

ARTICLE

# KRIFS Quartet Model Improving Livelihoods and Fueling Tourism in Kitagwenda District, Western Uganda

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ABSTRACT

Kyabwanswa Rural Integrated Farming Systems (KRIFS) is a Community Based Organization (CBO) with its Head Office in Kitagwenda Town Council. KRIFS quartet model involves emphasis of integrating four agricultural activities namely: Apiculture, agro-forestry, coffee and at least one type of livestock. The paper utilizes data obtained from January 2017 surveys, interviews, focus group discussions and observations by the authors. The authors observe that the four activities are symbiotic income generating enterprises. The quartet model has greatly contributed in reducing poverty, increasing agricultural productivity, facilitating value addition, conserving the environment, halting biodiversity loss and mitigating climate change. The model is strongly hinged on training of farmers in organized groups more especially the youth and the women. The involvement of KRIFS in integrated farming that involves introducing new innovations to improve production and productivity in agriculture through improved breeds of livestock and crops as well as environmental conservation being pivotal in its operations, has culminated to agro-tourism in the district. The authors recommend that the model be implemented in the whole of Uganda. Apiculture should be included in the priority commodity list for the parish model. Agro-tourism is yet another economic activity that should be exploited to reduce unemployment, conserve the environment and reduce effects of climate change.

## 1. Introduction

Kyabwanswa Rural Integrated Farming Systems (KRIFS) is a Community Based Organization (CBO) that was formed in 2004 with its Head Office in Nyakateramire Ward, Kitagwenda Town Council, Kitagwenda district,

western Uganda. KRIFS' Vision is to play a leading role in improving rural agriculture through integrated farming. This is in agreement with Uganda Vision 2040 that aims at "A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years".

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This paper addresses Uganda Vision 2040’s three of the strategic bottlenecks that have constrained Uganda’s socio-economic development since her independence namely: weak private sector, underdeveloped human resources and underdevelopment of agriculture. Uganda aspires to transform the agriculture sector from subsistence farming to commercial agriculture. This is intended to make agriculture profitable, competitive and sustainable to provide food and income security to all the people of Uganda. It also creates employment opportunities along the entire commodity value chain of production, processing and marketing <sup>[1]</sup>.

A model can be a theory or law or hypothesis or structural idea. It can be a role, a relation or an equation. It can be a synthesis of data <sup>[19]</sup>. However, in this paper, a model is defined as “a simplified structuring of reality which presents supposedly significant features or relationships in generalized form. The most successful models possess a high probability of application and a wide range of conditions over which they apply <sup>[19]</sup>. Figure 1 shows that the Quartet model is highly flexible, for example, a farmer has wide choice of the livestock to rear, fruit types and coffee varieties to plant and in case of bee farming, the type of hive to use.

KRIFS quartet model involves emphasis of integrating four agricultural activities namely: Apiculture, agroforestry, coffee and at least one type of livestock as shown in Figure 1. Quartet is derived from the important four crops (Olive-Citrus-Vine-Wheat) in the Mediterranean Climate (Dry summer-Subtropics) of Western Europe

<sup>[2]</sup>. This is in line with the application of knowledge learnt from elsewhere to the Ugandan situations. This is in agreement with the Uganda Second National Development Plan (NDPII) that stipulates that the agriculture sector aims to ensure sustainable and market-oriented production, food security and household incomes in the country. It is comprised of three subsectors, namely Crop, Animal and Fisheries Resources (the quartet model dealing with the first two). During the NDPII period, the sector had a target of increasing agricultural exports to USD 4 billion by 2020 from USD 1.3 billion and reducing the number of the labour force in subsistence production from 6 million in 2012/13, majority of who are women to 3 million in 2019/20 <sup>[3]</sup>.

In 2014, KRIFS in conjunction with the Department of Geography, Geo-informatics and Climatic Sciences (DGGCS) and Kamwenge Bee Keepers Co-operative Society (KABECOS) presented an innovative idea to the Consortium for enhancing University Responsiveness to Agribusiness Development Ltd (CURAD). The innovative idea was: “Poverty reduction through Integrating Improved Bee, Coffee and Goat farming with Agroforestry in Kamwenge district (QUARTET)”. In the same year, KRIFS in conjunction with the DGGCS, KABECOS and Department of Geography and Environmental Engineering, West Point-New York presented an innovative idea to Global Knowledge Initiative (GKI) an International organization: “Poverty Reduction through Innovative Bee Farming and Processing Hive Products in Kamwenge district, Western Uganda (PRIB-FPHP)”.

