



RESEARCH PROGRAM ON
Roots, Tubers
and Bananas



Technical report: Structure of the Cooking Banana Value Chain in Uganda and Opportunities for Value Addition and Postharvest Losses Reduction

*Expanding Utilization of Roots, Tubers and
Bananas and Reducing Their Postharvest Losses*



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A broad alliance of
research-for-development
stakeholders & partners



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The CGIAR Research Program on Roots, Tubers and Bananas (RTB) is a broad alliance led by the International Potato Center (CIP) jointly with Bioversity International, the International Center for Tropical Agriculture (CIAT), the International Institute for Tropical Agriculture (IITA), and CIRAD in collaboration with research and development partners. Our shared purpose is to tap the underutilized potential of root, tuber and banana crops for improving nutrition and food security, increasing incomes and fostering greater gender equity, especially among the world's poorest and most vulnerable populations.

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List of Acronyms

MBADIFA	Mbarara District Farmers' Association
NAADS	National Agricultural Advisory Services
PH	Postharvest
SACCO	Savings and Credit Co-operative
UGX	Uganda Shillings
VC	Value chain



EXECUTIVE SUMMARY

Cooking banana is the main staple crop in Uganda produced mostly by smallholders for food and income. However, actors along the cooking banana value chain in Uganda face risks high postharvest (PH) losses due to short green life of bananas and damage arising from poor postharvest handling, leading to high physical and economic losses. To understand and quantify the extent of the losses and other overarching issues along the value chain (VC), a detailed market study was conducted based on five specific objectives, including: (1) identify and describe the key players in the banana value chain; (2) establish the current demand and future growth prospects of the different banana presentation forms; (3) establish the level of sorting and grading in the banana value chain; (4) establish the level of use of the weight-based pricing system along the VC and the actor's willingness to pay for its introduction; and (5) determine the extent and causes of postharvest losses along the banana value chain.

The study was conducted in south-western Uganda in the districts of Rakai and Isingiro between July and September 2015. The two districts were selected because they are among the main banana producing districts in Uganda. Isingiro is located about 310 km and Rakai about 208 km south-west of Kampala, Uganda's largest urban and capital city. One sub-county from each district was purposively selected, that is, Dwaniro sub-county in Rakai and Rugaaga sub-county in Isingiro district. 100 farmers (50 per sub-county) were randomly selected for the survey. Ten wholesalers (lorry traders), seven bicycle traders, and ten brokers were selected for the study to get acquainted with the roles played by various value chain actors. Similarly, eight markets (Kasubi, Kisaasi, Bugolobi, Kalerwe, Kawempe, Kibuye, Nakawa and Kansanga) in Kampala and Wakiso districts were also selected. In these markets a total of 40 retailers and 80 consumers were randomly selected. Eight market masters (one per market) were also interviewed to obtain an overall picture of the banana retail market. Lastly, five supermarkets and three exporters were also interviewed. Different tools were used for data collection. A pretested structured questionnaire (for face-to-face interviews) was administered to producers, traders, and consumers, while checklists were used to gather information from key informants (including market masters, bicycle traders, brokers, wholesalers, exporters, and supermarket representatives). Direct observations and literature review were also used. Data were coded and entered in SPSS (version 17), while analysis was done using STATA 13. Descriptive statistics such as means and percentages are presented in this report.

Value chain analysis: The cooking banana value chain mainly comprises of producers, collectors (brokers and bicycle traders), wholesalers, exporters, retailers and consumers. The chain involves the movement of bananas from the producer to the lorry traders either directly by farmers or through brokers and bicycle traders. Lorry traders transport and distribute the bananas to the retailers who then sell to the final consumers. Some bananas move from producers directly to the



exporters; who mainly sell to Europe and to the region, especially South Sudan. But, the volume of export is relatively very small. For the study 58 male (28 from Rakai and 30 from Isingiro) and 42 female (22 from Rakai and 20 from Isingiro) producers were interviewed. The average age of male farmers is 48 years, while that for the female is 46 years. The proportion of four market-preferred varieties (including, Nakitembe, Musakala and Mbwazirume plus Kibuzi which is known to have long intrinsic shelf-life) was estimated at farm level. Prior to the survey, the market-preferred varieties were identified and confirmed during two stakeholders meetings involving various VC actors and other stakeholders. Kibuzi is grown by 25% male and 20% female farmers in Isingiro district, while in Rakai district it is grown by 15% male and 13% female farmers. Mbwazirume was found to be grown only in Rakai by 8% male and 4% female farmers, while Nakitembe is grown by only 2% male farmers in Isingiro and 3% male farmers in Rakai. Equal numbers (2%) of both male and female farmers grow Musakala in Isingiro and Rakai. Other varieties are also grown (Entukura, Mbululu, Enzirabushera, Muvubo, Enjagata, and Entukura). Most farmers (71%) obtain their planting materials from their own farms. The majority of farmers belong to groups, but they mostly sell as individuals; hence they tend to have low bargaining power. All bicycle traders are males. They buy their banana from the dispersed farmer plots within the village, and they act as the initial collecting agents. Bicycle traders are well-known members of the community and have established relationships with the farmers. Competition amongst bicycle traders exists as barriers to entry are quite low. Bicycle traders sell most of their produce to brokers at collection centers that are found at sub-county or district trading centers. Smaller percentages (20%) of their sales go to local consumers, market vendors or lorry traders directly. Similarly, all brokers are male with an average age of 40 years. Brokers, though sometimes collect bananas directly from the farmers, they mostly buy their banana from the bicycle traders and sold to lorry traders. They are therefore commission agents linking bicycle traders to lorry traders. Brokers, in few circumstances, engage in the transportation of banana to urban markets. There exists a strong relationship between brokers and lorry traders (wholesalers), compelling the latter to advance cash to former in order to bulk stock good quality bananas. Likewise, all lorry traders/wholesalers are men aged above 40. Lorry traders are mostly sole entrepreneurs, and majority (70%) don't own the trucks. Transportation cost is their highest operating cost. Retailers (vendors), on the other hand, are largely women (about 70%, according to the market masters) though for this study men were over sampled to get a clear representation of their views. They are self-employed operating small market stalls in the urban areas. The major key banana outlets/markets in Kampala include, Kalelwe, Nakawa and Kasubi, but there are several other markets found closer to large settlement communities. The vendors procure their entire banana stock from the lorry traders. Similarly, vendors also have long term strong relationships with lorry traders. Quantities required and price negotiations are mostly done via cellphones. Most vendors (80%) do not belong to organized groups or associations. They are clients of microfinance institutions and SACCOs, where they seek/obtain credit to boost their



working capital. Their main clients are household consumers, hotels, restaurants and schools. Market vendors incur few costs, including rent for stalls, own transport, meals and labor costs. The market margins along the value chain vary significantly with large differences between the farm gate price and the retail price. In the low production seasons, the total market margin for a small bunch (10-15Kg) is estimated at UGX 13,500 and UGX 16,500 for a large bunch (above 25Kg), while in the high production season it is estimated at an average of UGX 9,900 for a small and UGX 15,850 for a large bunch.¹ The node of the value chain with the highest market margin is the wholesale level, yet all actors at this level are men.

Presentation forms across the value chain: All producers, all brokers and 90% of wholesalers sell their banana in form of bunches and/or sacks of unpeeled fingers. On average, each producer sells approximately 400 bunches and 23 sacks of unpeeled fingers per month during surplus (June-August and December-February), while in scarcity season (September-November and March-May) each sells approximately 280 bunches and 14 sacks per month. Each broker sells an average of 1,900 bunches and 1,128 sacks, while wholesalers sell 1,292 bunches and 148 sacks per month. A bicycle trader (deals only in bunches) sell an average of 80 bunches per month in the high production season and 60 bunches in the low production season. Exporters sell in form of bunches (for regional market) and/or clusters (for European Market) while supermarkets sell in clusters. However, at retail level different presentations are sold, though all retailers reported that bunches are the most preferred form by consumers. On average, they sell between 122 and 210 bunches (low and high respectively) per month. The second most preferred type of presentation by consumers is unpeeled fingers as reported by 62.5% of the retailers; they sell from 714 to 760 small heaps (about 8-12 fingers) per month. On average a retailer sells 10 bags of unpeeled fingers, 520 clusters, and 530 (small) packs of peeled fingers per month. The proportion of total banana sales sold at retailer level in different presentation forms is approximately 47% bunches, 17% bags of unpeeled bananas, 11% clusters, 15% heaps of unpeeled banana and 10% peeled bananas. The preference for the different presentation types at different nodes of the value chain is attributed to the ease of handling and high demand for a particular presentation form, in particular, 32% of the retailers reported that there is an increased demand for peeled bananas .

Sorting and grading of bananas across the value chain: VC actors practice some sort of grading. For instance, results show that all VC actors grade their banana bunches by size. However, with exception of exporters, all other VC actors do not grade their banana by varieties and/or quality. VC actors have varying perceptions in relation to quality and variety grading. Results show that 78% of the producers agree that sorting and grading by variety and quality is a good practice and would increase revenues from banana sales, and close to three quarters of such

¹ Exchange rate 1 US\$=3,150 UGX at the time of the survey.



farmers (73%) believe that such practice would not require many (or any) additional skills since it can be done easily at farm level. However, the majority of farmers (80%) acknowledged that sorting and grading requires more time. Most farmers (80%) and bicycle traders (57%) are willing to accept and pay a premium for good quality and sorted bananas, respectively. 80% of retailers and 60% of wholesalers are also willing to accept and pay a premium for good quality and sorted bananas. Approximately 90% of the consumers are willing to purchase good quality and sorted bananas at a premium if availed on the market. About 55% of consumers are not satisfied with the quality of bunches sold in the market and 58% are not satisfied with the quality of peeled bananas sold in some open markets.

