban traders do not guarantee better prices to farmers, collaboration with such traders could better help farmers improve their animal quality.

In the banana value chain, it is observed that the majority of banana farmers depend on the crop as their main source of income with more men involved compared to women. Bananas are a major staple food crop that is highly demanded in all major towns of the country. Hence there are numerous traders and consumers ready to buy in any quality and quantity of the produce offered and for cash.

Banana farmers are however challenged by the rampant crop pests and diseases, the most destructive of these is the Banana Bacterial Wilt. In spite of the high susceptibility of the crop to pests and diseases, pesticides disease control chemicals, fertilizers and other inputs are too expensive for the ordinary farmer, making banana production rather risky. More importantly however are the effects of climatic change- extended drought, heavy rains, flooding hail stones all severely affect the productivity and survival of banana plantations.

The correlation and logit modelling indicated that farmers are generally get fair market prices from their main buyers because they have information on prices. There are numerous buyers who present a ready market and open competition in the market. It was however noted that the availability of a ready market that buys anything offered for sale undermined participation of banana farmers in organized value chains. Ownership of suitable land for banana production, education and availability of a phone network on the farm encouraged farmer participation in inclusive banana value chains. The analysis showed that investing to improve soil fertility and mobile phone connectivity can multiply by 2.5 the likelihood that banana farmers will be part of organized value chains.

In the fish value chain, most farmers ranked fish as the second, third or fourth important source of household income. The main Species farmed were Tilapia (*Oreochromis Niloticus*) and cat fish (*Ictalurus Punctatus*).
The investment cost of fish farming is high and probably acts as a barrier to entry. Yields are low with most farmers having produced less than 1 ton in the past year. Fish farming is also dominated by men.

The main marketing channels for aquaculture fish are local markets and consumers; local traders and middlemen; and urban traders who buy in bulk.

The aquaculture value chain is still underdeveloped and thus exposed to a number of risks and challenges that include high cost of feeds with hardly any alternatives for farmers; poor extension service delivery due to shortage of experienced personnel; lack of reliable suppliers of inputs like fish farming equipment, fish fingerlings, etc.; lack of confidence in the breeds and other factors have been identified in hindering development of fish farming.

Correlation and logit analyses showed that farmers are quite willing to adopt the latest technology to improve productivity on their farms and that government fisheries officials are the main sources of such information. It was also found that farmers’ participation in inclusive fish value chains is influenced by how high the level of importance attached to fish farming is, as a source of household income; and quantity of fish harvested. It is more likely for male farmers who decided to start the fish farm enterprise to be involved in inclusive value chains. Interestingly also, more educated farmers had lower odds of involving themselves in an inclusive value chain as compared to those who had acquired only up to primary level of education. The findings indicates that a unit increase in number of years spent in school by farmers leads to a 0.2 decrease in the odds of getting involved in an inclusive value chain. Indeed during the FGD meetings, farmers mentioned that the educated people in most cases will shy away from fish farming which is perceived to be very risky, and they earn a steady income from formal employment.

The results of this study allow the identification of the following factors as significant in the increasing the odds of smallholder farmers joining inclusive value chains:

- Soil fertility (positive impact)
- Amount of commodity produced (positive impact)
- Level of sophistication of the mode of transport used to reach market (positive impact)
- A good mobile phone network (positive impact)
- Membership of a credit group (negative impact)
- Members of a group on Good agricultural practices (negative impact)
- Share of the enterprise in the farm’s income generation (negative impact)
- Education level of the household head (positive or negative depending on commodity)
- Gender (men are more likely to be involved in inclusive value chains)

These findings require further research in order to qualify them and to identify the possible reverse effect that being part of an inclusive value chain could have on the variables that were hypothesized as explanatory in this study.

In this research identifying the factors influencing successful inclusion of smallholder farmers in modern value chains, we observe numerous bottlenecks, both structural and inherent, that call for increased support for inclusive value chain development in developing economies. In the developing economies, small businesses, whether in trade, services or agribusiness, account for the biggest share of the private sector. They are mostly informal operators edging a living from whatever means available. For example, from this study it was found
that the majority of farmers in Uganda are indeed small operating on less than 2 acres per household. Ironically, as part of its overall development strategies, the Government in collaboration with donors, has tended to channel most of its support to specific industries and sectors through a combination of policy measures, ranging from concessionary financing, tax breaks, and provision of trade credit to subsidies, public-private partnerships, and promotion of foreign investment, as evidenced in Uganda's fish sector. Unfortunately, such support is not accessible to the small and micro enterprises for structural and other reasons.

A business-enabling environment is a critical determinant of positive impacts in value chain development projects. No matter the country or sector context, support from government actors often dictates the extent to which businesses can thrive and grow or stagnate and collapse. The pig, banana and fish smallholder farmers studied in this research have specific needs that are often neglected in favor of top-down government policies that support medium and large businesses instead. For example, the study results show that investing to improve soil fertility and mobile phone connectivity can multiply by 2.5 the likelihood that banana farmers will be part of organized value chains. These results can help guide government and donor investment within the agricultural production, marketing and natural resources management systems. On the other hand, the fact that the likelihood of farmers joining organized value chains actually decreased with the lesser importance of fish as the main source of household income or with pig farmers' belonging to a GAP or credit group (indicators that farmers were investing in their other productions) is a reminder that the smallholder production systems in developing countries are very much intertwined and no intervention on one part of the system can be considered separately from the rest of the farmers' enterprises. By neglecting such specific needs, smaller enterprises particularly in agriculture tend to remain informal and produce below their growth potential. This will becomes a challenge for agro-based countries like Uganda where over 70% of the population depends on small scale agriculture.

Thus inclusive private-sector development requires government reforms that are more aware of and responsive to the needs of smaller, micro, and informal businesses throughout the market because the reforms currently do not take their perspectives into account. For donor organization engaged in value chain development, understanding the role of government and ways to increase its participation and the quality of its support in such work is crucial to reach sustainable, positive impacts. In failing to view the market system holistically, government policy reforms can exclude such smaller informal businesses. This presents a missed opportunity, as the informal sector and small and micro businesses often constitute a significant proportion of the economy, presenting an opportunity to achieve more impact on poverty alleviation at the grass-roots level.