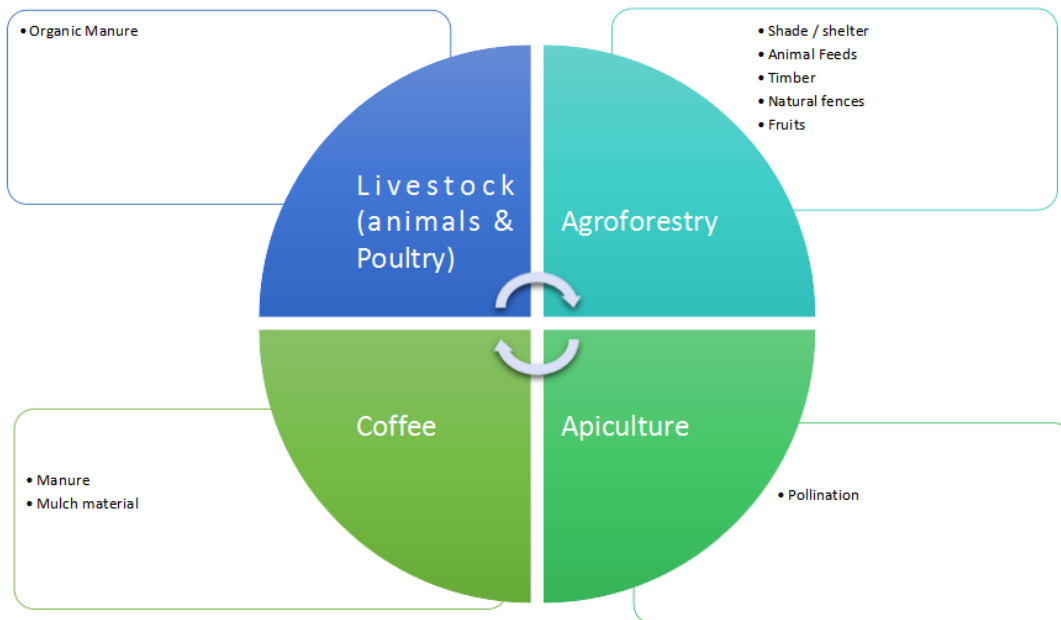


Figure 1. The Representation of the Quartet model

KRIFS and partners was one of the three finalists of the GKI Link Round IV (2014-15). The training that was offered by GKI changed the CBO from the the “Small Scale” (SS) to the “Think Big” (TB) approach.

In 2017, The partnership for Building Resilient Ecosystems and Livelihoods to Climate Change and Disaster Risks (BREAD) a grant project funded by SIDA made it possible to test the QUARTET model. One of the authors won a small grant titled: “Influence of Climate Change Variability on Livelihoods of Bee Farmers in Kamwenge district-Western Uganda” A section for testing the QUARTET model was added to the questionnaire and Focus Group Discussion questions for Ntara sub-county. This provided the survey data for this paper.

JENNI farm is one of the model farms in KRIFS. It is one of the Supper Sites (Field Laboratories). Super sites are centers in different locations of Uganda where the Department of Geography, Geo-informatics and Climatic Sciences of Makerere university use as focal points for research activities. This is in line with Makerere University policy of Community Outreach.

KRIFS encourages sustainable agricultural practices: “Efficient production of safe, high quality agricultural products in a way that protects and improves the natural environment, the social and economic conditions of farmers, their employees and local communities, and safeguards the health and welfare of all farmed species (www.saiplatform.org)” and sustainable development: “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

It emphasizes Integrated Farming system: “Whole farm management approach that combines the ecological care of a diverse and healthy environment with economic demands of agriculture to ensure a continuing supply of wholesome, affordable food” (www.seedbuzz.com) or “Concurrent linkages between two or more farming activities within a coordinated framework” This is simplified by KRIFS as “Feed me and I feed you” “*Ndisa nkulise*”.

KRIFS operates efficiently through organising local community in groups at household level referred to as KRIFS Focal Clubs (KFCs). Each KFC is composed of 10 households working for the same cause thus reducing poverty and sustainably conserving the environment.

Jenni farm is one of the leading model farms in KRIFS. Apart from offering free training services, it secures improved plant and animal varieties, market for products and farm inputs.

The KRIFS Quartet model differs from the one used by National Agricultural Advisory Services (NAADS) in

that it emphasizes four enterprises rather than the three for the latter. “NAADS operates through farmer groups at village level. The farmer groups in a given sub-county form the farmer forums. Each farmer group prioritizes three enterprises and the advisory service needs. The priority enterprises and advisory service needs are sent to the farmer forum, which determines three priority enterprises in the subcounty. NAADS supports the selected priority enterprises and the required advisory services needed to address the identified constraints and advisory service needs. Following selection of the three enterprises, NAADS provides technologies for demonstration on a member of a farmer group’s (or host farmers) field-technology development site (TDS). The host farmer is chosen by fellow members of the group, and private service providers are contracted to carry out the demonstrations and advise farmers at these TDSs”<sup>[18]</sup>.

The major objective of the paper is to illustrate an innovative development model that has been tried in Kitagwenda district by Kyabwanswa Rural Integrated Farming Systems (KRIFS) a local CBO in conjunction with the department of Geography Geo-informatics and Climatic Sciences (DGGCS) of Makerere University. Other objectives include the following: To upraise the values of bee farming in the improvement of livelihoods and emphasize its major link in the proposed quartet model in the district; to establish the proportion of the households that practice the four farming activities as propagated by KRIFS and to show the contribution of KRIFS in harnessing the vast agro-tourism potential in the district.

## 2. Materials and Methods

### 2.1 Study Area

Kitagwenda district is located in the south western part of Uganda. It is bordered by Kasese district in the West, Kamwenge in the North, Ibanda in the East and South East and Rubirizi in the South West (Figure 2). According to the Uganda Bureau of Statistics (UBOS), the population increased from 143,786 in 2014 to 178,300 in 2020 depicting a population change of + 3.75 per year (2014-2020)<sup>[4]</sup>. This is far above the national average of 3.01% per annum for the country between 2002 and 2014<sup>[5]</sup>. The population of the district is extremely rural (176,200) 93.8% and only (11,000) 6.2% as compared to the national average of 74.3% and 25.7% respectively.

Altitude of the district range between 1300 to 3800 m above sea level. As a result, temperatures range between 20 and 30 degrees centigrade. The district receives well distributed bimodal annual rainfall (February to April and

September to December) averaging 1200mm throughout the year for most parts. The greatest amount of rainfall is received in the southern parts of the district. The district is endowed with tropical high forests dominated by Kakasi-Kitomi Forest Reserve, woodland, grassland, papyrus reeds/swamp, open water.

