

# Study On the Contribution of Bee Farming On the Socio-Economic Transformation of Communities in Rural Areas in Arua District a Case Study of Pajulu Sub-County

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**Abstract:** *In order to assess the impact of beekeeping intervention on the socio-economic transformation of rural communities, figure out the factors that motivate smallholder farmers to participate in beekeeping, and determine the differences in household incomes between participants and non-participants, this paper compiled the beekeeping practice, marketing system, existence of opportunities, and constraints in Uganda. Due to the abundant apicultural resources, Uganda is the country's entire top producer of honey and beeswax. Traditional backyard, traditional forest, transitional, and modernized beekeeping techniques were all available in Uganda. The chi-square test revealed a substantial correlation between beekeeping and socioeconomic transformation because the p-value (0.04) was below the threshold at the 95% confidence level. The opportunities for beekeeping in Uganda have been found to be the presence of natural forests with the enough apiculture flora and water management, the existence of numerous bee colonies, the accessibility of farmers with indigenous knowledge, the socioeconomic value of honey, and the demand for honeybee products. Despite  $0.026 > 0.05$ , we accept the null hypothesis and get to the judgment that the disturbance terms are normally distributed with a bell-shaped curve by comparing the jarque-bera with the significance level. Although the price of honey and beeswax for export was increasing, the price of honey on the local market was generally higher than the price of honey on the international market, making honey export less lucrative in Uganda due to the country's rising demand. Even though, the export price of honey and beeswax was increasing, the honey price in the domestic market was mostly advanced than the international honey price which makes honey export less profitable in Uganda, due to increasing the demand of the country, as a result of this reason many of these honey exporters have dropped out of the international honey trade. Transitional hives are more productive than traditional hives and do not demand expensive high tech beekeeping accessories. The only costs involved are providing the design of the hives, training and initial support. In addition, transitional hives significantly improve the quality of honey since it allows farmers to inspect ripening of the honey. Farmers' annual incomes from honey can be improved through increasing the adoption of improved bee hives. The higher income also motivates the beekeepers to adopt the technology more intensively. Therefore, honey processors, governmental and NGOs should intensively promote the adoption of transitional beekeeping to help farmers increase their income with low cost.*

**Keywords:** NGO'S, bee farming, socio-economic transformation communities

## Background of the study

Given the excellent ecological conditions and floral diversity that now exist, Uganda is one of the countries with a substantial number of potential for beekeeping (UEPB 2005; Kilimo Trust 2012). In the country, regions with existing floral resources are ideal for beekeeping (UBOS, 2010). In terms of nectar and pollen grain quality and quantity, forests are an adequate source of food for bees. Because of this, beekeeping may also expand opportunities for sustainable management of natural resources (CIFOR 2008). When encouraged among communities near forests, beekeeping offers sustainable sources of revenue (Adgaba, 2014).

Uganda produces only approximately 2 million metric tons of honey annually, which is only 1% of the estimated 500,000 tonnes of potential national annual production, despite the favorable ecological conditions and floral diversity (Abere, 2012). The primarily small-scale operations that use traditional manufacturing techniques are to blame for Uganda's low honey production. As a result, the amount of honey produced is insufficient to satisfy the continuously increasing domestic and regional demand.

Just 1% of the projected 500,000 tonnes of output potential is harvested by Ugandan beekeepers. Weak policies, inadequate investment, and a lack of knowledge sharing among stakeholders are only a few causes of low production. The region of northern Uganda, where 60% of families have hives, offers the greatest possibility for raising beekeeping production. Beekeepers in the area face challenges due to the seasonality of forage, restricted availability to tools and training, and exacerbated droughts and bushfires. Forage crop development has been shown to boost hive productivity and colony survivability. The success of a beekeeping activity in rural communities is contingent upon its profitability within the farmstead. This study modelled potential yield changes for three

hive types, coupled with a dry season carbohydrate source to sustain colonies during periods of forage scarcity. Provision of a year-round bee forage plant was hypothesized to reduce absconding and increase colony survival leading to increased yields