The weight based pricing system: Unit prices are determined by visual inspection, as reported by all producers, brokers, bicycle traders and wholesalers, which is subjective and arbitrary and therefore presents risks for unfair marketing transactions. All exporters to Europe buy and sell banana in kilograms, yet their suppliers negotiate (through brokers) the bunch price using visual inspection at farm level and sell to exporters in kilograms. Only one of the five supermarkets visited had once sold bananas using the kilogram system, while only five female (12.5%) and three male retail traders (7.5%) in open markets sell (or have ever sold) their bananas by weight. However, the study shows that 98% of the producers, 40% retailers, 75% supermarkets and 50% consumers are willing to embrace the weight-based pricing system. Similarly, 40% of the interviewed consumers believe that other consumers (who were not interviewed) will purchase cooking bananas sold in kilograms. Most consumers (57%) would prefer to purchase unpeeled fingers using the weight-based pricing system. The most preferred pack of weighted unpeeled banana would be a 5kg pack, with 55% of the consumers stating that they are likely to purchase weighed bananas in such quantities (5kg). Most producers are willing to accept an average price of about UGX 750 per kilogram of banana, while bicycle traders are willing to pay an average of UGX 413 per kilogram of banana bought. Super market traders are willing to buy a kilogram at UGX 1,000 and would sell it at UGX 3,200. A big proportion of consumers (45%) are willing to pay between UGX 1,000 and UGX 2,000 per kilogram. Value chain actors – most producers and wholesalers, and all bicycle traders believe that the introduction of a weight-based pricing system along the value chain would improve efficiency and lead to fairer pricing in the banana business. These actors as well as half of the brokers also believe that sales by weight would improve trust among the banana VC actors. However, retailers and consumers appear less optimistic at this regard and are mainly afraid that traders would mostly use fake weighing scales, not properly calibrated as required by UNBS. Moreover, some actors believe that the weight-based pricing system will come with added costs in terms of labor for weighing as reported by most producers, bicycle traders and retailers. Results show some gender differences in perceptions. Male producers and retailers are more positive about the weight-based pricing system in terms of efficiency, fair pricing and trust



compared to their female counter parts. However, female producers and retailers are more prone to think that the weight based pricing system will not add any extra cost.

The postharvest losses across the value chain: Actors along the cooking banana VC face risks of high postharvest (PH) losses due to short green life of bananas and damage arising from poor postharvest handling. During low production (scarcity), on-farm postharvest losses affect about 3.3% (in form of physical losses) and 5.4% (in form of economic losses) of bananas, while during high production PH losses increases to 9.6% (physical losses) and 8.1% (economic losses). On-farm economic PH losses translate into an average residual value of about UGX 7,500 during scarcity (e.g., a bunch that would have been sold at UGX 10,000 is sold at about UGX 7,500 due to quality deterioration) and UGX 2,400 during surplus per damaged bunch. The major causes of PH losses at farm level during scarcity are thefts (for physical losses) and sell of immature bananas (for economic losses), while ripening is the main cause of both physical and economic losses during surplus season. Though physical losses are not significantly different across gender, economic losses do differ. Female farmers exhibit more economic losses with approximately 8.3% of bananas affected by some degree of quality deterioration leading to lower prices compared to 5.6% of their male counterparts. Furthermore, this quality deterioration translates into higher price discounts for female than male farmers, with residual values of approximately UGX 4,700 compared to UGX 5,100 per bunch, respectively. PH losses in Isingiro are more than 50% higher than those in Rakai district. At retail level (for open market vendors) physical losses ranges from approximately 6.2%-9.8% (scarcity-surplus) and economic losses from approximately 6.5% to 12% selling at an average residual value of UGX 12,000 to 7,500 per bunch, respectively. The major causes of PH losses at retail level are thefts, bruising, finger-plucking and ripening. Losses due to ripening are mostly associated with production gluts, which are partly due to seasonal scheduling of follower sucker selection. Results also show that other chain actors experience PH losses as well. For brokers physical losses range from 2 to 4% while economic losses affect 2 to 5% of bananas. Bruising is the lead cause of physical losses while ripening causes the greatest economic losses in the scarce season. In the surplus season, ripening, bruising and scotching (browning of the fingers when exposed to the sun for long hours) stand out as the major causes. For wholesalers, physical losses range from 7 to 9% while economic ones range from 3 to 8%. Bruising and thefts are the lead causes of both the physical and economic losses in scarcity times, while ripening and bruising cause tremendous losses in the surplus season. The forms in which bananas are handled and transported lead to these high PH losses. Bananas are transported to the markets mainly as bunches on bicycles or stacked on trucks and unprotected. They are also transported as fingers tightly packed in poorly aerated polythene bags that build up heat around the bananas in transit. For the exporters, physical losses range from 2 to 3%, while economic losses are about 4 to 6%. Ripening is the major cause of physical losses in both scarcity and surplus seasons while bruising causes most of the economic losses during both seasons. The



losses at export level are minimized by transporting banana clusters with great care and protected in cardboard boxes.

Conclusion: Banana varieties Kibuzi, Nakitembe Mbwazirume and Musakala are only accessed by few farmers yet these are the most preferred varieties in the market. Farmers are willing to purchase clean planting materials of these varieties from the nurseries if availed. This presents a business opportunity to farmers who are willing to establish nurseries. Banana presentation forms of clusters and peeled fingers are missing at lower levels of the value chain. There is an increasing demand for peeled bananas at retail level therefore retailers could demand for peeled bananas right from the farm. Farmers are willing to provide peeled bananas as they would wish to use the banana peelings as manure for their gardens. Banana value chain actors are very positive and willing to embrace the weight based pricing system. This is expected to improve efficiency and fairness in the banana pricing system as well as improve transparency between buyers and sellers. The total postharvest losses across the value chain are high and thus require various interventions to reduce them tremendously. All these innovations are expected to improve margins along the value chain and thus reduce the difference between farm gate and retail prices.

1. INTRODUCTION

Cooking bananas are an important starchy food and cash crop in Uganda. About 24% of all agricultural households are engaged in banana production (Kalyebara *et al.* 2005). Communities from central, eastern, western and south-western Uganda have mostly relied on bananas for over 150 years. Compared to other important crops in the country, banana occupies the biggest proportion of utilized agricultural land - about 1.4 million hectares or 38% of the total utilized land (Wanda, 2009). The Uganda national banana production was estimated to be four million MT (from a total area of 807,000 Ha) in 2009 as compared with other staple crops such as cassava (2.9 million MT) and sweet potato (1.8 million MT) (UBOS, 2010). Production is mainly by smallholder farmers owning an average of < 0.5 ha, with medium-sized farms gaining prominence in southern Uganda (Ouma and Jagwe, 2010). Isingiro, Mbarara and Bushenyi districts in southwestern Uganda were ranked as the major banana producing districts in terms of production (UBOS, 2010). This region produces 68% of the cooking bananas in Uganda, with Isingiro district being the main producer (UBOS, 2010) providing a daily average of 37,000 bunches of marketed bananas in Uganda (The New Vision, August 2014).

Bananas are a major staple food for more than a half of the Ugandan population, with per capita consumption of 172Kg/person/year (Haggblade and Dewina, 2010) , making Uganda the largest consumer of cooking banana in the world (Kabahenda and Kapirir, 2010). Banana is the single most important source of calories among Ugandans accounting for 17% of total daily per capita caloric food intake (Fiedler *et al.*, 2013). Smallholder producers mostly sell their bananas to other agents at farm gate who finally deliver to the urban markets. Moreover, smallholder producers get the least share of the profits in the banana value chain due to a large number of middle men (about 5 to 7 according to Ngambeki *et al.*, 2010). According to the New Vision newspaper (August, 2014), for a 40kg bunch sold at UGX 25,000 in Kampala, its farm gate price is UGX 4,000, yet the transport costs for the same bunch is just UGX 2,000. About 90% of the bananas produced are consumed within the domestic market and the rest exported as fresh or processed banana products (Smale and Tushemereirwe, 2007).

However, actors along the cooking banana value chain in Uganda face risks of high postharvest (PH) losses due to short green life of bananas and damage arising from poor postharvest handling, leading to high physical and economic losses. To understand and quantify the extent of the losses and other overarching issues along the value chain, a detailed market study was conducted.

1.1. Objectives of the study

The objectives of the study were:

1. To identify and describe the key players in the banana value chain
2. To establish the current demand and future growth prospects of the different banana presentation forms

3. To establish the level of sorting and grading in the banana value chain
4. To establish the level of use of the weight based pricing system along the VC and the actor's willingness to pay for its introduction
5. To determine the extent and causes of postharvest losses along the banana value chain

1.2. Methodology

1.2.1. Study areas

The study was conducted in southwestern Uganda in the districts of Rakai and Isingiro for farm level analysis. Two districts were selected because they are cited among the highest banana producing districts in Uganda (UBOS, 2010). Isingiro district is located about 310 Km west of Kampala while Rakai is located about 208Km south west of Kampala, Uganda's largest urban and capital city. Similarly, the study was also conducted in different markets across the greater Kampala region for VC market analysis as showing in figure 1. This study was conducted between July and September 2015.



Figure 1: A map showing the study sites

1.3.2. Sampling and data collection methods

One sub-county from each district was purposively selected: Dwaniro sub-county from Rakai and Rugaaga sub-county from Isingiro district. A total of 100 farmers, 50 per district, were randomly selected. Similarly, in the same districts, ten wholesalers (lorry traders), seven bicycle traders and ten brokers were also randomly selected. Data regarding retailers and consumers were obtained from the major banana markets in the greater Kampala region as indicated in table 1. A total of 40 retailers (market vendors) and 80 consumers were randomly selected. Eight banana market



masters (one per market) were also interviewed to obtain an overall picture of the banana market. Lastly, five super markets and three banana (and fruit) exporters were also included in the study.

Table 1: Number of retailers and consumers selected per market

Name of market	Number of retailers	Number of consumers
Kasubi	6	14
Bugolobi	5	14
Kalerwe	8	4
Kansanga	4	9
Kibuye	3	9
Kawempe	1	7
Nakawa	7	15
Kisaasi	5	8
Total	40	80

Data were collected using different tools: a pretested structured questionnaire (for face-to-face interviews) was administered to producers, traders, and consumers, while checklists were used to gather information from key informants (including market masters, bicycle traders, brokers, wholesalers, exporters, and supermarket representatives). Direct observations and literature review were also used.

