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ANALYSIS OF FINANCIAL INCLUSION AMONG BEE FARMERS IN CROSS RIVER STATE, NIGERIA

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ABSTRACT

This study analyzed financial inclusion among bee farmers in Cross River State, Nigeria. The study assessed the levels of access, use and quality of financial inclusion, evaluated the implications of financial inclusion on honey production, analyzed the drivers of financial inclusion and evaluated the major constraints affecting financial inclusion among bee farmers in the study area. The study used multistage sampling technique to select 156 bee farmers for the study. Primary data were collected with the aid of a structured questionnaire and were analyzed using descriptive statistics, multiple regression analysis, probit regression analysis and principal components analysis. Results showed that majority of the respondents were males (90.4 %) and within the age brackets of 31-40 years. A greater number were also married (85.9%) and had attained secondary school education (55.8%), with a mean household size of 7 persons and an average farming experience of 10 years. The average farm size was 14 hives. Only 47.4% of the respondents belonged to farmers' association. The findings equally revealed that, 54.5% of the farmers had accounts with a bank and 33.3% of the farmers had accounts with informal financial institutions for the access dimension of financial inclusion. In the usage dimension of financial inclusion, 48.7% of the farmers had borrowed, and 58.3% of them saved. The quality dimension of financial inclusion showed that 40.4% made electronic payments for agricultural supplies for bee farming while 39.7% received electronic payment for sales of honey. On the implications of financial inclusion on honey production, the findings revealed that the output of bee farmers was positively influenced by account ownership ($p<0.01$), education ($p<0.01$), primary occupation ($p<0.05$), number of hives ($p<0.01$) and labour ($p<0.01$), and negatively influenced by household size ($p<0.01$) and age ($p<0.05$). The key drivers of inclusivity were income ($p<0.01$), financial literacy ($p<0.01$), education ($p<0.01$) and number of bee hives ($p<0.01$) across the three dimensions. The major constraints affecting financial inclusion in the study area were lack of trust, gender, financial illiteracy and belief system. The study, therefore, recommends that, government and non-governmental bodies can organize financial literacy training programmes that will educate farmers on the need for participation in financial services, consequently their increased participation would in turn improve their income and savings which could in turn boost farmers' production.

Key words: Drivers, production, probit, multiple regression socioeconomics, Constraints implications quality, access

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INTRODUCTION

Agriculture in Nigeria is mainly driven by rural smallholder farmers who despite being poor, are burdened with the nation's agricultural transformation for attaining food security and other sustainable goals. However, limited financial resources place a major constraint upon the key resources required to achieve sustainable outcomes [1]. According to National Financial Inclusion Strategy [2], over 70% of Nigerians participate in agriculture mainly at the subsistence level. As a result, access to finance is critical to the resilience of Nigerians as well as a key facilitator in economic well-being and growth. Despite this, access to credit is very limited, although accounting for over 44% of Nigeria's Gross Domestic Product (GDP) overall, the agricultural sector receives only 2% of the total loans by commercial banks [2].

Given the need for Nigeria to diversify its economy, and the key role of rural smallholder farmers, there is a need to intensify efforts to ensure that financial inclusion makes a significant impact in agriculture [1, 3]. Ensuring the sustainable financial inclusion of rural smallholder farmers is vital because access to and use of financial services, such as credit, savings, insurance and payments, facilitate several potential opportunities. These include: consumption smoothing, savings and capital accumulation, better risk management, investment in profitable business opportunities, and human and physical capital development [1, 4]. According to Enhancing Financial Innovation and Access- (EFinA) [5], formal financial inclusion grew from 56% in 2020 to 64% in 2023. Although this is good progress, yet the goal of 95 % financial inclusion was still far-fetched as approximately forty million Nigerians still remained formally excluded, including bee farmers who produce honey.

Furthermore, due to the extensive use of honey as a natural sweetener in the food and beverage sector, and the significant share it holds in personal care products and cosmetics, the global market share of honey and the adoption rate of honey worldwide has been on the increase. In 2016, global honey production amounted to 1704 thousand tonnes, with global honey exports accounting for 569 thousand tonnes [6].

According to Shabandeh [7], the average annual production volume of natural honey worldwide was about 1.77 million tonnes in 2021. The global production volume of honey peaked in 2017 at about 1.88 million tonnes and has since decreased to about 1.77 million tonnes. The global honey market was valued at over eight billion U.S. dollars in 2020. By 2028, the natural honey market is forecasted to exceed 11.8 billion U.S. dollars. However, according to World Bank [8], the import of five thousand, thirty-three tonnes of natural honey by Nigeria in 2023, amounted to an import bill of over \$3 million.