### PROBLEM STATEMENT

Given its variety of floral species, Uganda has a very high potential for beekeeping. Due to very traditional production methods and a lack of apicultural research, this potential has not been completely realized. The survey of 60 beekeepers in locations close to the Kalinzu forest was the foundation for this study, which was carried out in May 2014. A logistic regression model was employed in the study to analyze the variables influencing the adoption of enhanced beehives. Where  $\ln Y_i = 0 + 1 (\log K) + 2 (\log L) + 3 (\log Q) + E_t$  (logistic model). The study also examined the regional honey value chain to identify particular challenges faced by beekeepers in the research region. The adoption of improved beehives was shown to be factor motivating by education and training in beekeeping. Beekeepers, middlemen, and industrialized processors dominated the honey value chain. The biggest issues affecting honey producers were pests, a lack of equipment, low prices for bee products, and farm sprays. Due of high transportation expenses, low honey collecting rates, and non-cash payments from customers, middlemen were restricted.

Just 1% of the projected 500,000 tons of production potential is harvested by Ugandan beekeepers. Low output is ascribed to a number of issues, including ineffective policies, inadequate investment, and a lack of knowledge sharing between players (Haftom, 2013). The region of northern Uganda, where 60% of families have hives, has the most opportunity for increasing beekeeping production. Beekeepers in the area face challenges due to the seasonality of forage, restricted accessibility to tools and training, and intensified droughts and bushfires. The benefits of planting forage crops to increase hive yields and colony survival are known.

### Specific objectives of the study

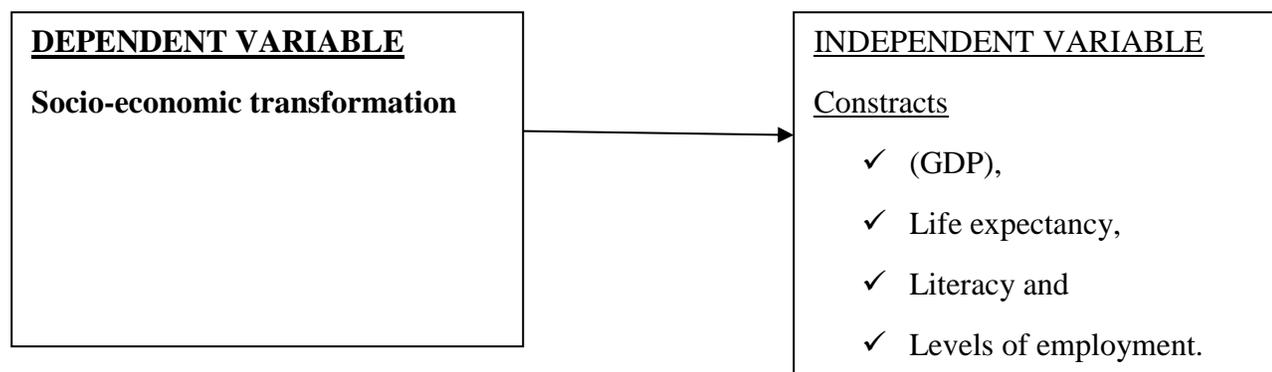
The objectives that guided the study included the following;

1. To assess the impact of beekeeping intervention on the socio-economic transformation of communities in rural areas
2. To determine factors that influence small holder farmers to participate in beekeeping.
3. To assess the differences in household incomes between participants and non-participants.

### Research Questions

1. What is the impact of bee keeping intervention on the socio economic transformation of communities in rural area of Pajulu sub-county Arua district?
2. What are the factors that influence small house farmers to participate in bee keeping in Pajulu sub county arua district?
3. What are the differences in house hold incomes between the participants and non-participants in Pajulu sub count arua district?

### Conceptual framework



Source: adopted from Mujuni et al. (2012) and modified by the researcher

### LITERATURE REVIEW

A review of the literature involves locating, exploring, and evaluating research journals that were relevant to the subject at hand. In this chapter, the researcher researched pertinent literature on the study objectives' independent variables. The review was structured according to the study's objectives and concentrated on the effects of beekeeping intervention on the socioeconomic transformation of rural communities. It also sought to identify the factors that encourage smallholder farmers to engage in beekeeping and to compare the household incomes of participants and non-participants.

### **Theoretical review**

Given its diversity of floral species, Uganda has a very high potential for beekeeping. Due to very antiquated production methods and a lack of apicultural research, this potential has not been properly exploited. The survey of 60 beekeepers in locations close to the Kalinzu forest served as the basis for this study, which was carried out in May 2014. The study used a logistic regression model to analyze the variables that affect the extent to which improved beehives are adopted. The study also examined the regional honey value chain to evaluate specific difficulties faced by beekeepers in the studied area. The adoption of improved beehives was shown to be frequent occurrence by education and training in beekeeping. Beekeepers, middlemen, and industrial processors dominated the honey value chain. Pests, a lack of resources, affordable 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. Commercialization efforts should therefore focus on specialized trainings that overcome the constraints identified in the value chain.