1.2.3. Data analysis

Data were coded and entered in SPSS version 17 while analysis was done using STATA 13. Descriptive statistics such as means, standard deviations and percentages were used to obtain the baseline values regarding banana varieties grown, banana presentation forms, grading, use of the weight based pricing system, and extent of postharvest losses across the banana value chain. Descriptive statistics were also used to determine the gender distribution of males and females across the value chain. Results were presented in tables and figures.



2. RESULTS

2.1. Production

The majority of farmers (93%) are members of at least one farmers group in the village. Each group has an average of 31 members, with 16 females and 15 males. There are four main joint activities carried out in the different groups, including, savings and credit management, collective marketing, pooling of labor and bulk procurement of inputs. The major group activity is savings and credit management as reported by 72% of the respondents. Through groups, farmers are able to easily access credit even without any collateral. The second major activity is collective marketing (25%). Though farmers agreed that collective marketing improves bargaining power and access to bulky markets, it was practiced by only 2% of farmers. Pooling of labor was practiced by 2%, while bulk procurement of inputs was practiced by 1% only. Farmers reported that if structured in groups they can easily organize and mobilize for trainings being much easier and cheaper to invite an extension worker in a group than on individual basis. Majority of the banana growing farmers in the study area are semi commercial (93%); i.e., they produce for both food and the market. Only 6% are exclusively subsistence farmers, while the least (1%) are commercial farmers. On average, the total land owned per household is 10.1 acres, of which more than a half (6.0 acres of land) is dedicated to crop production. An average of 5.4 acres of land is dedicated to banana production (table 2).

Table 2: Household land use and average acreage

Land acreage and use	All	Rakai	Isingiro
Total acreage	10.1(16.5)	8.0(14.2)	14.9(18.0)
Land under livestock	4.1(10.4)	0.9(1.3)	7.3(13.8)
Land under crops (banana inclusive)	6.0(5.4)	4.4(2.8)	7.6(8.3)
Land under banana	5.4(6.4)	3.2(2.5)	7.4(6.7)

Note: values in parentheses are standard deviations

Generally, the four most commonly grown varieties are Kibuzi, Mbwazirume, Musakala and Nakitembe. Other varieties grown include: Entukura, Mbululu, Enzirabushera, Muvubo, Enjagata, and Entukura. Kibuzi is most popular in Rakai and Mbwazirume is very popular in Isingiro. Male farmers grow more Kibuzi than their female counterparts in both districts, i.e., 25% of males as

compared to 18% of females in Rakai and 14% of males versus 12% of females in Isingiro district (figure 2).

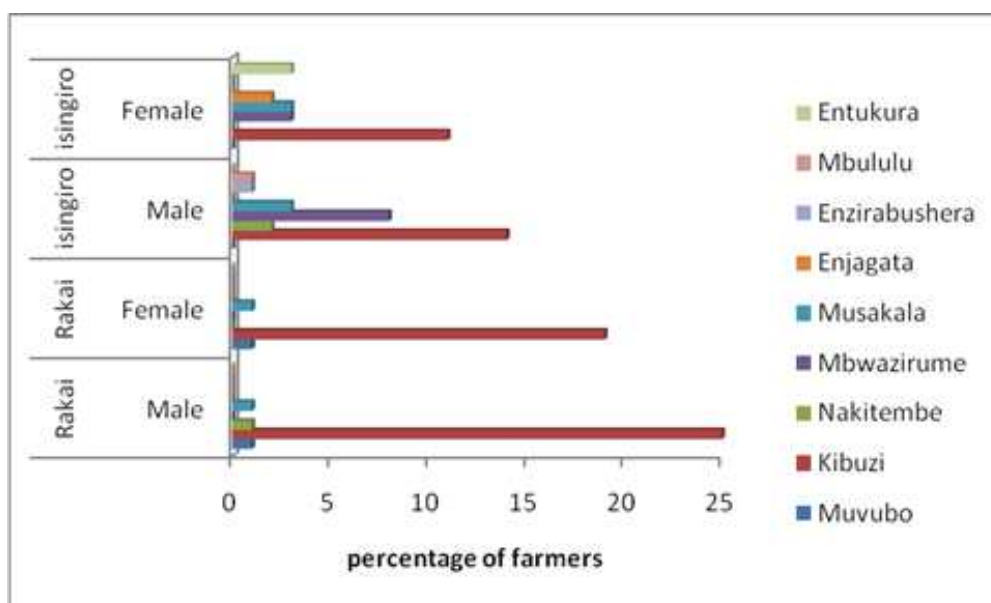


Figure 2: Varieties grown by male and female farmers in Isingiro and Rakai

The Pearson chi square test shows that there is a strong association between the main banana farming objective and the type of variety that is mostly cultivated. Moreover this test is highly significant ($p=0.000$). Results show that 63 out of 93 semi-commercial farmers would like to grow Kibuzi as their number one priority because this variety is more preferred in the market compared to other varieties. Kibuzi is preferred for its large finger size and longer shelf life (Spilsbury *et al.*, 2004). However, farmers have a challenge in accessing clean planting materials. About 55% farmers report that it is not easy for them to access clean planting materials when they want to expand their banana plantations. 14% of the farmers are not sure whether the planting materials they use are clean, while 30% are able to reliably access clean planting materials. Results further show that 95% of the farmers do not get their planting materials from nurseries. The main source of planting materials is the farmer's own farm (as reported by 71%). 3% of the farmers obtain their planting material from neighbors, while those who obtain planting materials from both neighbors and their own farms are 26%. If obtained from a neighbor's plantation, each farmer will incur an average cost of UGX 500 per sucker. If nurseries were established in their respective localities, 86% of the farmers would be willing to purchase the clean planting materials at a cost of UGX 900 per sucker. Generally, farmers anticipate a high demand for clean planting materials if grown in nurseries near their homesteads. Other purchased inputs include manure and mulching materials. On average, farmers spend UGX 1.5 million on manure per annum, while mulching materials purchases contribute approximately UGX 645,000.



Labor, including family and hired, is another input greatly required on banana farms. Both men and women participate in the day to day management of banana plots, with men participating more than women. Male family labor is mostly used in land preparation, while female labor is mainly used in weeding. Male household members generally work for more hours compared to the female. This can be explained by the fact that women have other roles (reproductive roles and household chores) to fulfill other than the productive roles. Similarly, more men are employed as laborers (hired labor) than their women counterparts. Hired labor is mostly used for land preparation, planting, weeding and manure spreading. On average, UGX 380,000 is spent on hired labor per annum.

The average annual banana production per farmers is about 660 bunches in Rakai and 2,050 bunches in Isingiro (table 3). The difference is primarily due to larger acreage allocated to banana production in the latter. The average annual yield is about 220 bunches per acre in Rakai compared to 260 bunches per acre in Isingiro. Approximately 78 bunches are produced per month in Rakai during surplus seasons (June-August and December-February) compared to 220 bunches produced per month in Isingiro, while approximately 40 bunches are produced per month in Rakai and 136 bunches are produced per month in Isingiro during scarcity seasons (March-May and September-November). Generally, most farmers (77%) experienced an increase in their banana production over the last one year.

Table 3: Average banana production and yield at farm level

	High production season (bunches per month)		Low production season (bunches per month)		Annual production (bunches)	
	Production	Yield/acre	Production	Yield/acre	Production	Yield/acre
Rakai	78	26	39	13	663	221
Isingiro	220	28	136	17	2052	257

In relation to attributes considered at the point of purchase at farm level, most buyers (55%) primarily pay attention to the size of the bunch and fingers while only 20% pay more attention to quality of the cooking banana. Producers mostly talk about prices (58%) when they meet their buyers, followed by quality of the banana (41%). Other issues discussed include, availability of bananas and the working relations. In addition, some buyers (13%) demand for varieties that are not currently grown by the producers.

When asked about the most crucial issues affecting the banana market, most producers reported taxes (71.7%), followed by lack of access to market information (66.7%). In particular, most women



producers (65%) do not have timely access to the prevailing market prices due to their immobility and thus they sell at lower prices than what could be fetched. 55% of the producers who sell to exporters reported that the export market has stringent regulations and standards and sometimes their bananas are rejected due to their poor quality. Similarly, another challenge reported by many producers (80%) is the lower prices caused by the production gluts (during the high supply seasons). Other challenges included lack of access to financial service (54%), lack of access to extension services (70%) and pest and disease outbreaks (30%).

2.2. Consumption

In general, women participate more in purchasing cooking bananas for consumption. In our sample across the market 72% of the respondents who buy cooking banana for consumption were women compared to 28% men. At farm level most (65%) of the banana produced is consumed and an average of about 30% is taken to the market. 60% of the banana sold in the open markets in the urban centers goes to individual households consumers, while the rest goes to other customers such as hotels and restaurants.

Results indicate that consumers have developed strong relationships with their respective sellers over time. For instance, figure 3 shows that about 36% of the consumers are loyal to their sellers. The main reasons given for their commitment include: fair price, good quality bananas (in terms of color and finger size), ability to purchase on credit and good customer care. Nevertheless, a good number of consumers purchase from more than one seller. This is mainly to cater for the seasonal supply of bananas in the market. Consumers feel that they can obtain bananas from other sellers even in the low supply seasons.

