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Research Article

Socio-economic analysis of beekeeping enterprise in communities adjacent to Kalinzu forest, Western Uganda

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ABSTRACT

Uganda has a very high potential for beekeeping given its floral diversity. This potential has not been fully exploited due to highly traditional production systems and limited apicultural research. This study, conducted in May 2014, was based on a survey of 60 beekeepers in areas adjacent to Kalinzu forest. The study employed a logistic regression model to assess the factors that influence the adoption of improved beehives. The study also analysed the local honey value chain to ascertain specific constraints affecting beekeeping in the study area. Results showed that education and training in beekeeping were the major factors influencing adoption of improved beehives. The honey value chain was dominated by beekeepers, middlemen and commercial processors. Pests, lack of equipment, low prices for bee products and farm sprays were the main factors affecting honey producers. Middlemen were constrained by high costs of transport, low quantities of honey collected and non-cash payments by buyers. Commercial processors were faced with honey adulteration, expensive equipment and unreliable honey supply. Commercialisation efforts should therefore focus on specialised trainings that overcome the constraints identified in the value chain.

Key words: Adoption, bees, beehives, apiculture, honey value chain

Introduction

Uganda is one of the countries with a huge potential for beekeeping given the prevailing suitable ecological conditions and floral diversity (UEPB 2005; Kilimo Trust 2012). Areas with existing floral resources are highly suitable for beekeeping in the country (Bradbear 2008). Forests, provide adequate bee-forage in terms of both quality and quantity of nectar and pollen grains. For this reason, bee-keeping also has the potential to increase opportunities for forest conservation (CIFOR 2008). When promoted among forest adjacent communities, beekeeping provides reliable livelihood options (Timmer and Juma 2005; Mazur and Stakhnov 2008).

Highlights

- Honey production in the area is highly dependent on the use of traditional beehives;
- Formal education and training were the main socio-economic factors that influenced adoption of improved beehives;
- Interventions should aim at trainings that overcome production, processing and marketing constraints in the value chain.

In spite of the suitable ecological conditions and floral diversity, Uganda produces about 5,000 metric tons of honey which is only 1% of the national annual production potential estimated at 500,000 tonnes (Horn 2004; Nadelman et al. 2005). The low honey production in Uganda can be attributed to the dominantly small-scale operations which employ traditional methods of production. As such, the honey produced falls short of meeting the ever increasing domestic and regional demand.

Furthermore, little research and development in apiculture has been done (Kajobe et al. 2009) A few studies that have been conducted are general in nature. General studies tend to hide local variability because beekeeping is diverse varying greatly in the way it is practiced from one region to another. As such, efforts to boost honey production would benefit from a more understanding of area specific constraints related to production, processing, and marketing in order to develop realistic interventions. This study was conducted in adjacent areas of Kalinzu forest renowned for beekeeping. The study was conducted to determine the socio-economic factors

that would facilitate adoption of improved beehives in order to boost honey production among Kalinzu forest adjacent communities. The study also analysed the local honey value chain to better understand the challenges faced by the different players in order to propose realistic interventions on upgrading the honey value chain in the area.

Materials and methods

The study area

This study was conducted in areas adjacent to Kalinzu Central Forest Reserve (CFR) (Figure 1). Kalinzu CFR located in Bushenyi, Rubirizi and Mitooma districts in Western Uganda (30° 07' E, 0° 17' S) (Furuichi and Hashimoto 2004) is a natural forest teeming with terrestrial bio-diversity. The reserve is located in the western highlands agro-ecological zone of Uganda which is renowned for honey production. The forest covers an area of 14,162 ha and hosts 414 species of trees and shrubs. The areas adjacent to the reserve are especially ideal for beekeeping activities because of the suitable climatic conditions and abundant year round floral resources from the forest. The adjacent communities are largely farmers who mainly grow bananas, tea, coffee, cotton, pineapples, and passion fruits. Honey, cattle and fish also raise significant amounts of money to the regional economy (UBOS 2004).

In order to involve the adjacent communities in forest management, the National Forestry Authority (NFA) has adopted a collaborative forest management model. This has brought on board Collaborative Forest Management (CFM) groups of Ndangara – Nyakiyanja Parishes Tutungukye group and Rwoburunga Bahiingi Turinde Ebyobuhangwa group. Such CFM groups are engaged in beekeeping as an alternative source of livelihood and also a means to sustainable use of the forest. A pre-assessment study for undertaking Forest Stewardship Council certification of Kalinzu forest identified honey as one of the potential certifiable products (NFA 2014). As such, NFA is using the collaborative forest management approach to promote beekeeping in adjacent areas. Beekeeping is seen as an effective management approach that would enable local people to meet and sustain their livelihoods while conserving the forest.