It is prudent therefore for both governments and donors to promote inclusive business models, as such models tend to sustain the development and uptake of more structured companies in the respective countries and abroad. In order to have a more inclusive development impact, it is crucial that donor support and government reforms become more open to, and supportive of, small, micro, and informal businesses throughout a value chain. In such an approach businesses maintain their for-profit nature, while contributing to poverty reduction by including low-income communities in their value chains.
Appendix 1: P-values of correlations coefficients and logit analysis tables
P-values of Correlations coefficients - pig data analysis

<table>
<thead>
<tr>
<th></th>
<th>H3_My buyer will buy my products whenever I am ready to sell&quot;</th>
<th>PIG1 UNIT EQUIVALENT</th>
<th>G15_&quot;it is difficult to find the inputs I need to produce banana/fish/pigs&quot;</th>
<th>C82_Membership to a GAP group</th>
<th>H7_My buyer helps me with Technical information</th>
<th>H9_My buyer rejects my products</th>
<th>G21_&quot;the government has built a good road that leads up to my farm&quot;</th>
<th>G11_&quot;I find it easy to access government extension services for farmers&quot;</th>
<th>Household Size</th>
<th>Household head age</th>
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<td>H3_My buyer will buy my products whenever I am ready to sell&quot;</td>
<td>0.207</td>
<td>0.021</td>
<td>0</td>
<td>0.862</td>
<td>0</td>
<td>0</td>
<td>0.515</td>
<td>0.435</td>
<td>0.212</td>
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<tr>
<td>PIG1 UNIT EQUIVALENT</td>
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<td>0.813</td>
<td>0.75</td>
<td>0.092</td>
<td>0.847</td>
<td>0.087</td>
<td>0.369</td>
<td>0.013</td>
<td>0.319</td>
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<td>0.813</td>
<td>0.236</td>
<td>0.576</td>
<td>0.175</td>
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<td>0.009</td>
<td>0.545</td>
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P-values of Correlations coefficients in Banana data
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| H/3  | "My buyer will buy my products whenever I am ready to sell" | H/7_My buyer helps me with Technical information | H/5  | "My buyer helps me to obtain credit" | H/6  | "My buyer does not delay in paying for my products" | H/1  | "I have good access to a mobile phone network from my farm" | G/2.2  | "I have good access to a mobile phone network from my farm" | G/2.1  | "the government has built a good road that leads up to my farm" | F/3  | "I find it quite difficult to get cash when I need to invest in my farming activities" | D/5  | "I currently use?" | D/Sai if yes what is the average quantity of banana you sell to your buyer per transaction during the low season? | D/8ai what is the average quantity of banana you sell to your buyer per transaction during the high season | D/1D1  | T b sales quantity | D/1G_Time taken to reach market | D/7  | "during the low season, my buyer is satisfied with the quantities of banana/fish I deliver" | D/10  | "during the high season, my buyer is satisfied with the quantities of banana/fish I deliver" | C82__Members hip to a GAP group | C22  | Total land under crops only |
|------|-------------------------------------------------|-------------------------------------------------|------|-------------------------------------|------|-------------------------------------------------|------|-------------------------------------------------|----------------|-----------------------------------------------------------------|----------------|-----------------------------------------------------------------|------|-------------------------------------------------|----------------|-------------------------------------------------|----------------|-------------------------------------------------|----------------|-------------------------------------------------|----------------|-------------------------------------------------|------|-------------------------------------------------|
| 0.864 | 0.068 | 0.1 | 0.043 | 0.678 | 0.209 | 0.03 | 0.758 | 0.092 | 0.425 | 0.464 | 0.403 | 0.435 | 0.951 | 0.226 | 0.262 | 0.459 |
| 0.697 | 0.746 | 0.324 | 0.201 | 0.657 | 0.168 | 0.738 | 0.758 | 0.933 | 0.96 | 0.707 | 0.212 | 0.235 | 0.831 | 0.774 | 0.428 | 0.987 |
| 0.471 | 0.699 | 0.855 | 0.565 | 0.952 | 0.702 | 0.769 | 0.092 | 0.933 | 0.871 | 0.906 | 0.724 | 0.994 | 0.18 | 0.783 | 0.689 | 0.149 |
| 0.286 | 0.142 | 0.206 | 0.318 | 0.199 | 0.891 | 0.829 | 0.425 | 0.96 | 0.871 | 0.711 | 0.922 | 0.749 | 0.785 | 0.933 | 0.806 | 0.859 |
you sell to your buyer per transaction during the low season?

<p>|                  | 0.874 | 0.353 | 0.959 | 0.181 | 0.687 | 0.302 | 0.826 | 0.464 | 0.707 | 0.906 | 0.711 | 0.848 | 0.561 | 0.004 | 0.831 | 0.0 | 0.966 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|-----|
| D/8ai what is the average quantity of banana you sell to your buyer per transaction during the high season |       |       |       |       |       |       |       |       |       |       |       |       |       |      |     |    |</p>
<table>
<thead>
<tr>
<th>P-values of Correlations coefficients in Banana data</th>
</tr>
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<tbody>
<tr>
<td>H/3 &quot;My buyer will buy my product s whenever I am ready to sell&quot;</td>
</tr>
<tr>
<td>D/1D1b sales - quantity</td>
</tr>
<tr>
<td>D1G_Time taken to reach market</td>
</tr>
<tr>
<td>D/7 &quot;during the low season, my buyer is satisfied with the quantities of banana/fish i deliver&quot;</td>
</tr>
<tr>
<td>D/10 &quot;during the high season, my buyer is satisfied with the quantities of banana/fish i deliver&quot;</td>
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<tr>
<td>----------------------</td>
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<td></td>
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<tr>
<td>C82_ Membership to a GAP group</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>C22_ Total land under crops only</td>
</tr>
</tbody>
</table>

52
<table>
<thead>
<tr>
<th></th>
<th>A/8 Gender of respondent</th>
<th>Household Size</th>
<th>LEVEL OF EDUCATION OF HOUSEHOLD HEAD IN YEARS</th>
<th>FISH RANK</th>
<th>B2 GENDER OF PROPRIETOR</th>
<th>D2B1 HARVEST AMOUNT CATEGORIZED</th>
<th>D2E1_marketing channel</th>
<th>D2G1_transport mode</th>
<th>F21_“I am aware for the latest production techniques for producing”</th>
<th>F22_“I practice the latest production techniques for producing”</th>
<th>G27_“I am satisfied with the interactions I have with Government officials in charge of agriculture, livestock and fisheries”</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/8 Gender of respondent</td>
<td></td>
<td>0.965</td>
<td>0.663</td>
<td>0.512</td>
<td>0</td>
<td>0.21</td>
<td>0.489</td>
<td>0.317</td>
<td>0.827</td>
<td>0.781</td>
<td>0.235</td>
</tr>
<tr>
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<td>0.081</td>
<td>0.761</td>
<td>0.074</td>
<td>0.25</td>
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<tr>
<td>LEVEL OF EDUCATION OF HOUSEHOLD HEAD IN YEARS</td>
<td></td>
<td>0.663</td>
<td>0.737</td>
<td>0.026</td>
<td>0.385</td>
<td>0.251</td>
<td>0.097</td>
<td>0.254</td>
<td>0.746</td>
<td>0.272</td>
<td>0.748</td>
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<tr>
<td>FISH RANK</td>
<td></td>
<td>0.512</td>
<td>0.002</td>
<td>0.026</td>
<td>0.909</td>
<td>0.128</td>
<td>0.574</td>
<td>0.018</td>
<td>0.007</td>
<td>0</td>
<td>0.267</td>
</tr>
<tr>
<td>B2 GENDER OF PROPRIETOR</td>
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<td>0.402</td>
<td>0.385</td>
<td>0.909</td>
<td>0.39</td>
<td>0.618</td>
<td>0.927</td>
<td>0.549</td>
<td>0.965</td>
<td>0.85</td>
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<td>D2B1 HARVEST AMOUNT CATEGORIZED</td>
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<td>0.598</td>
<td>0.251</td>
<td>0.128</td>
<td>0.39</td>
<td>0.003</td>
<td>0</td>
<td>0.047</td>
<td>0.018</td>
<td>0.085</td>
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<td>D2E1_marketing channel</td>
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<td>0.489</td>
<td>0.025</td>
<td>0.097</td>
<td>0.574</td>
<td>0.618</td>
<td>0.003</td>
<td>0</td>
<td>0.572</td>
<td>0.019</td>
<td>0.806</td>
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<tr>
<td>D2G1_transport mode</td>
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<td>0.317</td>
<td>0.081</td>
<td>0.254</td>
<td>0.018</td>
<td>0.927</td>
<td>0</td>
<td>0</td>
<td>0.208</td>
<td>0.001</td>
<td>0.741</td>
</tr>
<tr>
<td>F21_“I am aware for the latest production techniques for producing”</td>
<td></td>
<td>0.827</td>
<td>0.761</td>
<td>0.746</td>
<td>0.007</td>
<td>0.549</td>
<td>0.047</td>
<td>0.572</td>
<td>0.208</td>
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<tr>
<td>F22_“I practice the latest production techniques for producing”</td>
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<td>0.781</td>
<td>0.074</td>
<td>0.272</td>
<td>0</td>
<td>0.965</td>
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<td>0.019</td>
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</tr>
<tr>
<td>G27_“I am satisfied with the interactions I have with Government officials in charge of agriculture, livestock and fisheries”</td>
<td></td>
<td>0.235</td>
<td>0.25</td>
<td>0.748</td>
<td>0.267</td>
<td>0.85</td>
<td>0.085</td>
<td>0.806</td>
<td>0.741</td>
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<td>0.001</td>
</tr>
</tbody>
</table>
Appendix 2: individual household questionnaire
# Household survey