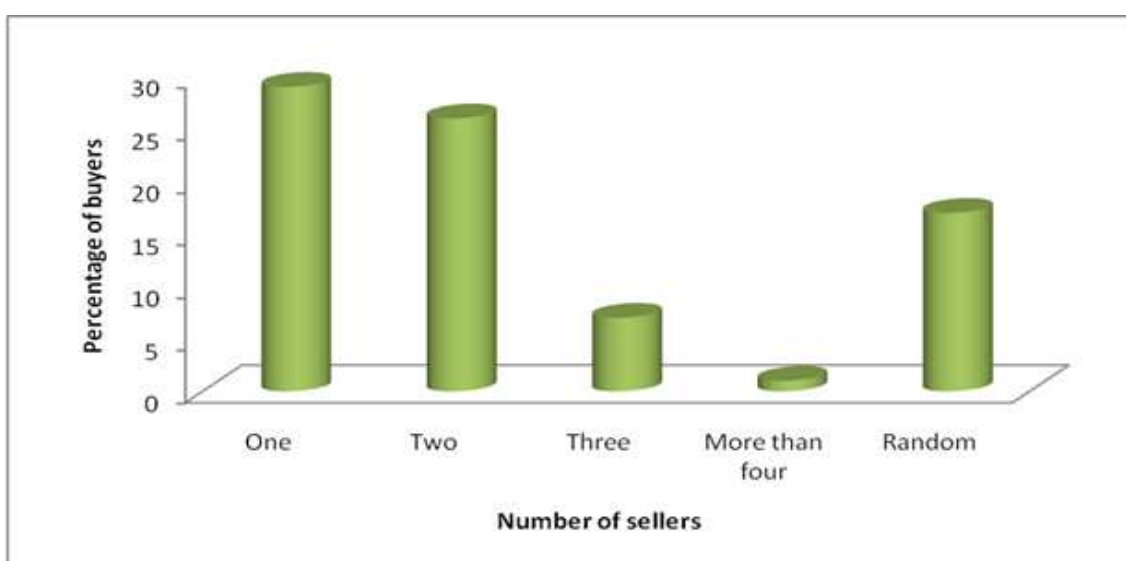


Figure 3: Buyer-seller relationships



There is information sharing regarding cooking bananas through the established buyer-seller relationships. For instance, approximately 71% of the consumers reported that they mainly inquire about prices when they talk to their respective sellers, 36% talk more about the quality while only 1% pays more attention to availability of specific varieties. Similarly, some consumers often inform sellers of the type of bananas they need in case they do not find them on the market. The most common means of communication is through face to face interaction (75 %), while 16% of consumers reports use of telephones and 9% communicates to their sellers through other people.

A number of attributes are considered when purchasing cooking banana as shown in table 4.

Consumers often consider maturity of the banana as the key attribute, as indicated by 95% of the respondents who agreed that maturity of bananas is very important at the time of purchase. This is followed by affordability (in terms of price), freshness (from harvest time to purchase) and size of the fingers and bunch. Only 20% of the consumers pay attention to the variety of the banana.

Table 4: Banana attributes considered by consumers at time of purchase

Attribute	Level of agreement (%)		
	Agree	Uncertain	Disagree
Large bunches	83.7	5.0	11.3
Mature bananas	95.0	2.5	2.5
Large fingers	88.7	1.3	10.0
Variety	20.0	25.0	55.0
Quality of packaging	35.0	25.0	40.0
Freshness	90.0	7.5	2.5
Price	92.5	5.0	2.5



2.3. Value Chain Analysis

The cooking banana value chain mainly comprises of input suppliers, producers, collectors, wholesalers, retailers and consumers as depicted in figure 4.

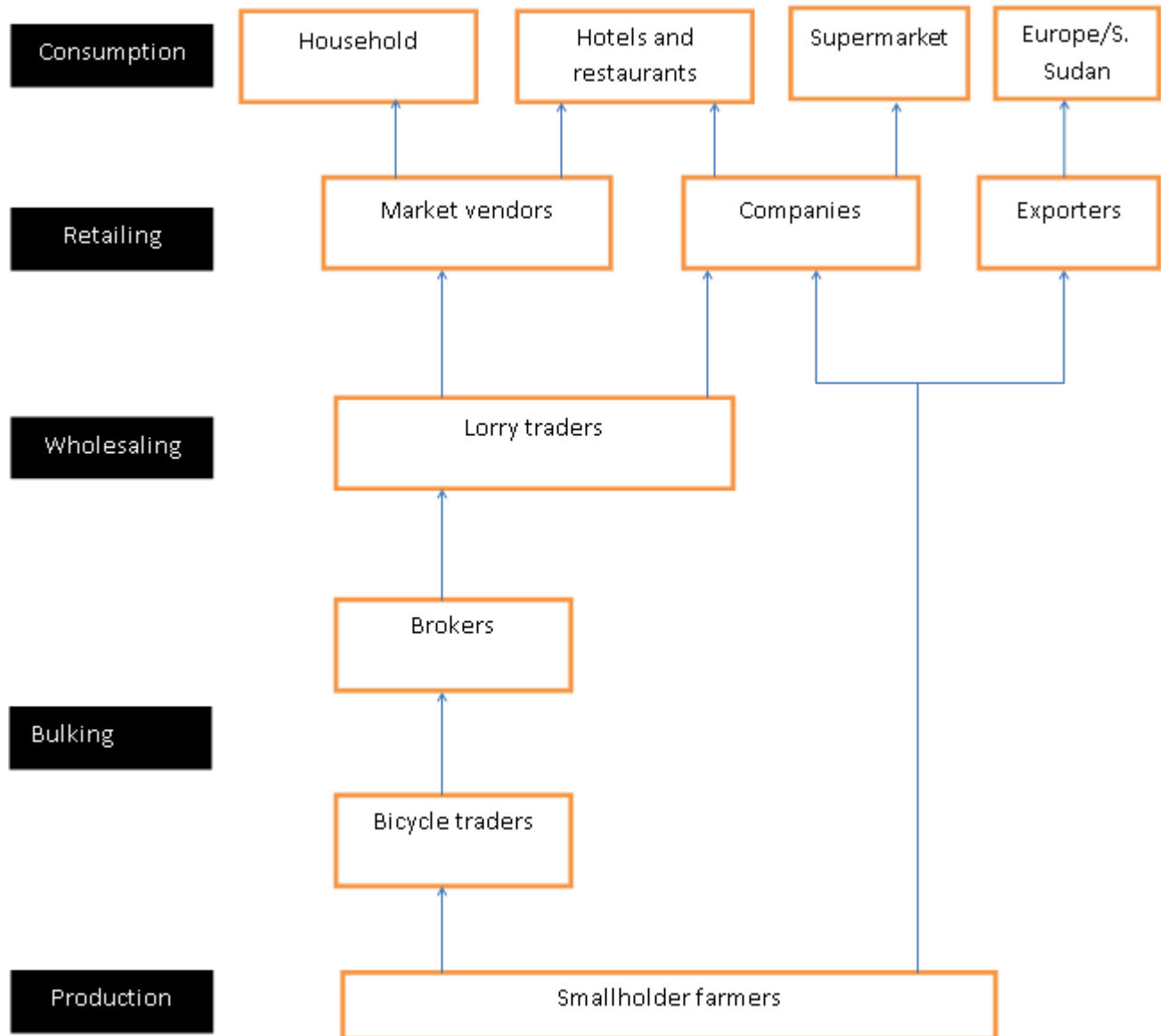


Figure 4: Representation of the cooking banana value chain

2.3.1. Value chain actors

2.3.1.1. Input suppliers

Input suppliers provide inputs to farmers for banana production. During the market study, one input supplier in Mbarara was visited. The nursery operator (supplier) mainly supplies banana tissue



plantlets and manure (cow dung) to farmers. The total volume of plantlets handled by the supplier is 2,000 plantlets in every six months. Of these, 1,700 plantlets are sold directly to individual farmers while others are sold to NGOs and institutions. On average, plantlets stay for two months in the nursery for hardening before being sold. On the other hand, four trucks of manure are sold per six months season each at UGX 150,000. The input supplier does variety selection for banana tissue plantlets and often sort and label (Table 5).

Table 5: Total volume handled by the nursery operator per variety

Variety	Volume handled in 6 months	Cost/plantlet (UGX)	Reason for variety preference
Mbwazirume	500	1,500	Commonly grown
Nakitembe	1,000	1,500	Fast maturing
Kibuzi	500	1,500	Large bunch size and longer shelf life

Each plantlet is purchased at UGX 1,500 from Agro Genetic Technologies Ltd (AGT) located at Buloba town in Wakiso district, which is about 300 km away from the nursery operator's point of operation. When the nursery operator meets with the supplier at AGT, they often talk about price related issues, availability of different banana varieties and disease control methods. Generally, there is no variation in varietal prices, though purchase prices slightly increase in the wet (rainy) season. This is due to the high demand generated by farmers who wish to benefit from the rain. The main customers are mostly men (table 6).

Table 6: Average 6-month sales of banana plantlets

Variety	Quantity sold		Buyers (%)		Price (UGX)	
	Dry season	Wet season	Males	Females	Dry season	Wet season
Mbwazirume	500	250	90	10	1,800	2,000
Nakitembe	300	500	87	13	1,800	2,000
Kibuzi	200	250	97	3	1,800	2,000

The input supplier reported that the majority of farmers (80%) does not use banana tissue plantlets. There are no other banana input suppliers known in the district except the interviewed one. The input supplier agrees that banana plantlet business presents future business



opportunities for farmer entrepreneurs. The biggest challenge faced by the input supplier is disease outbreaks, specifically banana *Xanthomonas* wilt (BXW). The main services received by the input supplier are trainings on agronomy and these are provided by MBADIFA and NAADS twice a year.

2.3.1.2. Producers

A total of 100 farmers were interviewed from both Isingiro (50%) and Rakai (50%) districts for this study. Table 7 shows the demographic characteristics of producers. Both male and female farmers were included in the sample, of which 58% were males and 42% are female. The majority of respondents were married (84%). Results indicate that 93% of the respondents had formal education while only 7% did not have any kind of formal education. The majority attained primary level of education. The average household size was six in Rakai and nine in Isingiro.