### **Bees, people and the planet**

There are 20,000 documented species of bees in seven known groups (Ascher and Pickering 2014). Bees play an important ecological role as pollinators for a number of flowering plant species since their evolutionary radiation symbiotic organisms with that of flowering plants (Kajobe, 2009). Bees are the most prevalent taxonomic group among pollinators, even if they are not the most diverse (butterflies and moths have over 140 000 species each), with the notable exception of the Arctic regions, where another group (flies) is more dominant (Gebiso , 2015)

### **Review according to the objectives**

#### **To assess the impact of beekeeping intervention on the socio-economic transformation of communities in rural areas**

Bees provide a wide range of environmental services that support the planet's life support systems and improve human well-being (Gill et al. 2016; Matias et al. 2017). The delivery of ecosystem services naturally aids in achieving global sustainable development (Wood et al. 2018). The extent to which bees aid in achieving the entire set of SDGs, however, has not been thoroughly investigated. The regulation of natural cycles, biological pest control, pollination, seed dispersion, and even as a source of bio-inspiration have all been demonstrated to be important ways that insects help achieve a number of SDGs..

#### **To determine factors that influence small holder farmers to participate in beekeeping.**

There are a lot of agricultural and agro-based opportunities in rural areas that can be used to earn cash and provide jobs. Beekeeping has been identified as a sustainable agriculture activity that could reduce poverty and maintain rural employment in Nigeria and is a beneficial way to boost livelihoods (Beyene, 2014) According to the remark, beekeeping should not be undervalued as a source of additional income, food, and employment even though it is uncommon for it to become a person's only sources of income and means of sustenance in the Third World. The following key points support the claim that beekeeping is a critical element in order to encourage rural self-reliance: • Beekeeping encourages rural diversification and is thus an alternative source of income and employment, especially in areas where arable land is limited and demographic growth is resulting in an increase in underemployment.

- Beekeeping is an activity that has successfully been adopted by women in many parts of the continent.
- Beekeeping allows for a degree of risk avoidance by providing a reliable, high-value product that enables rural farmers to survive in times of economic crisis. This is particularly true of beeswax, which can be stored indefinitely.
- Beekeeping clearly is a low-cost, sustainable undertaking with a low environmental impact. The spin-off of enhanced plant pollination is an invaluable one.
- Although honey is not a primary source of food, it can be used as a dietary supplement.

#### **To assess the differences in household incomes between participants and non-participants**

Both contracted and non-contract beekeepers released details on many socioeconomic factors of households. A list of variables depicts the distribution of contract and autonomous beekeepers. There are significant inequalities between farmers who are under

contract and those who are not in terms of access to credit, extension services, training, communication, and social standing in society. This suggests that these considerations may have an impact on farmers' willingness to engage in contract farming. According to the distribution of sample respondents overall according to literacy level, unemployment levels are respectively at 29.7% and 70.2%. Because of this, there is no noticeable difference in the literacy level of contracted and independent beekeepers.

## METHODOLOGY

### Research Design

The study's exclusive data on happenings originated from the use of both qualitative and quantitative methodologies. The research was carried out employing a descriptive survey. In studies where the goal was to characterize the characteristics of a certain group, estimate the proportion of individuals who have particular qualities, and make predictions, surveys were described without manipulation.

To test a hypothesis or reveal the current situation of the study subject in relation to individual perception, attitude, and behavior, a descriptive survey was used to collect data. These descriptive surveys were suited for gathering information for educational purposes and provided a wealth of data for our research. Data that describes events and organizes, tabulates, illustrates, and summarizes the data collection are collected for descriptive research. Graphs and other visual aids are commonly used.

### Study population

The term "target population" refers to any individual who is a part of a real or hypothetical collection of individuals, an affair, or an item for which the researcher is hoping to produce study results. A population is a large bunch of individuals, objects, situations, or belongings with observable qualities. It is the total of everything that complies with a particular specification. In the Arua district, study data was collected from 5 rural homes. This study focused mostly on farmers and the neighborhood leaders, including men and women. A random sample of 126 respondents was gathered, and they were first divided into tiny cohorts known as strata before being combined to form a stratum.