## A. Introductory Information

Codes: -99=unknown; -88=decline to answer

<table>
<thead>
<tr>
<th>A/1. Questionnaire ID</th>
<th>[____________________]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/2. Date of Interview (DD/MM/YYYY) :</td>
<td></td>
</tr>
<tr>
<td>A/3. Enumerator Name :</td>
<td>____________________________</td>
</tr>
<tr>
<td>A/4. Name of the head of the household :</td>
<td>____________________________</td>
</tr>
<tr>
<td>A/4a Gender of the head of the household</td>
<td>____________________________</td>
</tr>
<tr>
<td>A/5. Religious affiliation of household head</td>
<td>[___________ ]</td>
</tr>
<tr>
<td>Religious affiliation</td>
<td>1=Christian 2=Muslim 3=No religious affiliation 4=Other</td>
</tr>
<tr>
<td>A/6. Marital status of household head</td>
<td>[___________ ]</td>
</tr>
<tr>
<td>Marital status</td>
<td>1=Married 2=Widow/Widower 3=Single parent 4=Divorced 5=Other</td>
</tr>
<tr>
<td>A/7. Respondent name:</td>
<td>____________________________</td>
</tr>
<tr>
<td>A/8. Gender of respondent (0=Male; 1=Female)</td>
<td>[___________ ]</td>
</tr>
<tr>
<td>A/9. Time interview started :</td>
<td>HH:</td>
</tr>
<tr>
<td>A/10. Location of household (GPS readings)</td>
<td></td>
</tr>
<tr>
<td>District Code:</td>
<td>1=Mbarara 2=Masaka 3=Mukono 5=Other</td>
</tr>
<tr>
<td>A/11. District of survey (use code) :</td>
<td>[___________ ]</td>
</tr>
<tr>
<td>A/12. Name of sub-county</td>
<td>____________________________</td>
</tr>
<tr>
<td>A/13. Name of village</td>
<td>____________________________</td>
</tr>
</tbody>
</table>
B. Basic household details

B/1. Please provide details of your household members (including the household head). [WE DEFINE A “HOUSEHOLD” TO INCLUDE ALL MEMBERS OF A COMMON DECISION MAKING UNIT (USUALLY WITHIN ONE RESIDENCE) THAT ARE SHARING INCOME AND OTHER RESOURCES]

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members of your household [FIRST NAMES]</td>
<td>Year of birth</td>
<td>Gender 1=Male 2=Female</td>
<td>Relationship to household head</td>
<td>Highest education level attained</td>
<td>Main/primary activity [MOST IMPORTANT]</td>
</tr>
<tr>
<td>1</td>
<td>Household head</td>
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<tr>
<td>14</td>
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<td></td>
</tr>
<tr>
<td>Relationship to household head</td>
<td></td>
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</tr>
</tbody>
</table>

0 = Never went to school
1 = Nursery
2 = Pre-school age
3 = Non-formal education
4 = Primary education (P1-P4)
5 = Primary education (P5-P7)
6 = Secondary school (S1-S2)
7 = Secondary school (S3-S4)
8 = High school (S5-S6)
9 = Vocational training (specify no of years) ___________
9 = Tertiary training specify yrs ______
10 = University degree (undergraduate)
11 = University degree (postgraduate)
12 = Adult literacy
13 = Others (specify) _______ |
| | | | | | Primary activity |
| | | | | | 0 = None |
| | | | | | 1 = Crop farming |
| | | | | | 2 = Pig keeping (incl. sales) |
| | | | | | 3 = Cattle keeping |
| | | | | | 4 = Poultry/keeping (inc. sales) |
| | | | | | 5 = Salaried employment |
| | | | | | 6 = Self-employed-off farm |
| | | | | | 7 = Casual laborer on other farms |
| | | | | | 8 = Boda-boda |
| | | | | | 9 = Student/pupil |
| | | | | | 10 = Charcoal burning |
| | | | | | 11 = Agro-processing |
| | | | | | 12 = Banana farming |
| | | | | | 14 = Fish farming |
| | | | | | 15 = Other _______________ |

56
B/2. Rank the household’s most important sources of income during the last 12 months and the responsible persons.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1 = Banana farming</td>
<td></td>
<td></td>
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<tr>
<td>2 = Pig enterprise</td>
<td></td>
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<tr>
<td>3 = Fish farming</td>
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<td>4 = Crop farming</td>
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<td>5 = Cattle enterprise</td>
<td></td>
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<tr>
<td>6 = Salaried employment</td>
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<tr>
<td>7 = Self-employment-off farm</td>
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<td>8 = Casual labor</td>
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<tr>
<td>9 = Bodaboda</td>
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<tr>
<td>10 = Poultry enterprise</td>
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<td>12 = Property rent</td>
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<td>13 = Charcoal burning</td>
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<td>14 = Other</td>
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</tr>
</tbody>
</table>

B/3. Please indicate the regular household expenditures incurred in a month (30 days)

<table>
<thead>
<tr>
<th>Expenditure item</th>
<th>Amount (UG Sh)</th>
<th>Who provided money for the expenses? (1. Male or 2. Female)</th>
<th>Who decided when to spend? (1. Male or 2. Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Food</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2. School fees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Medical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. House rent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Land tenure and security

C/1. How many parcels* of land do you own? [ ______________ ]
C/2. How many parcels of land have you cultivated during the last rainy season (March-May 2014)? ______________ (this includes the one on which the residence is located) [FOR ALL THE PARCELS, PLEASE FILL IN THE TABLE BELOW; DESIGNATE PARCELS AS ID NUMBERED 1, 2… N].