## 2.2 Data Sources and Analysis

The main primary data for this paper were derived from a survey that was conducted in Kamwenge district

in January 2017. The current Kitagwenda district was one of the counties of Kamwenge district in 2017. It was carved from Kamwenge district in July 2019. Judgmental (purposive) sampling was used to get select Ntara subcounty for the study. Judgmental sample is the most subjective sampling method. Here, sample elements are selected based on judgment derived from prior experience. Sampling elements are selected based on the interviewer's experience that they are likely to produce the required results [16]. In case of this study, KRIFS headquarters are

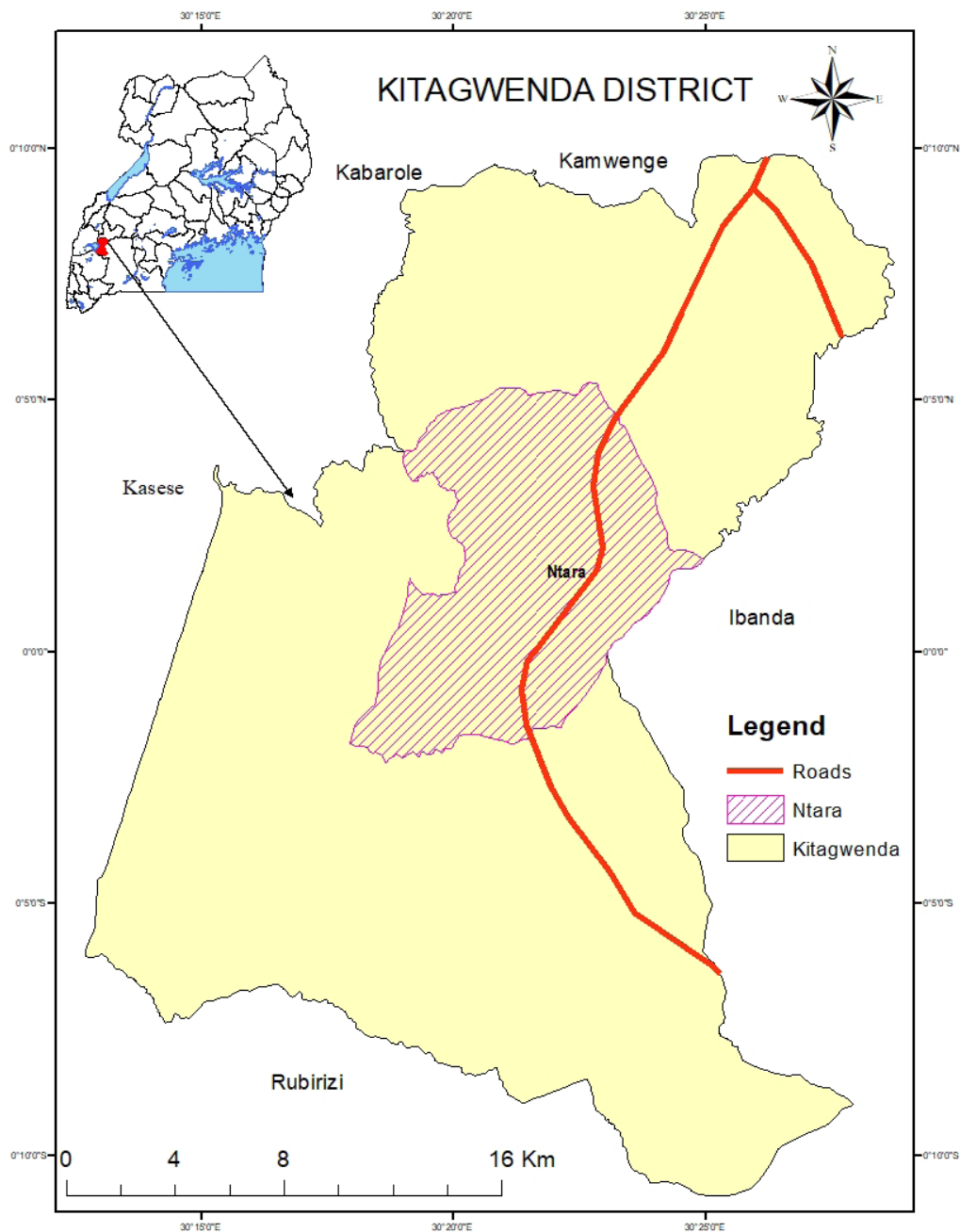


Figure 2. Map showing location of Kitagwenda and neighboring districts

in Ntara sub-county. This made Ntara sub-county the most appropriate. Snowball sampling was used to get respondents. Snowball sampling is non-random sampling method, which is used with the selection of people. This is based on a number of initial contacts that are asked for names and locations of any other people who might fulfill the sampling requirements. In this case, the bee farmers interviewed would help to inform the interviewers the location of the other bee farmers. For every bee farmer interviewed, the nearest neighbor non bee farmer would be selected as a respondent.

A total of 98 respondents from Ntara sub-county of Kitagwenda district who responded to the questions on the quartet model, 69 (70%) bee farmers and 29 (30%) non bee farmers were interviewed. Two Focus Group Discussions (FGDs) and four Key Informants provided additional detailed information. Observations by the authors played a vital role especially in the identification of natural and planted trees. The trees were identified in local names which were later cross checked with English and scientific ones<sup>[6]</sup>. Agro-tourism data source was a report written by one of the visitors of Jenni farm between 22<sup>nd</sup> and 25<sup>th</sup> June 2018. Secondary data included Uganda census results of 2002 and 2014.