### Sample size

The researcher selected (126) respondents out of which (45) male children, (16) female children, (60) elders male and (60) elders females who had knowledge on beekeeping.

Table 1 the number of respondents per category

Item	Population	Sample
Boys	40	45
Girls	20	16
male elders	60	15
Female elders	60	50
<b>Total</b>	<b>185</b>	<b>126</b>

### Sampling techniques

Every person in the population had an equal chance of being chosen for the study because the researcher utilized simple random sampling. The participants were chosen specifically using this. Convenience sampling was also utilized to pick respondents to aid the researcher in choosing the closest researcher he came across. The researcher also used purposive sample to select elders who significantly helped in selecting respondents who had a great deal of knowledge about the topic investigated. The researcher, in short, employed both probability sampling and non-probability sampling methods.

### Data collection methods and instruments

The data was collected from both primary and secondary sources. Secondary information was obtained from the available literature. Questionnaire and interview guide used as well.

**Questionnaire survey**

The researcher used structured questionnaire method to collect both qualitative and quantitative data from the respondents identified to be knowledgeable about the study. Open ended questions were designed to allow the respondents to fully express their views. These tools were advantageous because respondents had to fill in the questionnaires and freely give information without fear.

**Interviews**

Interview schedules were organized basically for the key informants who had prior knowledge and expertise on the study. The interview method was used because of the nature of its flexibility and it enabled the researcher to change the questions depending on the response of the respondents.

**Data quality control**

In order to ensure reliability and validity of data collection, the research was conducted under the guidance of an academic supervisor as well as using the Durbin Watson test. Proper sampling using convenience, purposive sampling was used. Tools that were used were being pretested and triangulation of data as a method was adopted as well.

**Data Analysis**

After data had been collected, it was sorted, edited and analyzed in tables, using descriptions in percentages and frequencies, unit root tests, correlation coefficients as well as regression analysis to portray the various objectives that was used in the study. Both helped in obtaining findings and drawing conclusions thematically.

**RESULTS**

**Gender of respondents.**

The researcher investigated the respondent gender. The reason was found out if both sexes hold same views or different ones on the topic of research and various objectives of the research.

This is prepared officially below,

**Table 1 Gender of respondents.**

Gender	Frequency	Percentage
Male	45	45.0
Female	55	55.0
<b>Total</b>	<b>100</b>	<b>100%</b>

**Source primary data 2022**

Table 4.1, Shows that female respondents constituted 55 (55%) while male respondents were 45 (45%).

This implied that females were the major respondents of the study.

**Age Brackets of respondents**

**Table 2 age of respondents**

	N statistic	Min	Max	mean	Std	Skewness		Kurtosis	
Age	126					statistic	Std Error	statistic	Std error
<b>Valid N</b>	<b>126</b>	<b>22</b>	<b>56</b>	<b>34</b>	<b>11.786</b>	<b>0.456</b>	<b>0.345</b>	<b>0.487</b>	<b>0.475</b>

**Source: primary Data 2022**

The table reveals that the standard deviation was 11.786 and that the range's minimum and maximum ages have been 22 and 56, correspondingly. The presented data is trustworthy and provides a decent fit because of standard deviation is within the range of the minimum and maximum age, where R-squared value must be higher than adjusted R-squared. This suggests that the majority of respondents were between the ages of 20 and 30, while the least amount were between the ages of 41 and 50.

However, we reject the null hypothesis and reach the conclusion that the disturbance terms are not normally distributed because the Jarque-Bera value of 0.487 is higher than the crucial value (0.05) at 95% confidence range.

### Academic background of respondents

**Table 3 academic background of the respondents**

Academic background	Frequency	Percentage
Certificate	26	26.0
Diploma	45	45.0
Degree	24	24.0
Others	5	5.0
Total	100	100%

**Source: primary data 2022**

26 of the respondents had attained a certificate of education, in accordance with the table above, which displays the respondents' educational standards. 5 (5%) of the respondents had completed another level of education, compared to 45 (45%) who had completed a diploma and 24 (24%) who had graduated with a degree. This suggests that respondents with diplomas held the biggest proportion of responses, followed by respondents with certificate-level education and then respondents with degrees. The least amount of respondents are from other educational levels.