<table>
<thead>
<tr>
<th>Parcel ID</th>
<th>Primary USE of the land parcel</th>
<th>Size of this parcel in acres**</th>
<th>Tenure system (Code)</th>
<th>If parcel is owned, who owns (Code)</th>
<th>If parcel is rented in, how much is the rent paid?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
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<tr>
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</tbody>
</table>

TENURE SYSTEM

<table>
<thead>
<tr>
<th>Land parcel USE:</th>
<th>If owned, name on title/certificate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=Title deed</td>
<td>1=household head</td>
</tr>
<tr>
<td>2=Owned but not titled</td>
<td>2=spouse</td>
</tr>
<tr>
<td>3=Squatter on public land</td>
<td>3=other household male</td>
</tr>
<tr>
<td>4=Rented-in</td>
<td>4=other household female</td>
</tr>
<tr>
<td>5=Kibanja owner on “Kabaka land”</td>
<td>5=joint (household head &amp; spouse)</td>
</tr>
<tr>
<td>6=Kibanja owner on “mailo land”</td>
<td></td>
</tr>
<tr>
<td>7=Other (specify)</td>
<td></td>
</tr>
<tr>
<td>1=crop activity</td>
<td></td>
</tr>
<tr>
<td>2=fodder</td>
<td></td>
</tr>
<tr>
<td>3=pasture</td>
<td></td>
</tr>
<tr>
<td>4=trees</td>
<td></td>
</tr>
<tr>
<td>5=others________</td>
<td></td>
</tr>
</tbody>
</table>

*parcel is one contiguous plot of land. One parcel can contain more than one plot.

** - conversion factor from square ft to acres: 1 acre=43561ft²

C/3. What is your perception regarding your security of land tenure? Do you agree with the following statement?

“I can keep this land and am sure to transfer it to my children.”[ ______ ]

5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree
C/4. What is your perception regarding suitability of soils and climate, access to water, potential impact on environment? Indicate how you agree/disagree with the following statement, use ranking given:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-Strongly Agree</td>
<td>The soil of my farm is suitable to produce bananas or crop inputs to feed Pigs/Fish</td>
</tr>
<tr>
<td>4-Agree</td>
<td>The climate in my farm area is suitable to produce bananas or crop inputs to feed Pigs/Fish</td>
</tr>
<tr>
<td>3-Undecided</td>
<td>My farm does not have good access to water to produce bananas or crop inputs to feed Pigs/Fish</td>
</tr>
<tr>
<td>2-Disagree</td>
<td>If I continue producing bananas or crop inputs to feed Pigs/Fish, my children will also be able to use the same plot for farming</td>
</tr>
</tbody>
</table>

C/5. Which crops were cultivated during the last rainy season and what were the harvested amounts?

<table>
<thead>
<tr>
<th>Crop grown</th>
<th>Harvest amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
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<tr>
<td>C</td>
<td></td>
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</tbody>
</table>
C/6. Does the household have any livestock? [_____] 1=Yes 0=No

C/7. If yes, please indicate the type and number of livestock kept/owned

<table>
<thead>
<tr>
<th>Livestock Species</th>
<th>Total number owned by the household</th>
<th>Number not owned by household but kept for others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigs</td>
<td></td>
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<tr>
<td>Local</td>
<td></td>
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<tr>
<td>Cross/ exotic</td>
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<tr>
<td>Cattle</td>
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<tr>
<td>Dairy cattle cross/ exotic</td>
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<tr>
<td>Local</td>
<td></td>
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<tr>
<td>Sheep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross/ exotic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exotic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poultry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross/ exotic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rabbits</td>
<td></td>
<td></td>
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<tr>
<td>Other, specify</td>
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</tbody>
</table>

* "Cross" refers to a cross-bred animal which is part-exotic.

C/8. Organization of farmers in formal or informal groups

C/8.1 Do you or any household member belong to any of these groups*? (Circle all that apply)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>4. Farmers’ union</td>
<td>5. Credit access group</td>
<td>6. Innovation platform</td>
</tr>
</tbody>
</table>

C/8.2 What are the activities of the groups?

C/8.3 What are the advantages of belonging to such groups?
C. Agricultural production, marketing and seasonality

D/1. For the current **banana crop**, which types of banana do you have and what were the harvested and sale amounts for the past 12 months?

<table>
<thead>
<tr>
<th>Banana type</th>
<th>Harvest amount</th>
<th>Retained for home consumption</th>
<th>Sales</th>
<th>Marketing channel</th>
<th>Mode of payment</th>
<th>Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>Unit quantity</td>
<td>Unit quantity</td>
<td>Unit quantity</td>
<td>Price/unit</td>
<td>Mode</td>
<td>Time taken (hrs:min)</td>
</tr>
<tr>
<td>Cookin g banana</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Beer (juice) banana</td>
<td></td>
<td></td>
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<tr>
<td>Dessert banana</td>
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<tr>
<td>Plantain</td>
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<tr>
<td>Other (specif y)</td>
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</tbody>
</table>

Units
1 = Kg
2 = Bunches
3 = Other ________

Marketing channel
1-Local markets
2-Farmer co-operative
3-Local institutions/consumers
4-Local traders
5-Urban traders
6-Others ________

Mode of payment
1-Cash
2-Credit
3-Cheque
4-In-kind
5-Other ________

Transport mode
1-Bicycle
2-Motor cycle
3-Car
4-Pick-up
5-Truck
6-Foot
7-Other ________

Who pays
1-Buyer
2-Farmer
3-Others ________

D/2. For the current **Fish stocks**, which types of fish do you have and what were the harvested and sale amounts for the past 12 months?
<table>
<thead>
<tr>
<th>FISH type</th>
<th>Harvest amount</th>
<th>Retained for home consumption</th>
<th>Sales</th>
<th>Marketing channel</th>
<th>Mode of payment</th>
<th>Transportation</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unite quantity</td>
<td>Unite quantity</td>
<td>Unite quantity</td>
<td>Price/unit</td>
<td>Mod of</td>
<td>Time taken (hrs:min)</td>
<td>Wh</td>
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<tr>
<td>Tilapia</td>
<td></td>
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<td></td>
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<tr>
<td>Cat Fish</td>
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<tr>
<td>Other</td>
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</tbody>
</table>

Units
1 = Kg
2 = Number
3= Other ___________

Marketing channel
1-Local markets
2-Farmer co-operative
3-Local institutions
4-Individual consumers
5-Local traders
6-Urban traders
6-Others

Mode of payment
1-Cash
2-Credit
3-Cheque
4-In-kind
5-Other

Transport mode
1-Bicycle
2-Motor cycle
3-Car
4-Pick-up
5-Truck
6-Foot
6-Other

Who pays
1-Buyer
2-Farmer
3-Others
For banana and fish continue here, for pig farmers skip to Section E

D/3. How much quantities of banana/fish do you sell to your buyer on average per transaction? [ _______ ] unit (use codes above) [ ___ ]

D/4. Is there any seasonal variation in the quantities you sell to your buyer? [ _____ ] 1=Yes 0=No

D/5. If yes, what is the average quantity of banana/fish you sell to your buyer per transaction during the low season? [ _______ ] unit (use codes above) [ ___ ]

D/6. What is the average price you receive for banana/fish from your buyer during low season? [ _______ ]UgSh per unit (indicate unit using codes above) [ ___ ]

Farmer perception on buyer satisfaction with respect to quantities supplied during the low season:

D/7. “During the low season, my buyer is satisfied with the quantities of bananas/fish I deliver.” [ _______ ]
   Indicate if you agree with the statement using: 5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree

D/8. What is the average quantity of banana/fish you sell to your buyer per transaction during the high season? [ _______ ] unit (use codes above) [ ___ ]

D/9. What is the average price you receive for banana/fish from your buyer during high season? [ _______ ]UgSh per unit (indicate unit using codes above) [ ___ ]

Farmer perception on buyer satisfaction with respect to quantities supplied during the high season:

D/10. “During the high season, my buyer is satisfied with the quantities of bananas/fish I deliver.” [ _______ ]
   Indicate if you agree with the statement using: 5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree

D/11. Contracts

D/11.1 Is there a contract between you and your banana/fish buyer (s)? [ _____ ] 1=Yes 0=No
If Yes, is this contract a verbal agreement or a signed paper?[ _____ ] (use codes below)

Farmer perception on buyer satisfaction with respect to quantities supplied during the high season:

D/11.3 "I have negotiated some of the terms of the contract with my buyer before agreeing on it."[ _____ ]

Indicate if you agree with the statement using: 5-Strongly Agree 4-Agree 3-Undecided 2-Disagree 1-Strongly Disagree

D/11.4 “I am satisfied with the contractual arrangement I have with my buyer.”[ _____ ]

Indicate if you agree with the statement using: 5-Strongly Agree 4-Agree 3-Undecided 2-Disagree 1-Strongly Disagree

D/11.5 “In case I feel my buyer has not respected the terms of the contract, I know the person I should go to talk to help solve the problem”.[ _____ ]

Indicate if you agree with the statement using: 5-Strongly Agree 4-Agree 3-Undecided 2-Disagree 1-Strongly Disagree

D. Pig sales and marketing

E/1. Provide details on the past 12 months sales of pigs

<table>
<thead>
<tr>
<th>Animal type</th>
<th>How many animals sold?</th>
<th>Selling month? (Code b)</th>
<th>Purpose of selling (Code c)</th>
<th>Marketing channel (Code d)</th>
<th>Average price per animal</th>
<th>Mod of payment</th>
<th>Who decides on how to use the proceeds? (Male or Female)</th>
<th>If cash, after how many days do you receive payment?</th>
<th>If credit, what are the terms? (Code e)</th>
<th>Transportation</th>
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</table>

| a) Animal type | b) Selling Month | c) PURPOSE OF SELLING |
1= Boar  
2 =Sow  
3= Gilt  
4= Weaners  
5=Finishers  
6=Piglets  

<table>
<thead>
<tr>
<th>Month</th>
<th>1=January</th>
<th>2=February</th>
<th>3=March</th>
<th>4=April</th>
<th>5=May</th>
<th>6=June</th>
<th>7=July</th>
<th>8=August</th>
<th>9=September</th>
<th>10=October</th>
<th>11=November</th>
<th>12=December</th>
</tr>
</thead>
</table>
| 1= To meet planned household expenses  
2 = To meet emergency household expenses  
3= Livestock trading as a business  
4= Culling because not productive  
5= Culling because sick  
6 = Other: (specify in cell)  

**d) MARKETING CHANNEL**  
1 = Butchery  
2 = Abattoir  
3 = Feedlots  
4 = Individuals  
5 = Traders  
6= Retailers/Supermarkets  
7= other  

**e) CREDIT MODE OF PAYMENT**  
1= Buyer provided access to feed  
2= Buyer provided access to animal health  
4= Buyer provided access to breeding services  
5= Buyer provided access to household goods  
6= Other: (specify in cell)  

**f) MODE OF TRANSPORTATION**  
1 = Trekking the animal  
2 = Owned Small truck for animals  
3 = Hired Small truck for animals  
4=Buyer pick the animal with his/her own transport  
5 = other (specify in cell)  

**g) who pays**  
1= your self  
2= buyer pays it and deduct from the sale amount  
3=other (specify)  

E/2. How many pigs do you sell to your buyer on average per transaction? [ __________ ]

E/3.Is there any seasonal variation in the quantities you sell to your buyer? [ _____ ]  
0=No  
1=Yes

E/4. If yes, what is the average quantity of pigs you sell to your buyer per transaction during the low season and price received? Indicate quantities and pig type.

<table>
<thead>
<tr>
<th>Pig type</th>
<th>No. sold per transaction</th>
<th>Price received (Ug SH/head)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

Farmer perception on buyer satisfaction with respect to quantities supplied during the low season:

E/5.“During the low season, my buyer is satisfied with the quantities of pigs I supply”. [ _____ ]

Indicate if you agree with the statement using: 5-Strongly Agree  
4-Agree  
3-Undecided  
2-Disagree  
1-Strongly Disagree  

E/6. What is the quantity of pigs that you sell to your buyer per transaction during the high season and price received? Indicate quantities and pig type.

A  
B  
C  

65
<table>
<thead>
<tr>
<th>Pig type</th>
<th>No. sold per transaction</th>
<th>Price received (Ug SH/head)</th>
</tr>
</thead>
<tbody>
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</table>

Farmer perception on buyer satisfaction with respect to quantities supplied during the high season:

E/7. “During the high season, my buyer is satisfied with the quantities of pigs I supply”. [ _____ ]
Indicate if you agree with the statement using: 5-Strongly Agree 4-Agree 3-Undecided 2-Disagree 1-Strongly Disagree

E/8. Contracts
E/8.1 Is there a contract between you and your pig/pork buyers?[ _____ ] 1=Yes 0=No

E/8.2 If Yes, is this contract a verbal agreement or a signed paper? [ _____ ] (use codes below)
1. Verbal agreement
2. Signed paper
3. Other………………………..

Farmer perception on buyer satisfaction with respect to quantities supplied during the high season:
Indicate if you agree with the statements below using: 5-Strongly Agree 4-Agree 3-Undecided 2-Disagree 1-Strongly Disagree

E/8.3 “I have negotiated some of the terms of the contract with my buyer before agreeing on it.”[ _____ ]

E/8.4 “I am satisfied with the contractual arrangement I have with my buyer.”[ _____ ]

E/8.5 “In case I feel my buyer has not respected the terms of the contract, I know the person I should go to talk to help solve the problem.”[ _____ ]
AGRICULTURAL PRODUCTION AND MANAGEMENT PRACTICES

F/1. What farming practices/technologies do you use to improve crop/Livestock/fish production? (Do not read out responses. Multiple Responses)

1. Organic farming
2. Irrigation
3. Water harvesting
4. Farm planning and record keeping
5. Post-harvest handling
6. Crop rotation
7. Construction of bands
8. Improved seed/planting materials
9. Fertilizer application
10. Mulching
11. Seed control
12. Intergraded pest and weed management
13. Improved commercial feeds
14. Fish cage farming
15. Specialized ponds
16. Others, specify_______

F/2. Farmers perception about their farming and farm management skills. Indicate if you agree with the statements below using:

5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree

F/2.1. “I am aware of the latest production techniques for producing”.
Bananas/Fish/Pigs [ _____ ]

F/2.2 I practice the latest production techniques for producing
Bananas/Fish/Pigs [ _____ ]

F/2.3 I do not know how much I spend on inputs to produce one unit of
Bananas/Fish/Pigs [ _____ ]