The study area was purposively selected because it's renowned for beekeeping. Besides, there are on-going efforts by NFA with support from World Wide Fund for Nature to promote and modernise beekeeping. Thus, results from the study would inform the on-going efforts to promote beekeeping as a viable enterprise in the area.

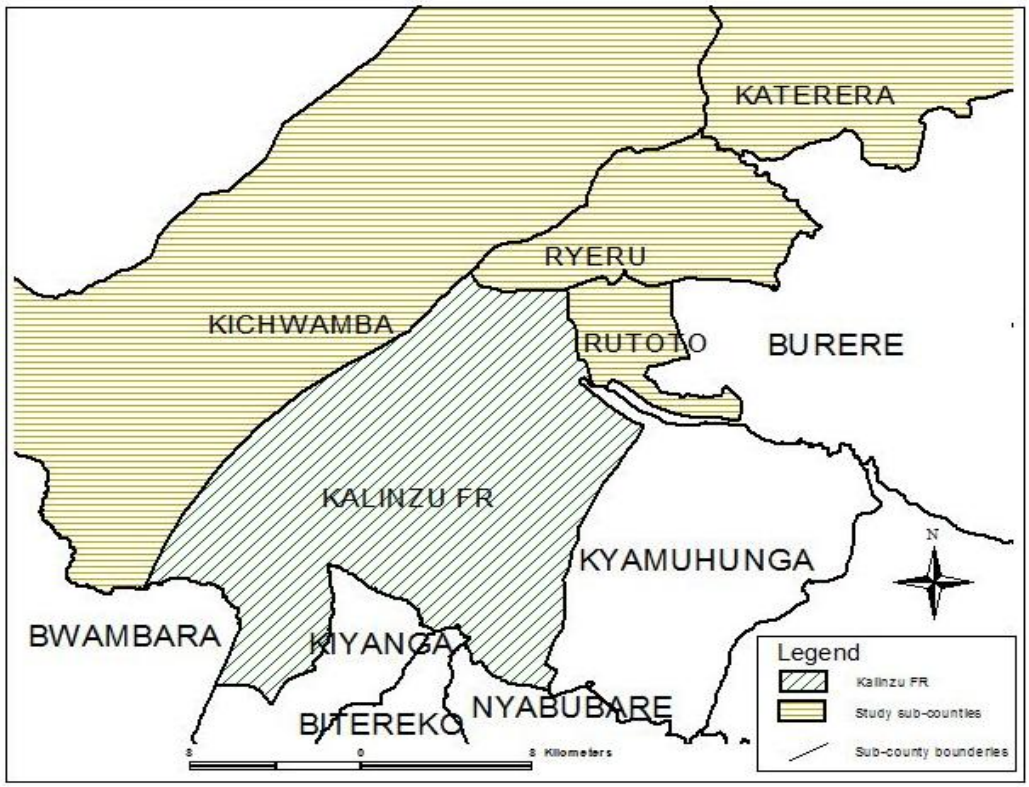

Figure 1: Map of the study area (Source: www.wri.org/resources/data-sets/uganda-gis-data)

Data collection

A snowball sampling method (Goodman 1961) was used to select the respondents. This sampling method was used because beekeepers in the study area were not well enumerated. Consequently, a total of 60 beekeepers were interviewed in Ryeru, Rutoto, Kichwamba, Nyakabirizi, Rubirizi and Katanda sub-counties. Also, seven honey buyers (individuals and companies) were identified and interviewed through referrals by beekeepers who were dealing with them. Data on production, processing and marketing of honey were collected through in-depth interviews using a semi-structured questionnaire. Key informant interviews were also conducted with district forest officers, NFA Range Manager, NFA Sector Manager, district entomologist and district agricultural officers for data triangulation. Two group discussions were held that involved the beekeepers, middlemen and processors. Group discussions focussed on constraints faced by the different value chain actors and opportunities for local level upgrading of the honey value chain. Field observations were also used to verify and validate the information collected from in-depth interviews.