### Departments of the respondents

**Table 4 departments of respondents.**

Department	Frequency	Percentage
Stores	9	9.0
Top management	5	5.0
Accounts	6	6.0
Purchasing	34	34.0
Others	46	46.0
Total	100	100%

**Source: primary Data 2022**

From the table 46.0% of the respondents were from the department , 34.0% are from the purchasing sector, 6.0% are from Accounts department, stores management are 9.0% and 5.0% are from the top management . From the study findings in the table, it's clear that the highest number of respondents came from other various departments and these were followed by the purchasing sector respondents while the least number of respondents came from the top management.

**Establish the effect of bee keeping on the household income of the people Pajulu sub-county Arua district**

**Table 5** Establish the effect of bee keeping on the household income of the people Pajulu sub-county Arua district

Respondents	SA		A		NS		D		SD		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
There are Increased incomes levels among the people of Pajulu sub-county Arua district.	33	33.0	53	53.0	10	10.0	2	2.0	0	0.0	100	100
Increased food security for farmers Pajulu sub-county Arua district.	56	56.0	40	40.0	2	2.0	0	0.0	2	2.0	100	100
Increases agricultural productivity	46	46.0	34	34.0	6	6.0	9	9.0	5	5.0	100	100
Bee keeping reduces farmers' vulnerability to climate variability which increases crop yields	28	28.0	56	56.0	5	5.0	9	9.0	2	2.0	100	100

Source: primary data 2022

The graphic illustrates that 35% of respondents agreed or strongly agreed that inhabitants of Pajulu sub-county in the Arua district have higher income levels. As a result, 10% following considerations and 2% opposed the notion. Based on the results, Communities that reside in mountainous regions often rely on smallholder farming and subsistence farming for their livelihoods. To meet their company and includes for a living, rural mountain communities generally need an additional source of income, particularly monetary revenue. The study's findings imply that beekeeping has been demonstrated to be a viable alternative source of income for smallholder farmers in rural mountain areas of Chitral. The study's improved version that both beneficiary and non-beneficiary households could use the revenue generated through beekeeping for household benefits. The idea of greater food security for farmers in Pajulu sub-county, Arua district, was approved by 56% of the respondents. 40% of respondents supported farmers' beekeeping practices, 22% were unsure, and 2% strongly opposed the notion. An evaluation of the effect of the beekeeping demonstration on community livelihood is based on structured questionnaires administered to households both before and after the beekeeping intervention. This includes how much land each household uses, the size of their farms, the main crops they plant, the tree species they choose to use to make charcoal, number of times they manufacture it each year, how they maintain their beehives, and the amount money they make from selling honey. The table next demonstrates that 46% of respondents highly agreed, 34% agreed, 6% were unsure, 9% disagreed, and 2% strongly disagreed to the premise that agricultural productivity has grown. According to 28% of respondents, beekeeping enhances crop production by lowering farmers' vulnerability to climate change. One respondent's argument that beekeeping contributes to economic stability in another way—by having a beneficial influence on agricultural pollination in rural developing countries—provided support for this. Even if the use of pesticides in modern agriculture is still on the rise, controlled pollination has been able to compensate for some pollinator shortages and has enhanced production and consequently revenues. In a verbal interview, the respondents stated that beekeeping can contribute to securing sustainable livelihoods by transforming vulnerabilities into security. It can be carried out by resource-poor farmers, and is particularly suitable for under-privileged, landless and low-income groups as well as for women, as it requires minimal start up investment and generally yields profits within the first year of operation.

**Factors that influence small holder farmers to participate in beekeeping Pajulu sub-county Arua district**

**Table 6; Factors that influence small holder farmers to participate in beekeeping Pajulu sub-county Arua district**

Response	SA	A	NS	D	SD
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	F	%	F	%	F	%	F	%	F	%
Low returns from beekeeping	28	28.0	66	66.0	6	6.0				
availability and improper use of harvesting equipment	30	30.0	41	41.0	4	4.0	20	20.0	5	5.0
Limited and unorganized markets and market channel	38	38.0	56	56.0	6	6.0				
Low quality of honey products	41	41.0	56	56.0	3	3.0				
Shortage of trained personnel	61	61.0	30	30.0	9	9.0				
Low levels of improved technologies	28	28.0	66	66.0	6	6.0				