Farmers perception regarding cash flow
F/3. I find it quite difficult to get cash when I need to invest in my farming activities. [____]
Indicate if you agree with the statement using:

5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree

F/4. What is your MAIN source of information on pig/fish/banana production technology? (tick what applies)

1. Radio
2. TV
3. Media (print, mass, electronic)
4. Fellow farmers
5. NGO Extension workers
6. Government Extension staff
7. Agro input dealer
8. Produce buyers
9. Other projects (specify) ________
F/5. What production constraints do you face? (*Multiple Responses allowed*)

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<tbody>
<tr>
<td>1. Lack of farm tools &amp; equipment</td>
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<td>3. Lack of credit facilities</td>
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<td>4. Cultural beliefs</td>
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<td>5. Inadequate extension services</td>
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<td>7. Lack of improved breeds/cultivars</td>
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<td>8. Fake/adulterated inputs into fig/fish/banana farming</td>
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<td>9. Pests &amp; diseases</td>
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<td>10. Lack of ready market</td>
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<td>11. Theft</td>
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<td>12. Other (specify) ________</td>
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F/6. What types of ICT technologies have you used? (Read out)

<table>
<thead>
<tr>
<th>Type of ICT technology</th>
<th>Used 1=Yes 2=No</th>
<th>When first used (Year)</th>
<th>Currently used? 1=Yes 2=No</th>
<th>Who owns the ICT in this Household? 1 = Household head 2 = Spouse 3=Child 4=Other ____ E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tele/cell phone (voice call)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone SMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile money</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone calls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District Agricultural Training and Information Centre/Management Agricultural Resource Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Specify) ____</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

F/7. Does the household own any one of the following possessions?

<table>
<thead>
<tr>
<th>Household asset</th>
<th>Quantity</th>
<th>Household asset</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Radio</td>
<td></td>
<td>13. Sprayer pump</td>
<td></td>
</tr>
<tr>
<td>3. Television</td>
<td></td>
<td>14. Sewing machine</td>
<td></td>
</tr>
<tr>
<td>4. Car/truck</td>
<td></td>
<td>15. Ploughs</td>
<td></td>
</tr>
<tr>
<td>5. Motorbike</td>
<td></td>
<td>16. Spades</td>
<td></td>
</tr>
<tr>
<td>6. Bicycle</td>
<td></td>
<td>17. Generator</td>
<td></td>
</tr>
<tr>
<td>7. Refrigerator</td>
<td></td>
<td>18. Cooking stove/gas</td>
<td></td>
</tr>
<tr>
<td>11. Internet</td>
<td></td>
<td>22. Other ……………</td>
<td></td>
</tr>
</tbody>
</table>
E. Enabling environment factors (institutions and policies)

G/1. Farmers perception on ease of access to support services and inputs

Indicate if you agree with the statements below using:

5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree

G/1.1 I find it easy to access government extension services for farmers. [____]
G/1.2 I find it easy to access NGO extension services for farmers.[____]
G/1.3 I find it easy to access extension services from the private sector.[____]
G/1.4 If I had the money to pay for them, it is easy to access the services of private support services to farmers. [____]
G/1.5 It is difficult to find the inputs I need to produce.
Bananas/Fish/Pigs [_____]

G/2. Government infrastructure provision and policies

Indicate if you agree with the statements below using:

5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree

G/2.1 The government has built a good road that leads up to my farm. [____]
G/2.2 I have good access to a mobile phone network from my farm. [____]
G/2.3 I have good access to a mobile phone network from the land where I produce
Bananas/Fish/Pigs [_____]
G/2.4 I do not have access to a source of drinking water near my household. [ ____ ]
G/2.5 I can use a closed toilet facility near my household. [ _____ ]
G/2.6 The policies implemented by Government in my area are preventing me from producing the products efficiently.
Bananas/Fish/Pigs [_____]
G/2.7 I am satisfied with the interactions I have with Government officials in charge of agriculture, livestock and fisheries. [ _____ ]

H. Indicators of success of the inclusive value chains, from the smallholders’ perspective

Indicate if you agree with the statements below using:

5-Strongly Agree  4-Agree  3-Undecided  2-Disagree  1-Strongly Disagree

H/1. The farm-gate price I receive from my buyer is fair[ _____ ]
H/2. I trust my buyer [ _____ ]
H/3. My buyer will buy my products whenever I am ready to sell[ _____ ]
H/4. I call my buyer to obtain information about the market[ _____ ]
H/5. My buyer helps me to obtain credit[ _____ ]
H/6. My buyer does not delay in paying for my products[ _____ ]
H/7. My buyer does not help me with technical information about better farming practices[ _____ ]
H/8. I do not feel obliged to sell my product to my buyer[ _____ ]
H/9. My buyer does not reject my products[ _____ ]
H/10. I am generally satisfied by the relationship I have with my buyer[ _____ ]
Appendix 3: Focus group discussion and key informant questionnaire
FOCUS GROUP DISCUSSION TOOL

Factors influencing successful inclusion of smallholder farmers in inclusive value chains around the Lake Victoria Basin area in Uganda

Village: ________________________________
Parish: ________________________________
Sub-county: ____________________________
District: ________________________________
Name of facilitator: ________________________
Total number of participants in the group: [ ____________ ]
Number of men: [ __________ ] Number of women: [ __________ ]

Value chain mapping

Overview

Material needed: Large sheets of paper
Time: 2 hours
Group participants: separate groups of men and women

Objectives

To examine:
- the composition of the value chain, including the main actors, services, and enablers, the main market channels and their relative importance and requirements, and geographical spread, to visualize linkages and demonstrate interdependencies in the chain
- the major sources of inputs and services and their accessibility to different types of producers
- the relative access to and control over the different market channels and services by men and women respectively
- major constraints in selling products and buying inputs and accessing services
Source material drawn from: Livestock and Fish CGIAR program toolkit

How to facilitate

Tape six flipchart pages to the floor to allow sketching of actors and transaction linkages. This is a discussion focused on the place of the producer in the L&F value chain and uses an interactive diagram-based process, which successively:

- sketches the actors buying from and selling to producers
- identifies and characterizes marketing channels
- describes the transactions and relations between buyers, sellers, and others
- tests awareness and enthusiasm surrounding potential interventions, including collective action and hub-type arrangements
- provides checks/triangulations for research investigations for specific domains (feeds, breeding and animal health)

The outputs are a map of the value chain and discussion notes recorded in the recording sheet.

Use the following guiding questions for discussion:

**Market map**

1. Ask the participants to draw themselves on the sheet of paper
2. Draw the main locations where product buyers operate, and their distance from the community
3. Then, ask them to identify and draw the sales channels (buyers from the producer), Indicate this for each product type separately (include also home processed product types).
4. How many buyers are there in each channel? Indicate this on the map
5. To whom do these buyers sell onwards to? Draw the next product destination(s)
6. What are the final products at retail or consumer level? Indicate on the map
7. Who are the final consumers? Are they in urban or rural places? Draw on the map
8. Identify the channels through which producers buy animals for fattening and/or breeding / purchase fry / fingerlings
9. Identify and draw purchase channels for feed and other inputs (indicate which inputs)
10. Identify and draw credit sources available
11. Discuss whether sales to these channels/locations vary during the year, due to fluctuations in demand or supply

For each of the product sales channels now indicate:

12. Proportions of men and women selling into / buying from each of the channel/location (indicate on the map whether men or women dominate a market channel or whether they have equal access)
13. Do men and women have any particular roles in selling?
14. Proportion of sales into each channel, by season. Indicate on the map.