Table 7: Demographic characteristics of producers

Variable	Rakai district	Isingiro district	All
	Proportion (%)		
Level of formal education			
None	6.3	8	7.2
Primary	41.7	56	48.9
Ordinary level (S4)	33.3	20	2
Advanced level (S6)	10.4	2	6.2
College	6.3	10	8.2
University	2	4	3
Gender of respondent			
Male	57	57	57
Female	43	43	43
Marital status			
Single	2	4	3
Married	87	84	86
Widowed	9	9	9
Divorced/separated	2	2	2
Main person in charge of business			
Husband	72	81	76
Wife	22	17	19
Male child	4	2	1
Female child	2	0	2
Means			
Household size	6.0 (2.2)	9.0 (3.3)	7.4 (3.1)
Age of respondent (years)	48.1 (11.2)	46.7 (10.0)	47.2 (10.6)

Note: Values in parentheses are standard deviations

2.3.1.3. Bicycle traders

The study shows that all bicycle traders are males and self-employed, with an average age of 33 years. They buy bananas from dispersed farmer plots within the village. They operate as the initial collecting agents. They are well-known members of the community and they have established strong relationships with the farmers. The strong relationship helps the bicycle traders to collect enough volumes (quantities) and good quality bananas from farmers at reasonable prices. Nevertheless, competition amongst bicycle traders exists as barriers to entry are quite low. Bicycle traders mostly obtain information from fellow traders. There is also information sharing between bicycle traders and farmers in terms of price and quality of the product. Information is shared through telephones (50%) and face to face interaction (50%). About 57% of the traders inform the producers about customer needs in terms of quality (i.e., fresh, green and large finger size) and about 86% of the producers occasionally respond to such needs. On average, bicycle traders make four trips per day during the surplus season and three trips per day in the low supply season. Figure 5 shows that all bicycle traders look for fresh and mature bunches (with good bunch and finger size). Most traders (86%) also consider price and variety during purchase. Bicycle traders sell their produce to brokers at collection centers that are found at sub-county or district trading centers, while a smaller percentage (20%) of their sales go to local consumers, market vendors or lorry traders.



Figure 5: Bicycle traders' searched attributes for bananas

The major challenge faced by bicycle traders is price fluctuation of the bananas (figure 6). About 30% of the bicycle traders reported that low supply in the scarcity season affects them as they waste a lot of time looking for bananas. 15% of the traders reported that it is hard for them to find



the varieties mostly required by the market (Kibuzi, Musakala, Nakitembe and Mbwazirume). Losses during transportation to the point of sell reduce their revenue and these losses are mainly due to bruising, breakages and scotching (browning of the fingers when exposed to the sun for long hours).

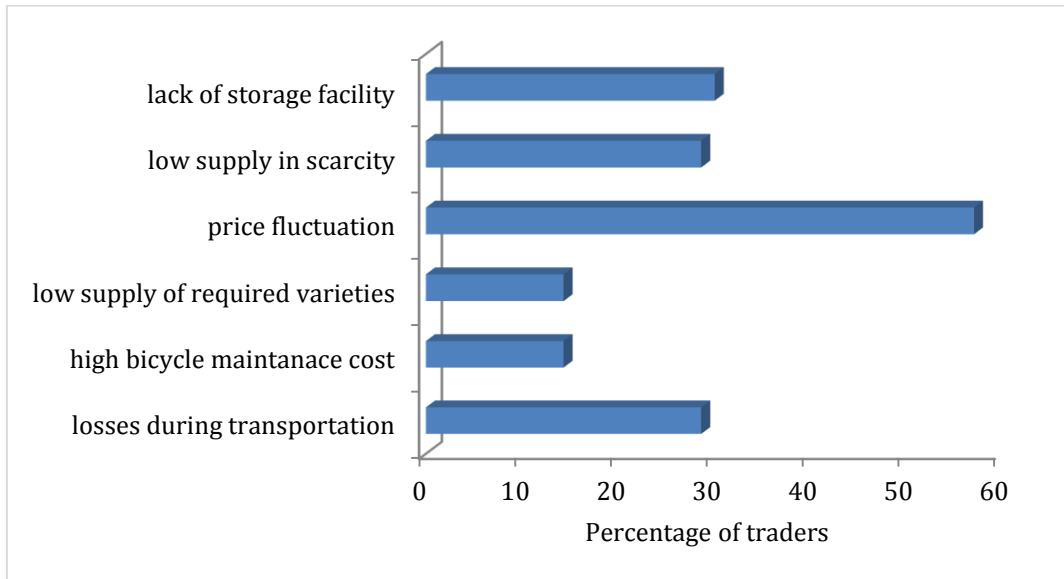


Figure 6: Bicycle traders' challenges in buying and selling bananas

Bicycle traders receive services from banana traders (63.7%), banks (9%) and consumers (27%). All traders receive services at least once a year. Figure 6 shows the services rendered to the bicycle traders. Majority (50%) receive information on quality and quantity of bananas. Results show that 86% of the bicycle traders have never received loans for banana business.

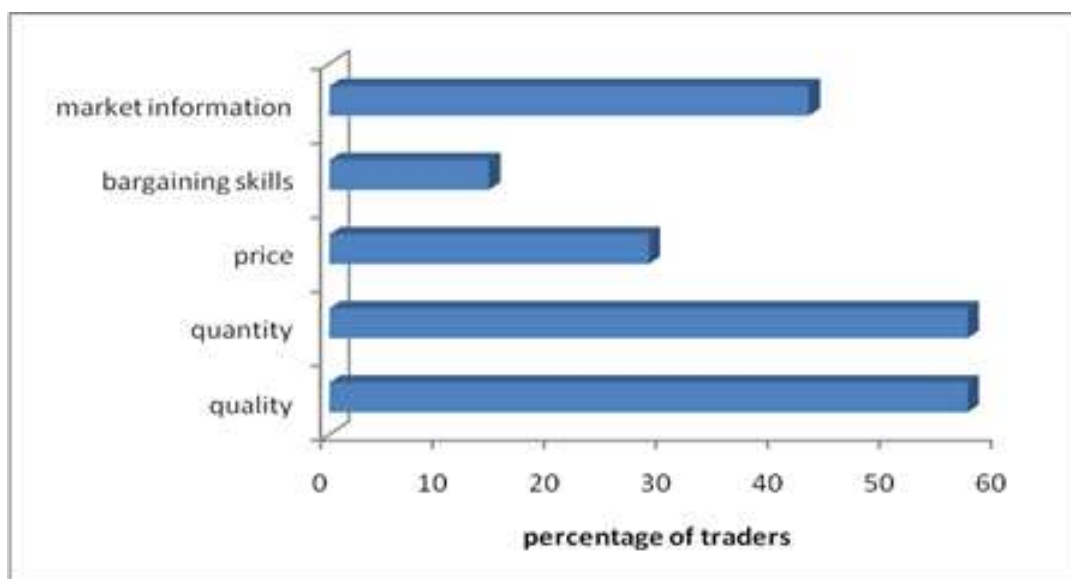


Figure 7: information received by bicycle traders

2.3.1.4. Brokers

All brokers were found to be male with an average age of 40 years. At least 50% of the brokers have attained primary level education and own their businesses. Brokers have been involved in the banana business for an average of ten years. Brokers, though might collect directly from the farmers, buy most (70%) of their banana from the bicycle traders. Brokers are commission agents linking bicycle traders with lorry traders who buy directly from them. Brokers, however, also engage in the transportation of banana to urban markets. Brokers sell primarily to lorry traders. Results show that about 34% of the brokers have good relationships with the lorry traders, and as a result they get cash advances to consolidate stocks and, likewise, sometimes lorry traders are able to buy on credit. 47% of the brokers reported that the main information shared between the brokers, suppliers and the buyers is price-related, while 45% reported to mainly share information related to the quality of bananas. The most popular mode of communication is telephone as reported by 62% of the brokers while 38% communicate face to face. 40% of the banana producers occasionally respond to the brokers needs in the banana market. Results further show that 80% of the brokers look for large fingers, 100% look for mature bananas, 50% look for particular varieties and 80% look for freshness while buying bananas. Brokers reported some challenges in buying bananas as shown in figure 8. Due to the inability to meet the market demand, there are many immature bananas on the market during the scarcity season and, despite the higher market prices at this time, such bananas are low priced due to their low quality. Brokers are also challenged with procuring the preferred varieties (Musakala, Nakitembe, Mbwazirume and Kibuzi) and, most of the times, the varieties are mixed especially for fingers packed in polyethene bags. This makes it difficult to sell to buyers who have a clear preference for particular varieties (e.g. the export market). Brokers receive training once a year by NGOs and NAADSs and pay an average of UGX 2,500 per training. 88% do not have access to loans.

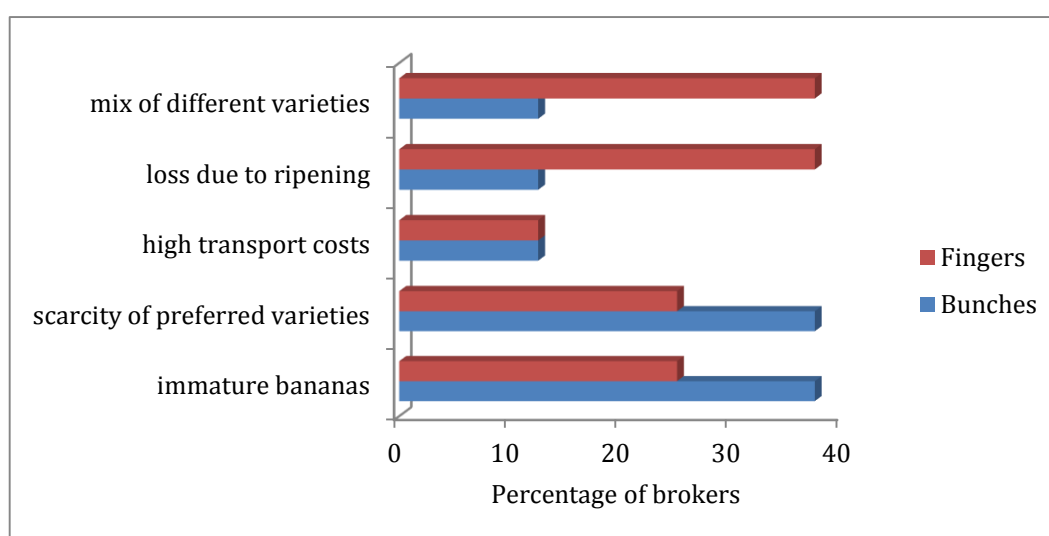


Figure 8: Challenges in buying bananas



2.3.1.5. Wholesaler / lorry traders

All lorry traders (wholesalers) are men and mostly above 40 years of age. The majority (80%) have attained primary level of education. Lorry traders mainly buy their bananas from brokers, with whom they have long and well established relationships. These traders are individuals, and unlike farmers, most (80%) are not organized into any group or association. These traders are self-employed. However, most of them (70%) do not own the trucks. These are hired, which represents their highest operating cost. Traders tend to work with brokers because they prefer to buy bulked stocks which have already been quality screened by the brokers. Mainly price related information is shared between the lorry traders and the suppliers, where 70% communicate occur through telephones. Lorry traders transact mostly (71%) on cash basis but sometimes (21%) procure on credit. All lorry traders have obtained business loans at least once, with an average of UGX 7,500,000. The major constraints faced by lorry traders are high transportation costs, postharvest losses due to ripening and low supply in the scarcity season that leads to purchasing immature bananas. The scattered nature of farmers and the poor road infrastructure in the villages discourage lorry traders to transact directly with the farmers.