Statistical analysis was done on two levels. In the first stage it involved univariate analysis to give the frequency distributions of the variables. This was followed by bivariate analysis using Chi-square. This statistic was

used to determine whether there were any significant associations between the dependent variable that is participation of the four activities (Quartet) and independent variables (size of land, income and type of house). Associations were considered significant at  $p < 0.05$ .

### 3. The Quartet Model

The livestock (goats, cattle and pigs) feed on conserved, planted and maintained plants. Their excreta are used as organic manure to increase productivity in crops such as maize, beans and cassava which in turn are used to feed the animals. The fruit trees inter-planted with bananas and coffee are also used as feed to the zero-grazed cattle and goats. Mutooma (*Ficus natalensis*) inter-planted with coffee for shade is the most delicious feed for the livestock (Photo 1).

The quartet model is intended to increase production and productivity using improved animal and crop breeds as well as innovative methods of farming. The model is an innovation of four interlinked agricultural enterprises (QUARTET). Bee farming does not require a lot of labour and the hive can produce many products highly demanded for their medicinal and food values. The improved hives will increase production of honey and other products such as pollen, propolis, royal jelly, bee wax and venom. The bees are pollinators, also increase yields of coffee and other crops. Agro-forestry increases the nectar and pollen for the bees by reducing the distance covered by the bees



Photo 1. Goats feeding on *Ficus natalensis*

in collecting the same raw materials for honey and other hive products. The fruit trees increase production of fruits. The trees also provide shade for the coffee while at the same time increase forage for the zero-graded animals such as goats. The animals supply the highly required organic manure from their urine and droppings thereby increasing yields of coffee and other crops.

Agro-forestry involves inter-planting coffee with trees for provision of shade for the coffee and forage for the zero-grazed animals. Fruit trees that are planted include: Vacados (*Persea americana*), Mangoes (*Mangifera indica*), Guavas (*Psidium guajava*) and Jack fruits (*Artocarpus heterophyllus*). In addition, Mutooma (*Ficus natalensis*) and Calliandra which are delicious feeds for goats shall be emphasized. Farmers are encouraged to conserve and propagate indigenous trees such as Musizi (*Maesopsis eminii*), Murongo (*Albizia grandibracteata*), Musasa (*Sapium ellipticum*), Mubirizi (*Vernonia amygdalina*), Munyinya (*Acacia gerrardii*), Mukunyu (*Ficus mucuso*), Murama (*Combretum molle*) and Mwitibale (*Blighia unijugata*). *Grevillea robusta* is planted in the boundaries of the farms. These trees are frequently visited by bees for nectar and other products. At the same time, trees to contribute to environmental conservation and improve the micro-climate of the area<sup>[6]</sup>.

It is envisaged that QUARTET innovation will be scaled out to other members in the district and other parts of the country through farmer to farmer extension, tapping into expertise gained by the KRIFS farmers. The proposed

engagement is in tandem with Uganda government policies of increasing production and productivity through nucleus farmers in the private sector. It is also meant to support small holder farmers, increase value addition and therefore household income. This concurs with the objective interventions 1 of the Uganda National Development plan II: Increase agricultural production and productivity.

One KI summarized the quartet model as follows: *“It is a life time business that insures old age insurance that is lacking in the country. An old man aged 80 years shall be able to harvest honey and process other hive products, sell coffee and manage to raise high quality animals that shall be feeding from forage from the trees that he planted 20 years ago and sell timber from Musizi and Grevillea”.*

Beans, cassava, ground nuts are inter-planted with eucalyptus for a period of two years, five in pine and seven in musizi (*maesopsis eminii*) and gravelia. When the crops are no longer planted, the goats and cattle graze under the trees enjoying the shade and soft grass. The most loved paddocks by the cattle on Jenni farm are those with musizi (*maesopsis eminii*) trees (Photo 2).

The conserved trees and planted ones are used in fencing the paddocks for the cattle and the goats. The dry leaves that drop from the branches of the trees are used as mulch for coffee and other crops. The mature trees are processed into timber for making bee hives and other products (Photo 3).

The goats and cattle use the same paddocks because



**Photo 2.** Cattle grazing in the musiza paddock



**Photo 3.** Mature trees from natural forest provide timber for construction of bee hives.

they have different feeding habits. Goats are 90% browsers and 10% grazers while cattle are 90% grazers and 10% browsers. Due to many crops grown, the conserved and planted forests provide forage for the bees. The bees in turn help in pollination of crops and therefore increasing yields. The whistling pine which does not provide timber is one of the most frequently visited trees in the compound.

#### 4. Analysis and Discussion of Results

The results show that out of the 98 members of the households that responded to the question on the quartet model, 42 (43%) participated in all the four activities as observed in Table 1.

**Table 1.** Participation in the four activities.

Level of Participation	Number	Percent
Participated in four activities	42	42.9
Did not participate in all the four activities	56	57.1
<b>Total</b>	<b>98</b>	<b>100.0</b>

Source: 2017 survey data

On the other hand, Table 2 shows that out of the 41 respondents of the 56 respondents that were not involved in all the four activities, the majority (71%) were not involved in bee farming. This is not surprising, because previous studies revealed that the biggest proportion (37%) of the respondents were not practicing apiculture

because they lacked training that was connected to ignorance and fearing the bees <sup>[7]</sup>. The second biggest proportion (19%) stressed shortage of land as the main reason. However, it should be noted that with training and provision of protective harvesting gear, the fear of the bees can be solved. With the issue of land, even those with small pieces of land can also carry out bee farming if they have neighbors with big chunks of land or are neighboring protected areas such as National parks and game reserves. One of the KI remarked: “the bees do not respect boundaries of land. They move to where ever there is forage!!!”