Based on the diagram now discuss the following

**About product prices**

15. What are the prices TODAY in each channel?
16. What is the unit used (per head or per kg/other, per litre)?
17. Are prices any different when paid to/by a man or woman?
18. When do the seasonal high and low prices occur in each channel? What were the high and low prices during the last 12 months?
19. Why do prices vary between channels for each product?

About product quality:
20. Which quality attributes do buyers look for? Do buyers inform you about product quality? How is this communicated?
21. For the product you are selling are quality grades in place? (List)
22. What are the grades? (record discussion)
23. For which channels are these in use? (record for each attribute and each channel)
24. Do buyers in any channel pay a price premium for good quality?
25. Do buyers in any channel pay lower prices for poor quality?
26. Do buyers in any channel reject product due to quality? What is the experience with rejection in the group?
27. Do buyers test the product for any quality attribute?
28. Are you able to meet the quality requirements of your buyer?

About payment:
29. What is the payment mechanism in each channel?
30. Do buyers in any channel offer advance payment or advances of inputs?
31. Are check-off arrangements available in any channel? (when inputs are advanced to a producer and the costs later deducted from the buyers price this is called check-off)
32. How long does it take to receive payment after sales for each channel?
33. Are there long term relationships with particular buyers? Specify that relationship?
34. Are there long term relationships with particular sellers of inputs? Is this the same for men and women?
35. Are formal or informal agreements or contracts (of any kind written, verbal, customary) used for sales or purchases? In which channel and for which product? Is this the same for men and women?

About transport:
36. Who pays for transport to the market/buyer in each channel?
37. If you pay for the transport what is the mode of transport? What is the average cost of transport per unit (define unit) for each channel? How much time does it take to get the product to market (return trip) each time product is sold?
38. Does transport affect product quality or result in losses or death?
39. What your transportation related constraints? (record separately by gender)

About other issues:
40. Is packaging required by the buyer?
41. Once you have made the decision to sell, how long does it take you to find a buyer?
42. Are the proceeds from sales of product allocated to particular uses? Does this differ by men and women?

**Animal health product and service provision**

Direct the attention back to the market map drawn by the participants. Confirm with them the channels/locations/kind of products or services provided related to animal health. Adjust the map as required. Then discuss the following.

43. Designate public or private providers. Indicate on the map.
44. Discuss with the producers which animal health services they require.
45. Are you able to get these services, and if so, through which channels?
46. If not, why not?
47. Is this the same for men and women?
48. Are the products of good and reliable quality? Are they affordable?
   - Drugs (which ones?)
   - Vaccines (which ones?)
   - Chemical treatments (which ones?)
49. For livestock: Are you vaccinating a larger or smaller proportion of your animals than you did 5 years ago? / For fish: Has your usage of chemicals and other treatments changed in the past 5 years and how?
50. Is a reliable service provided?
51. What do you do when drugs and/or services are not available?

**Feed (for L&F)/ fertilizer (for fish) / chemicals (for fish) inputs and services**

Direct the attention back to the market map drawn by the participants. Confirm with them the channels/locations/kind of products or services provided related to feed. Designate public or private providers. Adjust the map as required. Then discuss the following.

52. Designate public or private providers. Indicate on the map.
53. Is each of these channels equally accessible to men and women?
54. How many producers buy feeds (for L&F) / fertilizers (for fish) / chemicals (for fish) from each channel/type of seller?
55. At what locations are the various sellers of feeds / other inputs operating? How far is this from the village?
56. What are the prices TODAY in each channel for each type of feed/feed product / other inputs?
57. Are there any differences in quality of inputs provided by each of the channels?
58. What is the unit used (per kg/bag/bale)?
59. Are prices any different when paid to/by a man or woman?
60. What are payment terms for feeds / other inputs bought? (cash / credit)
61. When do the seasonal high and low feed / other input prices occur in each channel? What were the high and low prices during the last 12 months?
62. Why do prices vary in each channel for each feed products / other inputs?
63. Would you pay a price premium for high quality feed / other inputs?
Animal breeding inputs and services

Direct the attention back to the market map drawn by the participants. Confirm with them the channels/locations/kind of products or services provided related to animal breeding. Adjust the map as required. Then discuss the following.

64. Is each of these channels equally accessible to men and women?
65. How many producers are supplied from each channel/type of seller?
66. At what locations are the various suppliers operating? How far is this from the village?
67. What are the prices TODAY in each channel for breeding services?
68. Are there any differences in quality of inputs provided by each of the channels?
69. What is the unit used (per straw/service/animal purchase)?
70. Are prices any different when paid to/by a man or woman?
71. Do prices vary between channels/providers for breeding services?

Credit provision services

Direct the attention back to the market map drawn by the participants. Confirm with them the channels/locations/kind of products or services that are providing credit. Make sure to include all types of credit both formal and informal and credit provided in kind (e.g. product buyers, informal credit sources and record these sources). Adjust the map as required. Then discuss the following.

72. Designate public or private providers. Indicate on the map.
73. Are sources of credit equally accessible to men and women?
74. How many in the group get credit from each channel?
75. What is the credit for?
76. Which channel is the preferred source of credit? Why?
77. What interest rates are charged TODAY in each channel? (Define terms and conditions of loan).
78. Do you have difficulties in getting credit? Why?

Information and extension services

Direct the attention back to the market map drawn by the participants. Confirm with them the channels/locations from which you receive market or technical information and extension services. Adjust the map as required. Then discuss the following.

79. Designate public or private providers. Indicate on the map.
80. Where do you find market information? (Price, quality, quantities demanded and location of buyers). Does this differ between women and men? Is the available information reliable?
81. Where do you find information about breeds? Does this differ between women and men? Is the available information reliable?
82. Where do you find information about feeds? Does this differ between women and men? Is the available information reliable?
83. Where do you find information about animal health? Does this differ between women and men? Is the available information reliable?
84. Who provides extension services? Are they also sellers of farm/animal/fish inputs?
85. Is the service of good quality?
86. Last year, how many times did you receive advice from an extension agent?
87. What subject was the advice on?
88. How was extension delivered (e.g. demonstration plot, farm visit, training course)?
89. On which topics do you need (more) training and/or extension?

**Constraints and solutions**

After completing the market map and discussion, now ask the participants to identify the main constraints they face related to all issues discussed in the market map. This is just to summarize the constraints and will be discussed in more detail in a plenary exercise. Ask the participants to discuss the questions below. Make a list of constraints and then ask them to nominate the top 3 constraints for product sales and the top 3 for inputs and services. For each constraint, ask a possible solution. Probe if solution has been tried and the associated results.

For each product:

90. What prevents you selling more?
91. What prevents you achieving better quality?
92. What prevents you achieving better prices?

For each input or service:

93. What prevents you using more?
94. What prevents you using better quality inputs

**Group membership / collective action**

**Overview**

Material needed: Large sheets of paper, pencils, markers

Time: 0.5 hour

Group participants: Mixed group men and women

**Objectives**

Identify the types of formal and informal groups that are active in the community and whether there are any boundaries for men / women or other sub-groups to belong to and participate in these groups.