Bee farming in Nigeria, a potential agricultural goldmine, is an agricultural enterprise which produces honey as its foremost product. Honey, constitutes a key ingredient in pharmaceutical, cosmetic and food beverage companies worldwide and due to the increased inclination for healthier food products and drugs produced from naturally potent ingredients such as honey, there has been a growing demand for honey which has led to scarcity of supply.

Due to this, the worldwide consumption of honey is anticipated to increase at a 5.4% compound annual growth rate and the market value is expected to rise from a valuation of US\$ 9.7 billion in 2023 to US\$ 16.4 billion by the end of 2033 [9]. However, Nigeria's significant consumption of honey has led her to heavily depend on imports, because until recently, commercial beekeeping was almost non-existent in Nigeria. According to World Bank [8], over \$3 million worth of honey was imported into the country in 2023. Beekeeping as a commercial venture has been largely underdeveloped in the country despite the various advantages and ready markets for most of its value chain products.

In Cross River State, the people of Obanliku are known for being considerable large-scale honey bee farmers. Honey sellers from across the country travel to buy large quantities of pure honey from the bee farming villages of Obanliku local government area. The local government is characterized by luxurious highlands and mountain ranges which boast of abundant floral species, trees and animals. Its climatic condition is largely a semi-temperate climate which is also ideal for bee farming as identified by Ahaotu and Nwachukwu [10]. Hence, Obanliku is the main hub of bee farming in Cross River State. Previously, due to government as well as non-governmental interventions which were however transient, bee farming became an agricultural enterprise in some other local governments of the state due to training and bee colony establishments by beekeeping specialists or apiarists within the state. Despite being an under-tapped agricultural enterprise, bee farming holds immense wealth-building and foreign exchange potentials for Cross River State and for the country at large. This assertion is supported by Ahaotu and Nwachukwu [10], who noted that Nigeria is one of the countries in the continent of Africa, that holds huge honey production potential due to its varied ecological and climatic conditions and specifically its excellent flora and fauna diversity. Yet bee farmers in Obanliku and other Local Governments may not have been producing at their optimum capacity due to reasons like long distance to formal financial institutions, low income and low financial literacy which have characterize several small holder farmers in Cross River State and Nigeria at large, and this may reduce the levels of access, use and quality of financial services available to the farmers.



Financial inclusion serves as a pivotal mechanism for fostering agricultural and economic progress within emerging economies. Accordingly, it is central to the World Bank's mission to enhance the well-being of the socioeconomically disadvantaged and vulnerable. The availability, access and usage of financial services such as credit, savings, insurance and payments may lead to increased agricultural production among all farmers, and may be a trigger to achieving considerable increase in honey production.

Although few studies have addressed some aspects of financial inclusion in Nigeria [11, 12, 13], these studies focused on financial inclusion for arable crop farmers, index of penetration for financial inclusion and effect of financial inclusion on poverty status. It is on this note that the researcher finds it imperative to fill the knowledge gap on financial inclusion as relates specifically to bee farming. It represents the source of the much-needed capital for investment, consumption smoothing, better risk management, capital accumulation, insurance, retained earnings and consequently a higher output among bee farmers.

Consequently, this study aimed to analyze financial inclusion among bee farmers in Cross River State, Nigeria.

Specifically, it sought to:

- Assess the levels of access, use and quality of financial inclusion among bee farmers in Cross River State.
- Evaluate the implications of financial inclusion on honey production among bee farmers in the study area.
- Analyze the drivers of financial inclusion among bee farmers in the study area.
- Evaluate the major constraints to financial inclusion for bee farmers in the study area.

Literature Review

Kumar and Bhargawav [14] studied financial inclusion of small and marginal farmers in Jhansi District, India. The study employed primary data from 500 farmers and data were analyzed using descriptive statistics and Chi-square analysis. The findings showed that 99% of the farmers were financially included in formal financial systems in terms of having a savings bank account, 82.2% of the farmers had accessed credit for short term use while 16.8% of the farmers had accessed credit for long term purposes. The result also revealed that most of the farmers were included in the formal financial systems in terms of access to bank account but the farmers were not utilizing the different services provided by the bank due to a deficiency in knowledge of those services.