**Table 2.** Activities not engaged in by farmers in the quartet model.

Activities	Number	percent
Bees	29	70.73
Livestock	2	4.88
Agroforestry	2	4.88
Bees & coffee	2	4.88
Bees & agroforestry	2	4.88
Coffee & livestock	2	4.88
Bees & livestock	1	2.4
Bees, coffee & livestock	1	2.4
<b>Total</b>	<b>41</b>	<b>99.93</b>

Source: 2017 survey data

The respondents revealed that they had small pieces

of land since many of them had either inherited it from their parents or had subdivided it to their children leaving each individual with a tinny acreage of land. Participation in the four activities was cross tabulated with size of land, income and type of house. Size of land ( $p= 0.001$ ) and Income ( $p = 0.020$ ) are significant. This is because Agroforestry and apiculture need large land size and money to establish. Lack of land and capital were listed as second and third in hindering bee farming as shown in Figure 3.

**Table 3.** Participation in four activities according to size of land, income and type of house.

Size of land (acres)	Yes	No	Total
1 to 5	13	37	50
6 to 10	15	6	21
11 to 15	4	4	8
Above 15	5	1	6
Total	37	48	85

Chi- square = 16.9,  $p= 0.001$

Annual Income bracket	Yes	No	Total
Less than 720,000/=	25	47	72
2,400,000 to 6,000,000/=	16	9	25
Over 6,000,000	1	0	1
Total	42	56	98

Chi-square = 7.842,  $p = 0.020$

Type of house	Yes	No	Total
Permanent	15	13	28
Semi-permanent	22	42	64
Temporary	0	1	1
Total	37	56	93

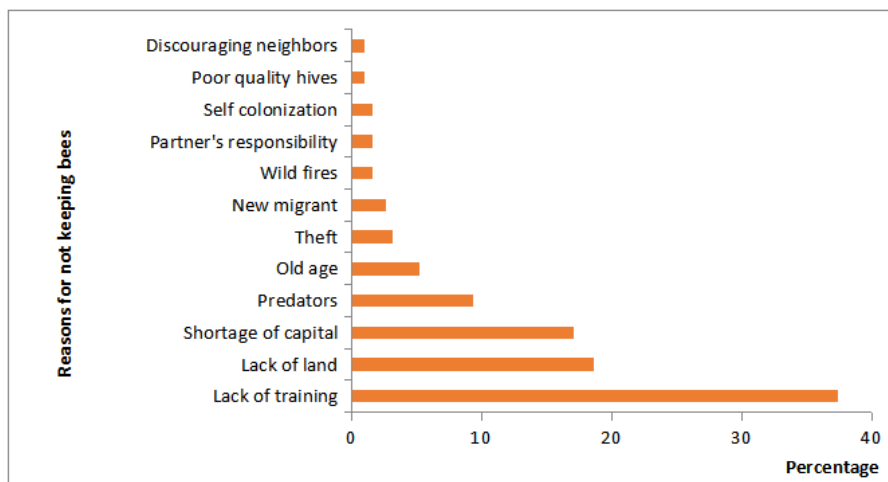
Chi- square = 3.664,  $p = 0.160$

Source: 2017 survey data

### 4.1 Bee Keeping

Bee keeping is one of the most undertakings for poverty alleviation. This fits well in the Uganda government strategies of transforming subsistence to commercial farming and linking agriculture to industry through agro-processing to curb unemployment as enshrined in the National Development Plan (2010-2015). It is one of the projects where funding by Uganda government for the youth is available through the Youth Livelihood Programme (YLP) [8]. However, apiary is not among the eighteen prioritized development commodities under the Parish Development Model (PDM) which is expected to start in the Fiscal year 2021/22. The priority commodity list for the parish model include: Coffee, cotton, cocoa, cassava, tea, vegetable oils/oil palm, maize, rice, sugar cane, fish, diary, beef, bananas, beans, avocado, shea nut and macadamia nuts [16].

Beekeeping or modern apiculture is the art and science of rearing, breeding and managing bee colonies in artificial hives for economic benefits. It has evolved into a farming enterprise that involves the use of sophisticated and artificial techniques to keep bees for bee products such as honey, propolis, wax, pollen, bee venom and royal jelly. It contributes significantly to securing sustainable livelihoods by assisting in transforming vulnerabilities into security [9]. It is an important component of agriculture and rural development in many countries. It provides nutritional, economic and ecological security to rural communities. Beekeeping is a useful means of strengthening livelihoods and has been identified as a viable agricultural practice that could alleviate poverty and sustain rural employment. It causes no disturbance to the natural environment. It creates an economic incentive for rural people to conserve



**Figure 3.** Reasons for not keeping bees.

Source: 2017 survey data



natural vegetation. It is the ultimate environmentally sustainable activity<sup>[10]</sup>. Improved bee farming would increase production of honey and other products such as pollen, propolis, royal jelly, bee wax and venom that will be processed to add value. Previous studies highlighted that in apiculture sub-sector, the national goal is to enhance the production and marketing of honey and other hive products. Increase in the number of bees, the best pollinators, will further increase yields of crops such as coffee, mangoes maize, beans and other crops<sup>[7]</sup>.