Data analysis

The data collected were coded and entered into SPSS (Statistical Packages for Social Sciences; version 16.0 software) for analysis. Descriptive and inferential statistics were generated and a logistic regression model (LRM) employed to predict the factors influencing adoption of improved beehives. A functional analysis of the local honey value chain was also conducted to map, identify roles and determine financial returns per unit at different stages.

Results and discussion

General characteristics of the respondents

The concentration of beekeepers varied from sub-county to sub-county with Katanda having 46.8%, Ryeru 19.1%, Kichwamba 17.0%, Rutoto 8.5%, Rubirizi 6.3% and Nyakabirizi 2.1%. The average age of the beekeepers was 46.7 years with the majority (61%) between 36 to 60 years (Table 1). This means that beekeeping in the area is dominated by older farmers possibly due to migration of the youths to towns and cities in search for white-collar jobs. While experience is a valuable capital in farming, most beekeepers (56.3%) in the study area had less than 10 years of experience in beekeeping. About 37.5% and 6.2% had spent 10 – 30 years and more than 30 years respectively in beekeeping. This shows that interest in beekeeping was gradually increasing over the years.

The increased enthusiasm in beekeeping was probably because people had realized that it's a profitable enterprise. The majority (95.8%) of the respondents were males reflecting their dominance in the beekeeping enterprise. This is possibly because honey is a high value product and men traditionally own most of the profitable enterprises in the household. This is in line with IFAD (2008) which noted that Non Timber Forest Product (NTFP) chains are highly gender specific with women mostly dealing with lower-value products and activities than men. Additionally, in most rural areas, women have a primary responsibility of ensuring food security to their families (Gittinger et al. 1990). Therefore income generating activities such as beekeeping tend to be dominated by men. It is also possible that men have co-evolved with beekeeping since honey hunting which has been practiced by humans over centuries was predominantly a male activity because it involved tree climbing which is not culturally suitable for most women in Africa (IFAD 2008). The low levels of education in the study area could also contribute to the limited women participation in the beekeeping enterprise (Fonjong 2008; Shackleton et al. 2011) since women constitute 64% of the illiterate population in Uganda (UBOS 2006). The level of formal education attained by beekeepers was generally low. The majority (59.2%) had stopped in primary while 16.3% had never gone to school. Also, only 47.9% of beekeepers had received formal training in beekeeping. This shows that beekeeping in the study area is mainly undertaken by the less educated. Low education hinders their acceptance of improved technologies (Onemolease 2005; Natukunda et al. 2011).

The majority of the respondents (55.1%) used traditional beehives compared to the Kenyan Top Bar (KTB) (38.8%) and Langstroth beehives (6.1%) (Table 1). This means that most beekeepers missed out on the advantages of improved beehives such as high honey yield, and ease of colony inspection and product harvesting (FAO 1990; Beyene et al. 2015). Improved beehives produce higher honey volumes annually than traditional hives (Nuru 2007; Workneh et al. 2008; Tsafack Matsop et al. 2011; Getachew et al. 2015). Besides, when Langstroth beehives are used, a bee farmer can only harvest honey thereby saving bees' effort to create new beeswax comb (FAO 2012). However, traditional beehives were popular in the study area probably because they were cheaper, required less accessories and low operational skills (Mahari 2007; Kebede and Lemma 2007).

Table 1. Socio-demographic characteristics of beekeepers in Kalinzu.

Parameter	Category	Percentage of respondents (n=60)
Age groups (years)	≤35	18.4
	36 - 60	61.2
	>60	20.4
Gender of beekeepers	Male	93.9
	Female	6.1
Highest level of education attained	Never went to school	16.3
	Primary	59.2
	Secondary	8.2
	Tertiary	16.3
Formal training	Yes	47.9
	No	52.1
Years of experience in beekeeping	<10	56.3
	10 – 30	37.5
	>30	6.2
Type of beehives used	Traditional	55.1
	Kenyan Top Bar (KTB)	38.8
	Langstroth	6.1