Source material drawn from: Livestock and Fish CGIAR program toolkit

**How to facilitate**

Discuss the questions listed below and record them on the recording sheet provided.

1. Are there any ways in which people collaborate with each other in the village? (List ways)
2. What kind of groups are these? (formal/ informal, based on production activity / family-ties, geographical location etc.). Are they formally organized?
3. Why do you belong to the group(s)?
4. Which ones facilitate L&F production and marketing?
5. How many people in the focus group benefit? (do a hand count separately for men and women)
6. What external support is available to the group? (training, credit, etc.)
7. What are the challenges to the continued activities of these groups?
8. What are the reasons that people would NOT be interested to join a group? (record reasons by gender)

A. Relationships wheel (assessing power relations in the VC)

Overview

Method: Participants should be value chain actors, and divided into gender-specific groups by node of the value chain. Include 8-10 participants in each group. Capture other relevant dimensions of difference (age, ethnicity, etc) within these groups, unless the context warrants further segmentation of participants by such categories.

Materials: Large sheets of paper, markers, tape.

Timing: 1.5 hours

Source material drawn from: CCAFs-AAS study tools; World Bank social analysis tools

Objectives

The objectives of this tool are to:

- Understand how the relationships between value chain actors, and various organizations and between value chain actors and other individuals important in their lives impact upon the effectiveness of value chain actors’ engagement in the selected value chain.
- Understand the quality of these relationships, how power operates within them and whether and how this varies by gender.
- Identify ways of strengthening positive relationships and mitigating the effects of negative relationships.

Facilitation Process

1. Setting Up
   1. Separate men and women value chain actors and allocate to rooms and facilitator/recorder.
   2. Introduce facilitator and recorder, and explain the objectives of the exercise, outline the steps in the process, and confirm the amount of time required (it is important not to go over time).
   3. Ask participants to introduce themselves. Record names.

Then the facilitator takes the participants through several steps, as follows:

Part 1: People and organizations that enable participants to work well in the value chain
1. Ask each participant to think about all of the people and organizations that are important to his/her success in their work in the value chain. List these people and organizations on a piece of paper.
   - If needed prompt participants to think about both people/organizations who help them from inside the value chain, as well as those who make it possible for them to work in the value chain. The latter may include those who provide child care or do household work, such as a crèche or school, a sister in law; a spouse, daughter, son, grandmother or father, etc.

2. Give each participant a big sheet of paper with a large circle with a dot in the center. Ask them to draw spokes of the wheel that represent each actor that they list as enabling their work in the value chain.

3. Explain that each spoke represents a scale, with 0 at the center and 10 at the edge.

4. Ask participants to think about the different ways in which each of the people or organizations they listed is important to their success.

5. Then ask each participant to give each person/organization a rating on a scale of 0-10 representing its influence on the success of his/her work in the value chain, with 10 meaning the person/organization has a lot of influence.

6. Finally, ask them to add pictures or words to illustrate why and how each person/organization is important. This can be done for all of the people/organizations; or if many people and organizations are listed, and time is limited, it can be done for those with the highest ratings/most influence.

Part 2: Organizations and people that hinder participants from working well in the value chain.

The above exercise is repeated but this time the focus is on listing and mapping organizations and people which hamper the participants from working well in the value chain. It is important to stress that the same organization or individuals can appear on both wheels; relationships are complicated so some aspects of them may be helpful while others are a barrier.

Part 3: Reflection on the Relationship Wheels

1. Have each participant post her/his wheels on the wall. Do a gallery walk and have participants look at each other’s wheels, to see where there are similarities and differences in the people and organizations that are enabling and hindering, and/or in the ways that relationships enable or hinder success.

2. Facilitate a discussion on ways that the group can:
   - help others to benefit from positive relationships, if some do not;
   - strengthen positive relationships;
   - reduce the effects of relationships that hinder successful operation in the value chain; and
   - obtain the support it needs to accomplish these changes.
## Appendix 4: Individual persons interviewed

<table>
<thead>
<tr>
<th>Name</th>
<th>Sex</th>
<th>Location</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamiyita Nasonko</td>
<td>Female</td>
<td>Mbarara</td>
<td>Banana Trader</td>
</tr>
<tr>
<td>Kyomugiga Joy</td>
<td>Female</td>
<td>Mbarara</td>
<td>Banana Farmer</td>
</tr>
<tr>
<td>Mababazi Agnes</td>
<td>Female</td>
<td>Mbarara</td>
<td>Banana Farmer</td>
</tr>
<tr>
<td>Asingwire Willis</td>
<td>Male</td>
<td>Mbarara</td>
<td>Banana Farmer</td>
</tr>
<tr>
<td>Kwehayaana Bob</td>
<td>Male</td>
<td>Mbarara</td>
<td>Banana Farmer</td>
</tr>
<tr>
<td>Ahairwe Denis</td>
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<td>Mbarara</td>
<td>Banana Farmer</td>
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<tr>
<td>Kailugara S.</td>
<td>Female</td>
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<td>Banana Farmer</td>
</tr>
<tr>
<td>Mujini Acleo</td>
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<td>Muhangi Abel</td>
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<td>Kamugisha Edson</td>
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<td>Mujinya Matison</td>
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<td>Ndyabawwe Karrow</td>
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<tr>
<td>Semakula Sezi</td>
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<tr>
<td>Eng Byamugisha Shillingi</td>
<td>Male</td>
<td>Mbarara</td>
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<td>Kato Muwounge</td>
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<tr>
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<td>Pig Farmer</td>
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<td>Ssemakula Joseph</td>
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<td>Ssekyondwa Sam</td>
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<tr>
<td>Kaweesa Christopher</td>
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<td>Barbara Kasuja</td>
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<td>Luswata Agnes</td>
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<td>Nabaninda Madrine</td>
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<td>Richard Ddungu</td>
<td>Male</td>
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<td>Njagala Joseph</td>
<td>Male</td>
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<td>Sserwadda Aloysius</td>
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<tr>
<td>Serugo Rose</td>
<td>Female</td>
<td>Jinja</td>
<td>Fish Farmer</td>
</tr>
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<td>Nyiro Francis</td>
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<td>Vincent Asea</td>
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<td>Mpigi</td>
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<tr>
<td>Naima Abdullah</td>
<td>Female</td>
<td>Jinja</td>
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<tr>
<td>Nusana Andrew</td>
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<td>Kiwanuka S.</td>
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<td>Wakiso</td>
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<td>Isabirye Farouk</td>
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<td>Jinja</td>
<td>Fish Trader</td>
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<tr>
<td>Lovinkobusingye</td>
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<td>Kampala</td>
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<tr>
<td>Enoth Mbeine</td>
<td>Male</td>
<td>Kampala</td>
<td>Value Chain Expert FIT (U) Ltd.</td>
</tr>
</tbody>
</table>
Appendix 5: List of documents reviewed

Development strategy and investment plan (dsip) of Uganda and the comprehensive Africa agriculture development programme (caadp) MAAIF DSIP, 2010.


Models of knowledge based transfer- the case of the Presidential Initiative on Banana development (2010, PIBID)

Tatwangire, 2013, Successes and failures of institutional innovations for improving access to services, input and output markets for smallholder pig production systems and value chains in Uganda

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