Beekeeping requires minimal start- up investment and generally yields profits within the first year of operation. It contributes significantly to securing sustainable livelihoods by assisting in transforming vulnerabilities into security. It is carried out by small farmers, and it is particularly suitable for under-privileged landless and low income, low resource individuals and groups<sup>[11]</sup>. Beekeeping is regarded as an activity that complements existing farming systems in Kenya<sup>[10]</sup>. It is simple and relatively cheap to start, enhance the environment and contribute to biodiversity through the pollinating activity of bees. It provides incentive to conserve natural forests to provide an abundance of excellent bee forage. It is completely sustainable, generates income and requires a very low level of inputs (land, labour, capital and knowledge] in

its simplest form. It is therefore an ideal activity for small scale, resource poor farmers. KRIFS carries out training of bee farmers therefore solving the most significant problem of lack of training (Figure 3) and makes improved top bar hives as well as protective harvesting gear which it sells at subsidized prices.

#### 4.2 Coffee

Coffee is the major perennial cash crop in Kitagwenda that was introduced during the colonial period. Bananas have recently become another cash crop although have been regarded as food crops for a very long time (Figure 4).

Coffee in some cases is inter-planted with bananas. Cassava used to be perennial crop but due to climate change and introduction of new varieties, it is now seasonal. Respondents still regard it as perennial. It is also a food and cash crop especially for Rwanda and DRC markets. Coffee seedlings provided by government free of charge for the last 10 years. Beans and Maize are major seasonal food and cash crops that usually inter-planted. Beans are stressed for nitrogen fixing. Millet and groundnuts have reduced in importance due to reduction in soil fertility and increase in population that has reduced the fallow period. Coffee is a popular crop in the district as observed from one of the KIs.

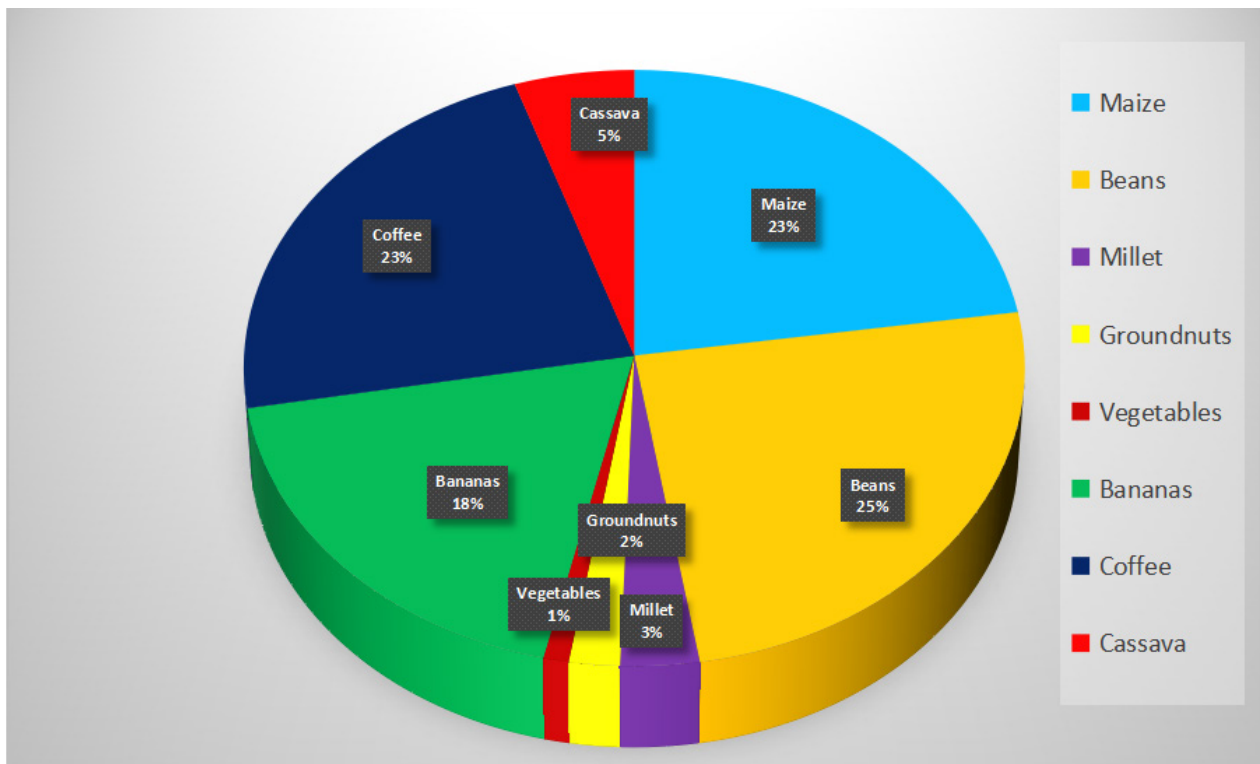


Figure 4. Seasonal and cash crops grown in Kitagwenda

Source: 2017 survey data

“Coffee is a perennial crop. You plant once and you keep enjoying your money for life. It is harvested twice a year. One earns cash twice in a year. The government is also interested in the crop. From one acre of coffee, if well managed, one can earn three million shillings a year”

The government of Uganda has for a long time emphasized coffee growing as evident from the distribution of agricultural inputs using various approaches: public private partnership arrangements, community procurement like under National Agricultural Advisory Services (NAADS), and Ministry of agriculture, animal industry and fisheries (MAAIF) through provision of seedlings; and the private sector and cooperatives. From 2014, Uganda government embarked on the programme of distributing free agricultural inputs (seeds, seedlings, planting materials and breeding stock) to farmers known as Operation Wealth Creation programme (OWC) with the main goal of commercializing agriculture by creating wealth at household level and reducing poverty. The programme uses the army, the Uganda Peoples Defence Forces (UPDF) to distribute and supervise delivery of inputs [15]. KRIFS through Uganda Coffee Development Authority (UCDA) supplied 63,680 coffee seedlings to farmers in Ntara sub-county, Kitagwenda district between November 2016 and February 2020.