Factors influencing adoption of improved beehives

The explanatory socio-economic factors that influenced the adoption of improved beehives were formal education and training in bee keeping (Table 2). Both formal education and training were positively influencing adoption of improved beehives. No wonder, adoption of KTB and Langstroth hives was higher for each of the educated and trained beekeepers than for non-educated and non-trained farmers (Figure 2). The positive B values for both education and training variables (Table 2) suggest that people who had received either education or training in beekeeping were more likely to adopt improved beehives. The chances of a person adopting improved beehives were 6.2 times higher for someone educated than for a person who wasn't educated, all other factors being constant. Likewise, the chances of a person adopting improved beehives were 25.7 times higher for a person who was trained in beekeeping than for someone who was not trained, all other factors being constant. Education increases the ability of the farmer to process and use information relevant to the adoption of a new technology (Lavison 2013; Namara et al. 2013). Other studies have also reported a positive relationship between education and adoption of technologies (Traore et al. 1998; Okunlola et al. 2011). On the other hand, trainings provide information that enables farmers to learn about the existence and applicability of a given technology. This in turn reduces the uncertainty about the technology's performance and serves as a precursor to adoption (Uaiene et al. 2009). A study by Nsabimana and Masabo (2005) on factors influencing adoption of agricultural technologies emphasized the need for farmers to have trainings on how to use the technologies before they are promoted.

Table 2. Logistic regression for factors influencing adoption of improved beehives.

Variable	B	SE	Wald	df	Sig.	Exp(B)
Marital status	-.98	1.78	.30	1	.58	.38
Age	-.01	.05	.06	1	.81	.99
Formal education	2.79	1.29	4.64	1	.03	6.22
Affiliation	.02	1.52	.00	1	.99	1.02
Training	4.83	1.60	9.16	1	.00	25.75

Where, B = coefficient for the constant, SE = standard error, Wald = the Wald chi-square test, df= degrees of freedom, Sig. = statistical significance, Exp(B) = exponential of the B coefficient.

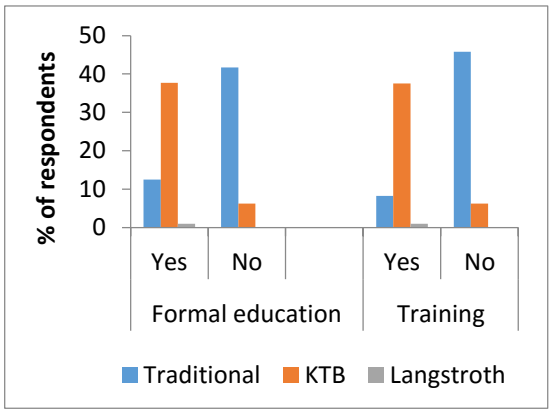

Figure 2. Influence of education and training on adoption of improved beehives

The production to consumption chain of honey in the study area was comprised of beekeepers, middlemen, commercial processors and consumers (Figure 3). About 60.4% of the beekeepers were organised in groups. However, most of the groups were not functional since the members could not recall having any group activity in the past six months. The only active groups were those supported by NFA through CFM arrangements and these had established group apiaries in the production and buffer zones of Kalinzu forest reserve.

Beekeepers individually sold both honey combs and semi-refined honey directly to village consumers, producer groups, beer brewers, roadside traders, middlemen and commercial processors. Where possible, beekeepers utilised local shops and roadside stalls to sell honey in recycled containers such as mineral water bottles. Most of the beekeepers (69.8%) reportedly received inadequate prices for high quality honey. This could be the reason why, honey adulteration was still a major constraint in the area. Other hive products were not economically popular in the study area, with only 13.3% of beekeepers extracting wax and 10% harvesting propolis.

Middlemen were mainly local retailers who had external market linkages. Most middlemen bought honey as honey combs and sold it to their customers as semi-refined honey. Because they had no quality standards to follow while buying honey from producers, they did not engage in any form of honey grading.

Commercial processors were basically small companies with processing equipment such as honey extractor, refractometer and air tight containers and also followed standardized processing, packaging and labeling. The main commercial processors in the area included Bushenyi connoisseur honeys, Mirembe bee honey association and Tropical bee honey. They bought honey from beekeepers who were willing to meet their quality standards. Commercial processors often trained their suppliers on honey quality and offered better prices.

Significant quantities of honey were being consumed locally. The main consumers included beer brewers and herbalists who used it in local beer production and herbal medicines respectively. Some commercial processors sold packaged and labeled honey to urban supermarkets mostly in Mbarara town.

Price sensitivity of honey ranged from UGX 4,000 per litre with no regard for packaging, quality or origin, to UGX 20,000 per litre for commercial companies which added value through grading, packaging and labeling – with UGX 3500 equivalent to 1 USD (Bank of Uganda 2015). Average farm gate price per litre of honey was UGX 6,000 compared to 8,000 for middlemen and up to 20,000 for commercial processors. This implies that commercial processors were earning more per litre from the sale of honey as compared to beekeepers and middlemen. This is in agreement with IFAD (2008) that found out that global value chains are highly skewed away from those at the production end who receive much less of the total selling price.