2.3.1.6. Retailers

Market vendors are largely women (about 70%) though for this study men were oversampled to get a better representation of their views. Most (43%) market vendors attained secondary level education. Retailers operate market stalls and most of them (90%) are self-employed. The major banana outlets are the open markets such as Kalerwe, Nakawa and Kasubi. There are several other markets mainly located nearby large communities. The vendors procure their entire banana stock from the lorry traders. They have long term relationships with 70% of their suppliers and at least 40% of their customers. They mostly communicate by mobile phone (52%) for pricing and delivery requirements. Most (83%) vendors do not belong to organized groups or associations. They are largely clients of microfinance institutions and SACCOs, from whom they derive most of their working capital requirements. The main micro finance institutions include FINCA, Pride microfinance and Brac. Market vendors sell their produce to household consumers, hotels, restaurants and schools are mostly paid (65%) on cash basis. Market vendors incur few costs, including rent for stalls, own transport, meals and labor costs resulting in high business profitability. Supermarkets are also involved in the retailing of bananas, and they prefer varieties with longer shelf life and large finger size. The greatest challenge faced by supermarkets is the inconsistent supply of bananas.

2.3.1.7. Exporters

67% of the exporters are male with an average age of 38 years and 9 years of working experience. The majority (67%) of exporters procure their bananas from farmers directly, while 38% obtain from



brokers. Their main challenges are poor quality of bananas during the scarcity season. Exporters sell their bananas to South Sudan and Europe.

2.3.1.8. Consumers

Consumers play the end-user’s role in the banana value chain. Eight markets in and around Kampala were visited from which 80 consumers were interviewed. Among those interviewed, 73% were female and 27% were male. The majority (95%) had acquired some level of formal education, where 24% had primary education, 43% secondary education, 13% tertiary and 15% university degrees. 66% of the respondents were married, with an average age of 34 years. The average household size is was five members per household. Decisions on whether to purchase bananas or not in a household are mainly (70%) taken by wives. About 35% of banana consumers earn below UGX 500,000, while 33% earn between UGX 500,000 and 1,000,000 per month. The average distance to the market is 2.5 kilometers. The majority of consumers (52%) mentioned rice as the typical substitute of banana, while 35% mentioned maize. The preference for these substitutes is because of their consistent availability in the market.

2.4. Margins along the banana value chain

At farm level, 77% of the banana business is managed by male household heads. Bananas are sold in form of bunches and sacks of fingers. The majority of farmers sell at farm gate, whereas 80% sell individually and only 20% sell in groups. About 12% of producers operate their banana business under contracts with buyers. Under these agreements, farmers are given advance payments before harvest. Producers rate their buyers as being trustworthy and bulk purchasers.

Results show that majority of the males are positioned in the most profitable nodes of the value chains (table 8).

The marketing margin (difference between the retail price and farm-gate price) is higher in the scarce season compared to the surplus season as shown in table 8. In the low production seasons, the total market margin for a small bunch is estimated at about UGX 13,500 and UGX 16,500 for a large bunch, while in the high production season it is estimated at an average of UGX 9,900 for a small and UGX 15,850 for a large bunch. Margins are higher in the scarcity season and for large bunches because of the higher prices of bananas.

Table 8: Marketing margins in low and high supply seasons

Season	Large bunch	Small bunch
Low supply (scarcity)	16,458	13,489
High supply (surplus)	15,850	9,900



The least profitable node of the value chain is that of the producer. The most profitable node is the wholesale level (table 9), yet all actors at this level are men (table 10).

Table 9: Margins at different nodes of the value chain

		Scarcity		Surplus	
		Large bunch	Small bunch	Large bunch	Small bunch
Retailers	Selling price	30,108	20,189	23,500	15,000
	Buying price	22,800	18,000	16,600	10,000
	Margin	7,308	2,189	6,900	5,000
Wholesalers	Selling price	22,800	18,000	16,600	10,000
	Buying price	15,000	8,333	13,000	6,667
	Margin	7,800	9,667	3,600	3,333
Broker	Selling price	15,000	8,333	13,000	6,667
	Buying price	14,000	7,500	10,000	6,000
	Margin	1,000	833	3000	667
Bicycle trader	Selling price	14,000	7,500	10,000	6,000
	Buying price	13,650	6,700	7,650	5,100
	Margin	350	800	2350	900
Producers	Selling price	13,650	6,700	7,650	5,100

Table 10: Gender difference across the value chain

Value chain actor	Gender (%)	
	Male	Female
Input suppliers	100	-
Producers	58	42
Bicycle traders	100	-
Brokers	100	-
Wholesalers	100	-
Retailers	30	70



2.5. Banana presentation forms along the value chain

Bananas can be sold to the market in different presentation forms, including bunches, unpeeled fingers, peeled fingers, and clusters. Different presentation forms could be preferred at different nodes of the value chain. This study establishes the volume and preferences of different presentations at each node of the banana value chain. All producers, brokers and 90% of wholesalers sell their bananas in form of bunch and/or bags of unpeeled fingers, while bicycle traders buy and sell only bunches. Exporters buy bunches and sell in form of clusters and supermarkets sell unpeeled fingers and clusters. At retail level (in open markets) different presentations are sold, though all retailers reported that bunches are the most preferred by consumers and thus the most sold. The second most preferred type of presentation is unpeeled fingers as reported by 63% of the retailers. Retailers either sell the whole bag of fingers (typically of X Kg) to the consumer or small heaps (about 8-13 fingers) depending on the consumers' preference. Table 11 provides an indication of the current volumes sold by different value chain actors. The preference for the different presentation types at different levels of the value chain is attributed to the ease of handling and the high demand for a particular presentation form. 32% of the retailers reported that there is an increased demand for peeled bananas.

Table 11: Volumes of different presentations forms sold by different actors per month

Actor	Presentation form									
	Bunch (#)		Bag (#)		Cluster (#)		Unpeeled (# of heaps)		Peeled (# of packs)	
	High	Low	High	Low	High	Low	High	Low	High	Low
Producers*	596	280	23	14	-	-	-	-	-	-
Bicycle traders**	80	60	-	-	-	-	-	-	-	-
Brokers **	1900		1128		-		-		-	
Wholesalers**	1292		148		-		-		-	
Retailers**	210	122	11	9	480	308	760	714	712	356

The most common types of presentations in the market (table 12) are the unpeeled bananas and bunches as reported by 65% and 55% of the consumers, respectively. The proportion of total banana sales sold at retailer level in different presentation forms is approximately 47% bunches,



17% bags of unpeeled bananas, 11% clusters, 15% heaps of unpeeled banana and 10% peeled bananas.

Table 12: Availability of desired quantities for consumers

Presentation type	Never	Rarely	Occasionally	Regularly
Unpeeled fingers	10.3	3.5	20.7	65.5
Clusters	15.4	7.7	30.8	46.2
Bunches	10.7	1.8	32.1	55.3
Peeled fingers	7.1	7.1	50.0	35.0

Further analysis was done to determine the quality of packaging materials for peeled bananas. Results show that 33% of the consumers have bought peeled bananas at least once. These consumers rated the quality of packaging material as shown in figure 9. The majority of consumers are not satisfied with the quality of the packaging material as they think it is unhealthy. However, consumers suggest that a standard packaging material that is less harmful to man and the environment should be developed.

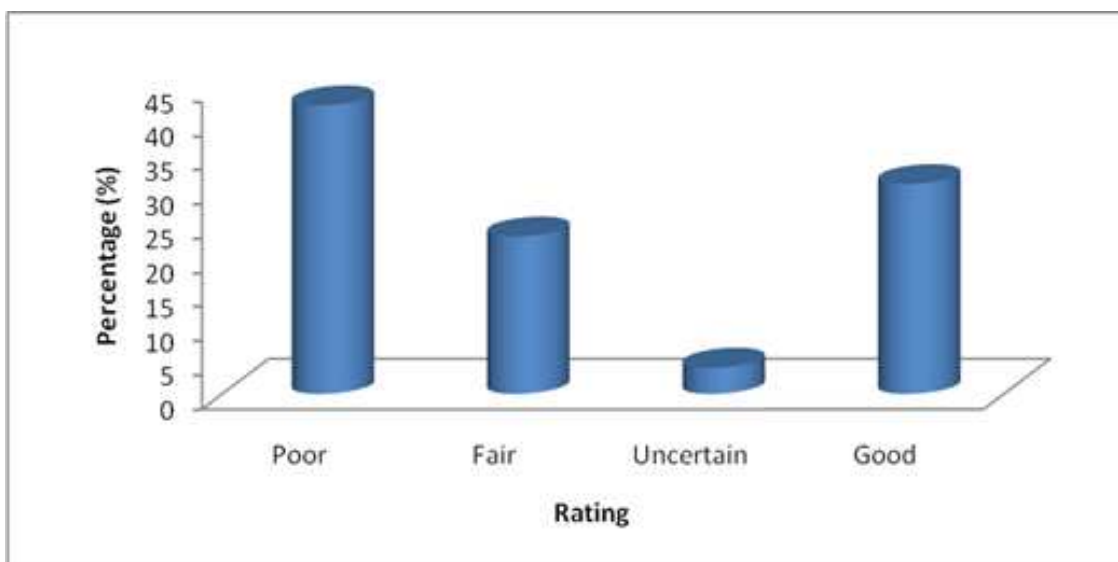


Figure 9: Rating of packaging materials used for peeled bananas

Consumers that do not buy peeled bananas stated that they are afraid to buy because they think peeled bananas has a short shelf life and they are not sure of the taste and color after cooking.