**4.3 Livestock**

More than half of the respondents (54%) kept animals while 46% did not (Table 4).

**Table 4.** Keeping animals

Animal keeping	Number	Percent
Yes	53	54.1
No	45	45.9
Total	98	100.0

Source: 2017 survey data

Animal keeping is generally regarded as a common venture in Kitagwenda. A KI had this to say:

“How can one regard himself as a head of family when he does not own a goat or chicken? The Batagwenda who were traditional hunters enjoy eating meat. The laws no longer allow people to hunt wild animals for meat. We therefore need to have our own animals for meat. Moreover, animals are essential items in cultural practice of bride price in marriage. These days when, you have animals, you have money”

The most common animals reared in Kitagwenda are goats (30%) followed by chicken (28%), pigs (26%) Small proportions of farmers keep cattle (5%), ducks (5%),

sheep (3%) and rabbits (1%) (Table 5).

**Table 5.** Animals kept

Animals	Responses	
	Number	Percent
Cattle	5	5.4
Goats	28	30.4
Sheep	3	3.3
Pigs	24	26.1
Chicken	26	28.3
Duck	5	5.4
Rabbits	1	1.1
Total	92	100

Source: 2017 survey data

KRIFS has played a big role in the improvement of goat breeds through emphasizing rearing of boer goat breeds in Kitagwenda district. The first buck boer goat was introduced in Jenni farm as early as 1997 and was used to crossbreed with the local mubende goats.

The South African boer goat is one breed that has been specifically selected for high meet production and quality. Introduction of exotic breeds and their use for upgrading indigenous breeds has been widely adopted my farmer communities and organizations as an alternative way of improving the low output of meat and milk among the indigenous goats [20].

**4.4 Agro-forestry**

Growing of fruit trees is a traditional activity. It is not common to find a homestead without fruit trees. Members of the Focus Group Discussion all agreed that fruit trees are part of homesteads in many parts of Uganda. Table 6 displays the commonly planted trees in the study area.

**Table 6.** Common varieties of planted trees

Planted Trees	Responses	
	N	Percent
Eucalyptus	19	13.3
Pine	3	2.1
Musiza	4	2.8
Mangoes	31	21.7
Avocadoes	30	21.0
Guavas	23	16.1
Jackfruit	27	18.9
Oranges	1	0.7
Pawpaws	5	3.5
Total	143	100

Source: 2017 survey data

Common trees planted include mangoes (*Mangifera indica*) (22%), avocados (*Persea americana*), (21%), Jackfruit (*Artocarpus heterophyllus*) (19%) and Guava (*Psidium guajava*), (16%). Eucalyptus (13%) is the dominant tree planted mainly for building and firewood. It has of recent become a commercial tree grown on large scale for timber. Other commercial trees for timber include musiza (4%) and pine (3%). In 2008, KRIFS in collaboration with Kamwenge Local Government collected and distributed the first 2000 improved mango seedlings from Kawanda research station paving the way for large scale farming in the area.

The following tree species have been planted by Jenni farm: Mutooma (*Ficus natalensis*), Musizi (*Maesopsis eminii*), Neem (*Azadirachta indica*) Mexican cypress (*Cupressus insitanica*), Whistling pine (*Casuarina equisetifolia*), Muluku (*Sapium ellipticum*), Castor oil plant (*Ricinus communis*), Calliandra (*Calliandra calothyrsus*), Podo (*Podocarpus latifolius*), Tipu tree (*Tipuana tipu*) and Ruyenze (*Euphorbia tirucalli*). In addition, Jenni farm has conserved the following other indigenous tree species: Murongo (*Albizia grandibracteata*), Munyinya (*Acacia gerrardii*), Rugando (*Acacia hockii*), Muko (*Erythrina abyssinica*), Murama (*Combretum molle*), Musasa (*Sapium ellipticum*), Mubirizi (*Vernonia amygdalina*), Mukunyu (*Ficus mucoso*), Musebeya (*Albizia Versicolor*), Musambya (*Markhamia lutea*), Mulamula (*Dracaena fragrus*), Muhoko (*Diaspyros abyssinica*), Mwatibale (*Blighia unijugata*), Mwongogwenkende (*Tabernaemontana pachysiphon*), Muzigangoma (*Cordia Africana*), Kirundu (*Antiaris toxicaria*) and Palm trees in the wetlands<sup>[6]</sup>.

#### 4.5 Protection and Improvement of the Natural Environment

The wetlands and riverine forests in the valleys have been conserved and preserved. Trees in the rest of the farm are conserved. In farm repairs, branches of trees are used. Cutting a whole tree in farm requires knowledge of the top management. The 200 year old musisa (*Olea capensis*) with six off-springs is the best example of the conservation of indigenous trees (Photo 4). Of the six off-springs, only one is over 33 years. Before the owners of Jenni farm settled in the area in 1987, the vegetation was burnt twice a year. This could not allow the young *Olea capensis* to grow.

The place which was grassland in 1987 is now covered by crops on top of the hill, beautiful forests and woodland savannah on the slopes and wetlands in the valley bottoms. The wetlands in the valleys have provided a favourable environment for the national bird the Crested

Crane to multiply. Crested cranes are strictly monogamous birds that lay their eggs in wetlands.