The honey value chain actors and price variations along the chain

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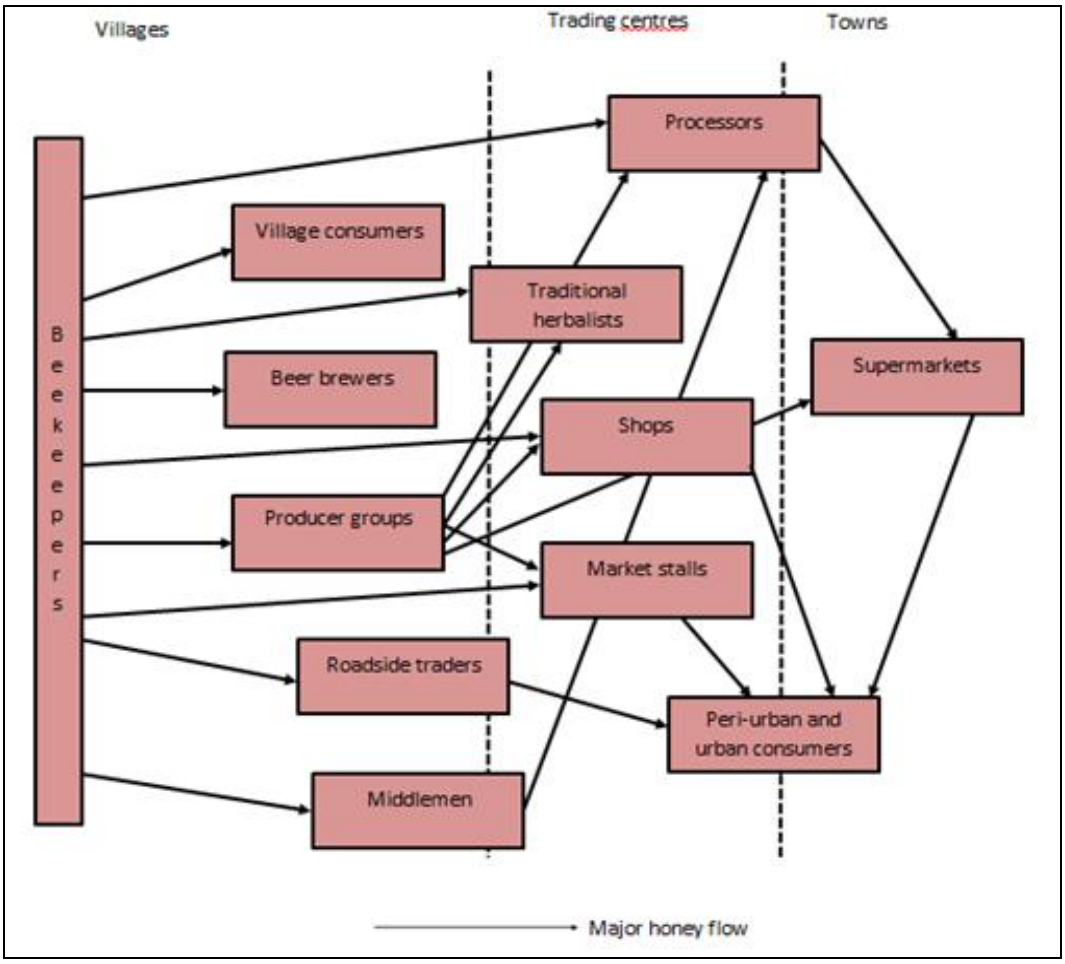

Figure 3. Schematic presentation of honey flow in the study area

Constraints in the honey value chain

The main constraints to beekeepers were pests, lack of equipment, low prices of honey and farm chemicals (pesticides and herbicides). Some of these constraints have also been identified in beekeeping communities elsewhere (Mujuni et al. 2012; Bansal et al. 2013; Kebede and Tadesse 2014). Pests that were reported to be detrimental included wax moth, red ants and termites leading to frequent absconding of bees. The incidence of bee pests is not new in Uganda. Kamatara (2006) also reported that ants cause up to 50.1% beehive abscondment in on-station hives in central Uganda. Beekeepers also lacked equipment like modern beehives, hive tools and protective gears. The cost of such equipment was high which acted as a disincentive to beekeeping. Most of the beekeepers were thus improvising and others coped through borrowing and hiring from friends. Beekeepers also expressed that low prices of honey is affecting honey production in the area. Besides, indiscriminate use of farm chemicals caused heavy loss of bees leading to insufficient populations in hives.