Source: Primary, Data, 2022

From Table 6, 28% of respondents claim that beekeeping offers low returns; in contrast, according to findings, many farmers have given up beekeeping due to low earnings and low harvests, as well as the labor and monetary outlays needed for hives and equipment. Inadequate apiary management Bees are left to find their own food and water as well as to protect oneself from intruders in both the migratory beekeeping system and the permanent apiary system. 66% of those respondents concur, while 6% were unsure. The study then reveals that 20% disagree, 5% disagree strongly, 30% strongly agree, 41% agree, 4% are not sure, and 5% disagree strongly to the fact that availability and improper usage of harvesting equipment. Poor harvesting procedures - Rudimentary methods, such as employing excessive smoke or burning the hives, cause the bee colonies to be decimated as well as contamination of the honey harvest and difficulties regarding quality control - Honey is susceptible to contamination and adulteration due to its limited availability and improper harvesting procedures, which results in low-quality honey that cannot enter the formal market chain but instead ends up in the informal markets where it is used as an ingredient in geographic brews or herbal products. From the study, 38% of the respondents confirmed the assertion that u Limited and un-organized markets and market channel, 56% of the respondent agreed, 6% were not sure. The study went ahead to discover that a well-organized market channel is one of the main driving factors for expansion of honey production. Through market channels, producers can be linked to potential buyers. An increased participation of farmers in these channels also leads to more supply for honey processors. In Arua District, there has not been a strong organized market channel for bee products. Limited of standards and grading systems discourage farmers to produce high quality products. As a result, the honey price received varies based on the good will of buyers.

**Table 7 Testing dependence of improper use of harvesting equipment and bee keeping in Arua.**

Chi-square	t-computed	t-tabulated
Sigma squared	3.185	0.056

Ho:  $\beta=0$

Ha:  $\beta\neq 0$

Since t-computed is greater than t-tabulated, we reject the null hypothesis and conclude that availability and improper use of harvesting equipment has a significant effect on bee keeping in Arua district

**Table 8. Testing relationship between Beekeeping on the household income of the people Pajulu sub-county Arua district.**

Depending on how the method or technique is used in the beekeeping practices, the relationship between beekeeping and household income of the inhabitants in Pajulu sub-county, Arua district, can either be negative or positive, as determined by the study's respondents. According to study's respondents, the information above strongly indicates that beekeeping practices can have a positive or negative correlation coefficient, which is further supported by the findings presented in table 6 below.

Ho: There is no relationship between household incomes on bee keeping in Arua district

Ha: There is a relationship between household incomes on bee keeping in Arua district

Household income	1.000
1.000	0.768
	0.000

Source: Field data, 2022

The correlation coefficient is 0.768 and therefore there is a strong positive correlation coefficient between house hold income and bee keeping in Arua district. This relationship is statistically significant at 5% level of significance since the P-value (0.0000) <0.05 thus the null hypothesis is rejected and conclusion made there is a significant relationship between house hold incomes and bee keeping.

**Table 9. Augmented Dickey Fuller test for household income at level and first difference.**

variable	Test statistics at Level	5% Critical values	At Level Test statistic	at First Difference	5% Critic Value	At First Difference Probability	at Level Probability At First Difference
Household income	-1.856	-2.345	0.0000	-3.789	-2.895	0.000	0.0001

Ho: Household income rate has no unit root.

Ha: Household income rate has a unit root.

Since the absolute value of the tau test statistic (-1.856) is lower than the 5% critical value (-2.345), the null hypothesis is accepted, therefore it is established that household income has a unit root and is not I (0).

We reject the null hypothesis and arrive at the conclusion that household income is steady and thus integrated of order one after differencing, as the tau test statistic (-3.789) in absolute terms is bigger than the crucial value at 5% (-2.8945)

**CONCLUSION**

It is obvious that improving the efficiency of agricultural marketing systems is crucial since agriculture has a massive effect on the household income and way of life of the rural population.

An alternative in this regard is beekeeping arrangements. In the Pajulu sub-county Arua district, this study looked into the impact of beekeeping farming on household income resulting from the production of organic honey. Furthermore, factors that affect the amount of honey produced by households were looked into. Furthermore, the management and operation of beekeeping farming are looked at.