About 60% of the producers reported an increased demand for bunches in the last one year, while 50% reported increase in demand for bags of unpeeled fingers. At retail level, 91% of the retailers reported an increased demand for bunches, 70% for heaps of unpeeled fingers, and 62% reported an increased demand for bags of fingers. Though the increase in demand for peeled fingers is not large (32%), retailers reported that the demand is steadily increasing over time. Bunches are the most highly demanded type of presentation, with 61% of the consumers demanding small bunches, particularly if they have a not too large household size. The results show that there is no significant difference between presentation type demanded and family size.

2.6. Grading of bananas along the value chain

Bananas can be graded according to variety, quality, size and form of presentation in the market. All value chain actors grade their bananas in terms of size and presentation form. However, there is no single actor grading in terms of variety and/or quality as shown in figure 10.

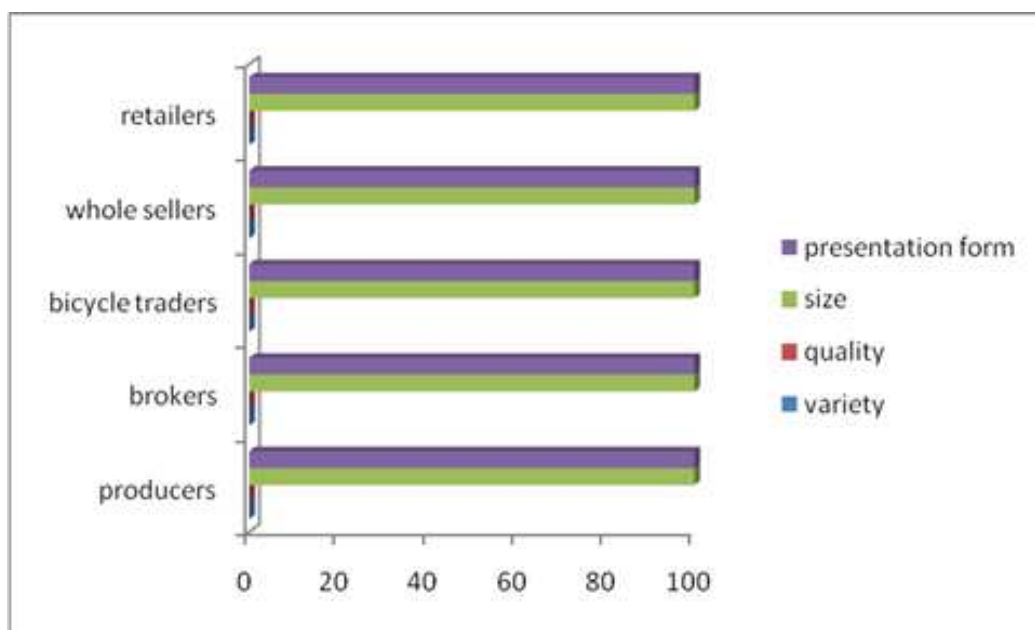


Figure 10: Percentage of banana value chain actors practicing the different forms of grading

Though grading in terms of quality and variety is not practiced in the banana value chain, different actors have different perceptions regarding this practice. Results show that 78% of the producers agree that sorting and grading is a good practice and would increase revenues from banana sales. Producers (73%) also believe that sorting and grading does not require any additional skill, however 80% of the producers agree that sorting and grading is tiresome and time consuming.

Results also show that 60% of producers are willing to accept higher prices for good quality and sorted bananas. Majority of the bicycle traders (57%) are willing to occasionally pay higher prices



for good sorted bananas while 43% are willing to regularly pay higher prices. 50% of brokers, 67% of wholesalers and 88% of the consumers reported that they are willing to pay higher prices for good quality and sorted bananas if available on the market.

The majority of bicycle traders (86 %) occasionally find the required quantities of the preferred banana varieties, while 14% rarely find the right quantities of the required varieties. About 32% of the retailers reported increased demand for particular varieties like Kibuzi, Nakitembe, Musakala and Mbwazirume. 55% of the consumers are not satisfied with the quality of bunches and 58% are not satisfied with the quality of peeled bananas.

2.7. Weight based price system along the value chain

Figure 11 shows the proportion of value chain actors selling banana using the kilogram system. None of the producers, bicycle traders, brokers and wholesalers use a weight-based pricing system. All European exporters buy and sell banana in kilograms, yet their suppliers (brokers) negotiate the bunch price using visual inspection at farm level and sell to exporters in kilograms. Only one of the five supermarkets visited had once sold bananas using the kilogram system, while only five female and three male retailers in open markets sell (or have ever sold) their bananas by kilogram.

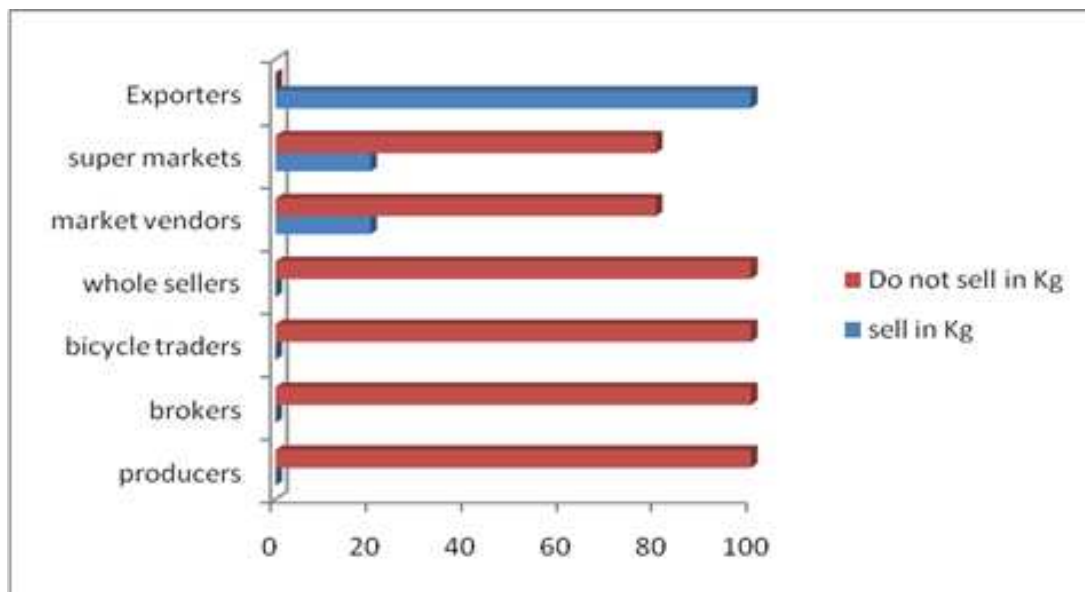


Figure 11: Share of value chain actors using the kilogram system

All markets have at least one market vendor who has ever used (or is still using) the weight based price system except Kalerwe market (figure 12). Results show that 31% of the consumers (25 out of 80) buy or have bought at least once cooking bananas sold in kilograms.

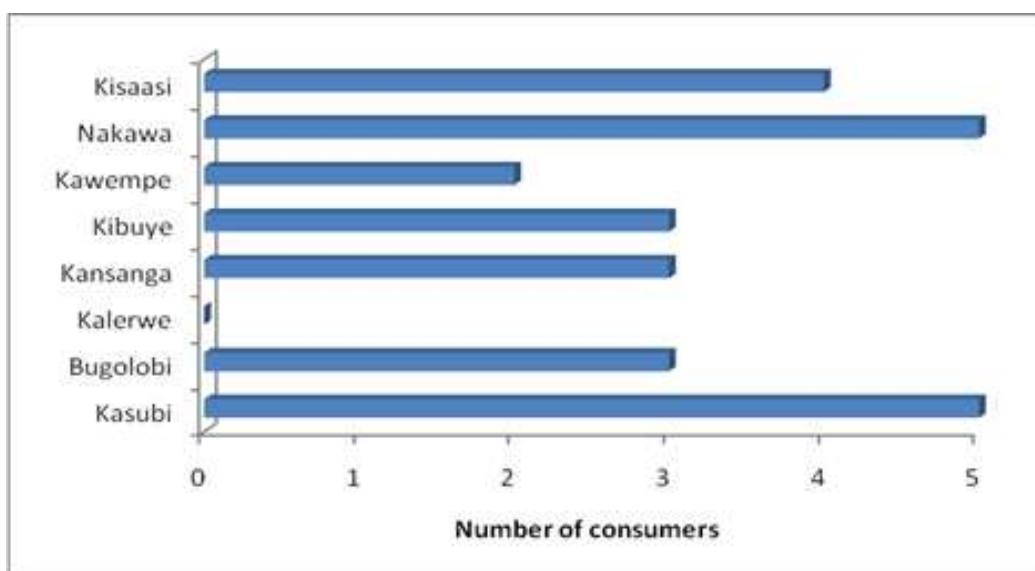


Figure 12: Number of consumers buying or ever bought in kilograms per market

However, the study shows that 98% of the producers, 40% retailers, 75% supermarkets and 50% consumers are willing to embrace the weight-based pricing system. Similarly, 40% of the interviewed consumers believe that other consumers (who were not interviewed) will purchase cooking bananas sold in kilograms. Most consumers (57%) would prefer to purchase unpeeled fingers using the weight-based pricing system. The preferred pack size for weighted unpeeled banana is a 5kg pack, with 55% of the consumers stating that they are likely to purchase bananas in such quantities (5kg). Most producers are willing to accept an average price of about UGX 750 per kilogram of banana, while bicycle traders are willing to pay an average of UGX 413 per Kg of banana bought. Super market traders are willing to buy a kilogram at UGX 1,000 and would sell it at UGX 3,200. A large proportion of consumers (45%) are willing to pay between UGX 1,000 and UGX 2,000 per kilogram.

Value chain actors – most producers and wholesalers, and all bicycle traders believe that the introduction of a weight-based pricing system along the value chain would improve efficiency and lead to fairer pricing in the banana business (table 13). These actors as well as half of the brokers also believe that sales by weight would improve trust among the banana VC actors. However, retailers and consumers appear less optimistic at this regard and are mainly afraid that traders would mostly use fake weighing scales, not properly calibrated as required by UNBS. Moreover, some actors believe that the weight-based pricing system will come with added costs in terms of labor for weighing as reported by most producers, bicycle traders and retailers. Results show some gender differences in perceptions as shown in table 13. Male producers and retailers are more positive about the weight-based pricing system in terms of efficiency, fair pricing and trust



compared to their female counter parts. However, female producers and retailers are more prone to think that the weight based pricing system will not add any extra cost.