Middlemen were mainly facing transport problems (see Figure 4). They had to travel long distances to locate scattered beekeepers in search for honey. Yet sometimes, they would only get honey in insufficient quantities. They also experienced non-cash payments from other buyers which affected their business. For commercial processors, quality of honey was very paramount. However, in most cases, they declined to buy honey from beekeepers and traders because it was often of poor quality. They also expressed that the cost of processing equipment was high. Their other challenge was the unreliable supply from traders and beekeepers who often chose to sell through other market channels.

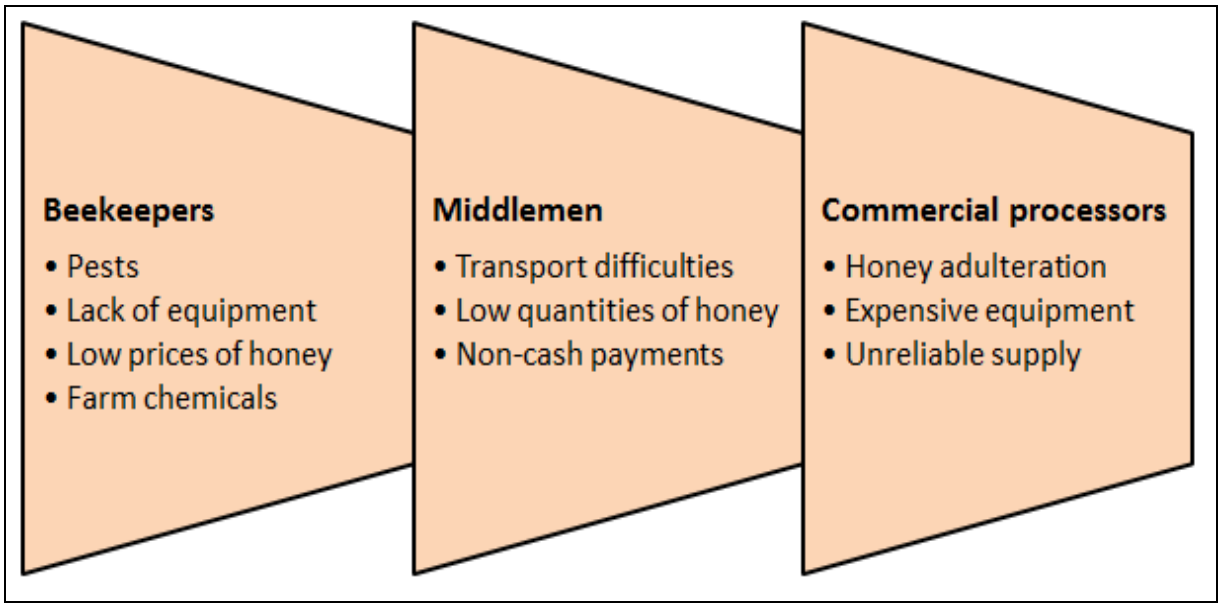

Figure 4. Challenges faced by different players in the honey value chain

Concluding remarks

Beekeeping has a very big potential and presents opportunities for people living adjacent to Kalinzu forest for income generation. However, the potential to create a significant livelihood from selling honey will remain out-of-reach unless there are serious interventions to transform the highly traditional honey production systems. Adopting improved technologies and management practices would greatly increase honey quality and quantity. The main socio-economic factors that would influence the adoption of improved beehives are formal education and training in bee keeping.

The honey value chain in the study area is still less developed. Beekeeping is to a large extent still evolving as an economic activity. Collective activities in procurement of inputs and marketing of honey were still lacking. This is because farmer established groups

other than those supported by NFA were very weak. Organizing a critical mass of commercially oriented beekeepers into functional groups will go a long way towards reducing individual transaction costs and easing market linkages for them to reap more from the enterprise.

Solving the problems faced by different players in the honey value chain would help them fetch better returns from honey. Support from government and development partners should thus focus more towards organizing specialized trainings to overcome production, processing and marketing constraints. Training and certification of bee-hive markers and other input suppliers is necessary so that farmers can access adequate and quality apiculture inputs at affordable prices.

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Photogrpah 1: Typical beehives in the study area near Kalinzu forest in Western Uganda

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