**Photo 4.** The oldest musisa (*Olea capensis*) preserved on Jenni farm

#### 4.6 Agro-tourism

KRIFS through Jenni farm has moved a step further to include special agro-tourism in Kitagwenda district. This is intended to give a special treat to the tourists through four categories. First, tourists visit a number of farm sections of Jenni farm and are involved in daily farm activities. This involves visitor participating in agricultural activities with the household members. For example, if the day is intended for bee farming, the visitors are having to be guided through the stages of hive making, bee trapping, cleaning the apiary, honey harvesting and processing as well as making other hive products. Experiences of one of the tourists on Jenni farm are given below:

“I must say that Kyabwanswa is a beautiful sprawling woodlot typical of English homesteads as observed from one scene below: Standing on the Eastern side of the main Kyabwanswa Hill, one can see a typical equatorial forest in the valley and in the background observe a pine forest on top of a Hill locally called Kinyamugara also part of Jenni farm in the background, as shown in Photo 5<sup>[12]</sup>.”



**Photo 5.** Equatorial forest in foreground and pine forest in the background

The activities that stand out are goat rearing, fruit growing, poultry keeping, cattle keeping, growing of all kinds of trees like eucalytus, musizi, pine, gravellier, but to mention a few. Other activities that take credence and are worth mentioning are beekeeping, biogas and use of the swamp to tap water, forming a dam.

All these are enterprises that are handled in a manner that is sustainable and adds value to the entire farming system. The philosophy of having an integrated farming system is clearly brought into light when you begin with the importance of conserving the wetland that provides the water for human and animal life sustenance. It is worth noting that each one of us comes up with an assessment of the entire enterprise. The following priority areas that truly stand out and could be further developed scientifically and research carried out: (1) Geographical engineering that ensures flow of water from the roof to the tank; also referred to as water harvesting. Creation of dams in the wetlands is highly commendable because the wetlands preserved and conserved help the farmer go through the long dry season. (2) The Bio-gas that helps in energy fuel saving. Meals at Kyanbwanswa are cooked using bio-gas. (3) The fruit trees that enrich diet, and help to prevent certain diseases like cancer, etc. (4) The forest cover that ensures a constant cool breeze, supply of timber for various purposes. Natural forests are also conserved. (5) The beekeeping activity with production of honey as well creams for skin beautification as well as healing. 6.

Animal husbandry that ensures a constant supply of milk. Poultry that brings in eggs. All this is for sale and home consumption.

All these enterprises are home based and have had a profound effect on improving the household incomes as well transforming lives of people in Kyabwanswa. As far as security is concerned, as there are three strong dogs for that purpose. The meals prepared are delicious. All the food cooked is obtained from the farm. A typical dish for lunch and supper begins with fruit served, then matooke, chicken or beef. For breakfast and the other meals too, honey that is homemade is served on table. Guests are assured of having enough to eat from Kyabwanswa. All kinds of fruits are available like mangoes, jackfruit, strawberries, ovacado, pineapples etc. Therefore a visit to Kyabwamswa will surely leave you fully satisfied, educated, comforted from the stress of life and wishing you would stay longer”<sup>[12]</sup>.

Secondly, tourists undertake landscape viewing using the numerous highlands around Jenni farm and river Mpanga gorge that is endowed with *Cycad* (Photo 6).

The *Cycad* plant scientifically known as the *Encephalartos villosus*, is an evergreen ornamental plant categorised as either male or female that lives for a long time. The cycad is only 6 km from Jenni farm. *Cycad* is a pre-historic plant species that from a distance could easily be mistaken for a type of palm tree but on close inspection has no relationship at all to palm trees. Located in Karubuguma



**Photo 6.** Cycad in Kitagwenda threatened by agricultural activities

I and II villages in Kitagwenda district, western Uganda, is the largest cycad in Uganda <sup>[13]</sup>. Uganda Tourism Board (UTB) is looking at creating a number of packages aimed at promoting the area to tourists. These include nature hikes, camping, canoeing, zip-lining, rock climbing and the cycad trail, among others. Therefore, promotion of tourism in the area would have a trickle-down effect that would see the local population stop the destructive activities on their lands as they would earn a livelihood from tourism. Other than the cycad plants, the area is home to beautiful sceneries, the presence of waterfalls along river Mpanga and the close proximity to Lake George and several national parks <sup>[13]</sup>. Cycad Plants, one of the most threatened plants in the wild, are capable of boosting Uganda's tourism if protected, tourism experts have observed. The male plant produces cones filled with pollen, while the female, usually bigger in size, produces seeds. Cycads are usually found in good landscape areas that are well moist, drained and with a mild climate. They are believed to be the oldest seed plants on earth traced from 315 million years ago even before the Jurassic period when dinosaurs flourished <sup>[14]</sup>.

The third stage of tourism organized by Jenni farm, involves visiting other areas of attraction in Fort Portal Tourism City area. These include, Queen Elizabeth National Park, Kibale Forest National Park, Semuliki National Park, Rwenzori National, Katonga Game Reserve and Kakasi-Kitomi Forest Reserve.

## **5. Conclusions and Recommendations**

The quartet model that involves encouraging farmers to grow coffee as the main cash crop, integrated with trees as shade and providing timber, firewood and fruits while rearing bees to pollinate the crops and keeping at least one type of livestock to provide manure and extra income as well as animal protein has been successfully used to increase production and productivity as well as diversification of sources of income and therefore playing a big role model in the reduction of poverty in Kitagwenda district. It is therefore recommended that the model be implemented in the whole of Uganda with adjustments to any four linked items depending on the agro-climatic conditions and preferences of the farmers after careful studies as has been the case in Kitagwenda district. Apiary should be included in the priority commodity list for the parish model. Agro-tourism is yet another economic activity that should be exploited to reduce unemployment and conserve the environment and reduce effects of climate change.

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