Table 13: Perceptions about the weight based pricing system by VC actor and gender

	Producer		Broker	Bicycle trader	Wholesaler	Retailer		Consumer	
	Male	Female	Male	Male	Male	Male	Female	Male	Female
Efficiency	54	36	37.5	100	100	28.2	17.9	-	-
Fair pricing	56	42	50	100	70	25.6	10.3	11	25
Trust	57	39	37.5	100	70	25.6	17.9	12	25
No added cost	65	75	25	53	50	76.9	92.3	-	-

2.8. Postharvest losses

2.8.1. Postharvest losses at the farm level

Generally, postharvest losses in Isingiro district are significantly higher than those in Rakai district. Results show that postharvest losses in Isingiro are more than 50% higher than those in Rakai in both seasons. This is because of the high production in Isingiro and the long distance to the capital city (Kampala) compared to Rakai. Postharvest losses are higher in the high production season than in the low production season. At times of scarcity, physical losses affect about 3.3% and economic losses 5.4% of bananas. The average residual value is estimated at about UGX 7,500. This means that, for instance, a bunch that would have been sold at UGX 10,000 is sold at about UGX 7,500 due to quality deterioration. The major causes of physical losses at farm level are theft and ripening, while causes of economic losses are mainly selling of immature bananas, followed by poor harvesting methods and ripening. Selling immature bananas is attributed to the high demand in the market that cannot be met by the available farm production during scarcity. Immature bananas are considered to be of low quality and thus buyers pay less than the normal price of a mature bunch.

During the surplus season, physical losses are estimated at 9.6%, while economic losses affect approximately 8.1% of banana with a residual value of about UGX 2,300 per bunch. The major cause of postharvest (physical and economic) losses during the surplus season is ripening. During the surplus season, there are many producers offering bananas to the market yet buyers are few thus some farmers fail to sell all their bananas that will soon start ripening. Table 14 shows the extent of postharvest losses at farm level.

Table 14: Extent of postharvest losses at farm level

	Physical loss (%)		Economic loss (%)		Residual value (UGX)	
	Scarcity	Surplus	Scarcity	Surplus	Scarcity	Surplus
Overall	3.3	9.6	5.4	8.1	7,534	2,385
Rakai	1.0	8.9	0.7	3.8	9,661	3,312
Isingiro	5.4	10.1	10.0	12.1	5,491	1,495

There is not substantial difference in postharvest losses for male and female farmers though female farmers have bigger economic and incur higher price discounts in the surplus season as shown in table 15.

Table 15: Gender distribution of postharvest losses at farm level

Type of loss	Scarcity		Surplus	
	Male	Female	Male	Female
Physical loss (%)	2.5	4.2	8.9	10.4
Economic loss (%)	4.5	6.7	6.8	9.8
Residual value (UGX)	7753	7232	2566	2135

2.8.2. Postharvest losses at the broker level

Only three out of eight brokers reported postharvest losses. Larger losses are experienced during the surplus season as shown in table 16. Bruising, ripening and overstay are the lead causes of physical and economic losses in both the surplus and scarcity seasons.

Table 16: Average postharvest losses at broker level

	Physical loss (%)	Economic loss (%)	Residual value (UGX)
Scarcity season	1.8	2.2	8,981
Surplus season	3.9	4.6	7,499



2.8.3. Postharvest losses at the wholesale level

At wholesale level physical losses during scarcity are estimated at about 6.7% and economic losses at 3%. These economic losses result into a residual value of about UGX 20,000 per damaged large bunch in scarcity season. The major causes of such losses are thefts and bruising for physical losses and bruising and ripening for economic losses. However, in the surplus season, both physical and economic losses increase and are mainly caused by ripening and bruising. Likewise, the residual value also decreases significantly to approximately UGX 11,000 per bunch if damaged (table 17).

Table 17: Postharvest losses at wholesale level by season

	Physical loss (%)	Economic loss (%)	Residual value (UGX)
Scarcity season	6.7	3.2	19,950
Surplus season	8.7	7.5	11,419

2.8.4. Postharvest losses at the retail level

At retail level during scarcity physical losses are estimated at about 6.2%, while economic losses are approximately at 6.5% translating into a residual value of about UGX 12,000 per damaged bunch (table 18). During surplus physical losses increases to 10 and volumes affected by economic losses almost double to 12%, resulting into an average residual value of UGX 7,500 per damaged bunch. Physical losses are mainly caused by ripening, bruising, and thefts while economic ones are caused by ripening, bruising and finger plucking in scarcity seasons. Generally, workers who load (and offload) bananas onto (from) the truck are not paid cash. So at any point of loading and offloading those workers pull out (pluck) fingers as their in kind payment. On average about 10 fingers are removed per bunch. Retailers are very dissatisfied with the act of plucking out fingers from the bunch and about 57% of the retailers reported tremendous losses (due to weight loss and accelerated quality deterioration) from finger plucking.

Table 18: Postharvest losses at retail level by season

	Physical loss (%)	Economic loss (%)	Residual value (UGX)
Scarcity season	6.2	6.5	11,833
Surplus season	9.8	11.9	7,558



Bruising and ripening are the lead causes of postharvest (both physical and economic) losses during the surplus season at retail level. Bruising results into discoloration and exposes the banana to infections thus shortening the shelf life and lowering the quality. Other causes that have been mentioned include overstaying, scotching and finger plucking. Table 19 shows PH losses by gender. Though no significant differences were observed, males tend to incur more physical and economic losses during scarcity than females, while during surplus women tend to incur more economic losses compared to men. Residual values are not significantly different in both seasons.

Table 19: Gender distribution of postharvest losses at retail level

Type of loss	Scarcity		Surplus	
	Male	Female	Male	Female
Physical loss (%)	6.4	5.8	10.5	8.9
Economic loss (%)	6.8	6.1	11.5	12.6
Residual loss (UGX)	12,206	11,273	7963	6952

2.8.5. Postharvest losses at the export level

Ripening is the major cause of physical losses at export level in both scarcity (1.5%) and surplus (2.5%) season, while bruising causes most of the economic losses (4.4%) in scarcity season. However, in surplus season over staying and bruising are the main causes of economic losses (5.8%).

2.8.6. Mitigation measures for postharvest losses

At production level, farmers suggested that if they can even out the supply throughout the year then the tremendous losses in the surplus season will be reduced. All value chain actors agreed that marketing varieties with longer shelf life can help reduce losses caused by ripening. Farmers suggested that training in proper harvesting time can reduce immature harvests, thus reducing losses arising from selling immature bananas. Similarly, farmers hinted that fencing off banana plantations can help reduce losses due to theft, but it would be costly to implement. Lorry traders suggested that improving roads in rural areas and proper packing of bananas on trucks can reduce losses during transportation. At retail level, about 50% of the vendors also suggested that avoiding overloading can reduce bruising during transportation to the market. All VC actors believe that proper handling of bananas right from the farm to the market can reduce bruises. Finally, covering bananas with tarpaulins after harvest at farm level, during transportation and at retail markets can



reduce exposure of bananas to direct sunlight, which in turn can minimize losses as result of scotching.

3. CONCLUSIONS

Banana varieties of Kibuzi, Nakitembe Mbwazirume and Musakala are only accessed by few farmers yet these are the most demanded varieties in the market. Farmers are willing to purchase clean planting materials of these varieties from the nurseries if availed. This presents a business opportunity to farmers who are willing to establish nurseries. Banana presentation forms of clusters and peeled fingers are missing at the production end of the value chain. There is an increasing demand for peeled bananas at retail level therefore retailers could demand for peeled bananas right from the farm. Farmers are willing to provide peeled bananas as they could use the banana peelings as manure for their gardens. Banana value chain actors are very positive and willing to embrace the weight based pricing system. This is expected to improve efficiency and fairness in the banana pricing system as well as improve transparency between buyers and sellers. The postharvest losses across the value chain are high and thus require various interventions to considerably reduce them. All these innovations are expected to improve margins along the value chain and thus reduce the gap between retail prices and farm gate prices.



REFERENCES

- Fiedler, J.L., Kikulwe, E.M., and E. Birol (2013). An Ex Ante Analysis of the Impact and Cost-Effectiveness of Biofortified High-Provitamin A and High-Iron Banana in Uganda. IFPRI Discussion Paper 01277, Washington, DC: IFPRI.
- Haggblade, S., and Dewina, R. (2010). Staple food prices in Uganda. Prepared for the Comesa policy seminar on “Variation in staple food prices: causes, consequence, and policy options,” Maputo, Mozambique (pp. 25-26).
- Kabahenda M. and Kapiriri N.M. (2010). Analyzing Agricultural Science and Technology Innovation Systems: A Case Study of the Banana Sub-sector in Uganda.
- Kalyebara, R., Wood, S. and P. Abodi (2005). The Potential Economic Benefits of Improved Banana Productivity in Uganda: An industry-scale analysis.
- Ngambeki, D., Nowakunda, K. and Tushemereirwe, W.K. (2010). Extent and causes of banana (*Musa Spp*) market distortions in Uganda. *Acta Horticulturae*, ISHS.
- Nyombi, K. (2013). Towards sustainable highland banana production in Uganda: opportunities and challenges. *African Journal of Food, Agriculture, Nutrition and Development*, 13(2).
- Smale, M. and Tushemereirwe, W. (Eds.) (2007). An economic assessment of banana genetic improvement and innovation in the Lake Victoria region of Uganda and Tanzania (Vol. 155). Intl Food Policy Res Inst.
- The New Vision (August, 2014). Raw deal for banana farmers. Accessed on August 20, <http://www.newvision.co.ug/news/658639-raw-deal-for-banana-farmers.html>
- UBOS (2010). Uganda census of Agriculture 2008/2009. Crop area and production report, volume IV.
- Wanda, O. (2009). Production risk and input use in banana production in Uganda.