In order to choose survey villages and respondents, stratified sampling was utilized. Data came from beekeepers who were chosen at random from four villages. To estimate the accidental effect of beekeeping farming on household income from honey production, propensity score matching was utilized. Furthermore, a regression analysis of instrumental variables was performed to explore the elements that affect household honey production revenue.

The purpose and management of bee keeping farms are covered in the study's first section. In the study region, the nucleus estate form of farming is practiced, which includes possessing a producing site and a beehive. The agreement's beekeeping document outlines each party's responsibilities and rights as well as standards for quantity, quality, pricing, and enforcement. Negotiation is employed to arrive at a price based on the honey market price. If farmers meet the quality requirements outlined in the agreement, they may receive a price increase of 15% to 20%.

The impact of beekeeping on household income from honey production is researched in order to provide answers to the research questions. It is true that beekeeping farming has a positive, significant impact on household income, according to the propensity score matching estimation results.

This Microsoft program result shows that participation in the production of organic honey improves beekeepers' revenues significantly compared to selling their wares at the local market. Nevertheless, many beekeepers are not aware of the benefits of Bee keeping organic farming.

The second analysis focused on investigating the major problems affecting household income from Bee keeping honey production. Results show that Bee keeping participation contributes to household income from honey production positively. The number of hives or bee colonies owned, which captures the production capacity, is one of the major factors affecting household income from honey production. The number of family members participating in Bee keeping honey production also affects household income. Another factor that significantly affects household income is the moisture content of the honey, which is the main quality parameter of honey production. Since processors are interested in this parameter, beekeepers who produce honey with the required moisture content can earn more income. These results imply the need to increase the distribution of improved bee hives that can help farmers to increase honey production and its quality

### **Recommendations**

The following policy recommendations are made in order to develop and expand the beekeeping farming method of producing organic honey in a sustainable way:

Raise beekeepers' awareness of the production of honey from beekeeping:

Despite the fact that beekeeping farming participation increases family income, it was found that farmers had relatively little knowledge about beekeeping farming. The awareness of bee keeping and the production of honey can be raised by establishing programs for farmers to impart their expertise, organizing field trips for farmers, and organizing workshops for interested government officials and NGOs. Promote transitional beekeeping methods:

Traditional hives are less productive than transitional hives, which also don't demand as many high-end beekeeping supplies. The design of the hives, training, and early support are the only expenses. Furthermore, since transitional hives enable farmers to see the honey develop, they significantly raise the quality of the honey. By increasing the use of enhanced bee hives, farmers' annual honey incomes can be increased. The beekeepers are encouraged to use technology more heavily by the increased income. To help farmers raise their income at an affordable price, honey processors, the government, and NGOs should actively support the use of transitional beekeeping.

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APPENDICES

APPENDIX 1: RESEARCH QUESTIONNAIRE

Topic: The contribution of bee farming on the socio-economic transformation of communities in rural Arua district Pajulu sub-county

I am FRANCIS a student of Metropolitan University pursuing a degree in Bachelor of Arts with Education.

All the information which was provided in this questionnaire was treated with maximum respect and confidentially.

Please tick in the box that corresponds to your answer(s) in the spaces provided.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENT.

1. What is your sex?

Male  Female

2. What is your age?

13-35  36-45  46-64  65+

3. What is your highest level of education?

Primary  secondary  tertiary  university

4. Has beekeeping improved the income level of people in the rural areas?

Yes  No  I don't know

If yes how has it improved the income level of the people in the rural areas? List them

.....

5. Approximately how much time did you put into researching bees and beekeeping before you got started?

.....

6. What stressors are you aware of that are currently affecting bees?

.....

.....

7. How long have you been practicing beekeeping, and do you do it for environmental benefits, financial gain, hobby, or other (list)?

.....

8. What was the approximate cost to get started and to maintain a bee colony?

.....

.....

9. How often do you maintain your hives, or what does a typical week of beekeeping tasks entail in terms of time?

.....

.....

Thank you.

**Appendix 11: Work plan**

Activities	Dates		
	November 2021	December 2021	January 2022
Proposal writing			
Collecting Questionnaires			
Organizing Data			
Organizing Data			
Data Analysis			
Research Approval			
Report submission			

**Appendix III: Research Budget**

Particulars	Amount in UGX.
Transport	200,000
Airtime	30,000
Lunch	80,000
Stationery	150,000
Fees	100,000
Others	70,000
<b>Total</b>	<b>630,000</b>