Ankita [15] analyzed primary data obtained from 543 respondents using descriptive statistics. The findings revealed that only 21.4% of the respondents used financial services for the purpose of obtaining loan, 54% had no bank accounts, 46% had bank accounts but never operated it, 71% of the respondents did not use mobile banking. Implying low level of financial inclusion considering the three dimensions of financial inclusion.

Mhlanga and Dunga [16] investigated the levels of financial inclusion among the smallholder farmers and its determinants. The study employed a household measure to measure the level of financial inclusion and multiple regression to assess the determinants of financial inclusion. The results indicated that the level of financial inclusion among the smallholder farmers was low because the percentage of households who were actively participating in the formal financial system was only 22%.

Muafueshiangha [17] carried out a study titled the impact of financial inclusion on agricultural development in Ngoketunjia division, North West Cameroon. The study employed primary data obtained from 285 farmers and the data were analyzed using the partial least square approach. The variables used to measure financial inclusion included account ownership and access to finance from financial institutions. The results revealed that financial inclusion was negative and insignificant between 1% and 10%, it further revealed that mainstream financial institutions were largely absent within the study area and that the availability of the few microfinance institutions in the region did not translate to improved farm output because farmers were actually excluded from its services.

Nwang and Bime [18] carried out a study titled implications of financial inclusion for agricultural production among cocoa producers in the southwest region of Cameroon, primary data were analyzed using the propensity score matching model. The findings showed a significant positive relationship between financial inclusion and cocoa production by 26%. The result also revealed that financially included farmers realized a significant increase in income than their excluded counterparts on account of the three main dimensions of financial inclusion.

Nwang and Bime [18] in a study on drivers of financial inclusion among cocoa producers in the southwest region of Cameroon, analyzed primary data collected through semi structured questionnaire from 380 Cocoa producers using the probit model. The result showed that financial inclusion was significantly enhanced by an increase in income, farm training, the closeness of financial institutions, larger households and small-scale production. Income is one of the main drivers that positively enhances financial inclusion. Therefore, access to inputs and proper



agronomic practices can be achieved through subsidies and training in order to enhance the return (benefit) from production [19].

Mhlanga and Dunga [16] found out that the driving factors of financial inclusion indicated that off-farm income, education level, distance, financial literacy and age of the household were positive and significant determinants of financial inclusion among the smallholder farmers in Manicaland Province of Zimbabwe. This implies that there is a direct relationship between financial inclusion with these variables.

Nkuna *et al.* [20] in a study found out that financial capability is the most important factor that positively influenced the likelihood of usage of financial products. Other important factors included age, employment, income, marital status, education, gender and geographical distribution. It was further revealed that individuals residing in urban areas are more likely to use financial products and services than those in rural areas while those in the northern region are likely to be more included than those residing in other regions. It was also revealed that the likelihood of owning these products increases with age, level of education, income, being married and living in an urban area.

Likewise, Yeboah [21] investigated "The drivers of savings account ownership: A cross-sectional analysis." Primary data sourced from informal market traders in Ghana were analyzed using the probit regression. The results revealed that financial education and number of income-generating ventures engaged in by the market trader are the major predictors of savings account ownership status while other drivers include age, sex, marital status and number of dependents.

Furthermore, Adetunji [22] examined the drivers of financial inclusion in Nigeria using primary data obtained from a survey of over 20,000 respondents in 36 states in Nigeria from 2008 to 2016. The results showed that the average income, average nearness to a bank and education levels in Nigeria significantly determine the likelihood of having an account with a bank or any other financial service provider. Being a woman, a youth and living in a rural area however had a negative and significant effect on Financial Inclusion.

Ankita [15] showed that distance to the bank was the biggest constraint to 60.6% of the respondents who did not have a bank account, followed by lengthy procedures and then followed by the low income of the respondents, and the least strong constraint was ignorance of the respondents in the study area.

Nwang and Bime [18] in their study also explored the constraints affecting financial inclusion in the study area using primary data. The result showed that on average, the long distance of financial institutions, intermediate farm size, lack of collateral



security and low annual income negatively accounted for 51.3% of the constraints that retarded financial inclusion in the study area.

MATERIALS AND METHODS

Study area

The study was conducted in Cross River State, Nigeria. Located in the tropical rain forest. The State is a coastal State with heavy rainfall that favours agricultural production. It lies between latitudes 4°27' and 5°32' North of the equator and longitudes 7°50' and 9°28' East of the Greenwich Meridian. It is bounded to the North by Benue State, to the West by Ebonyi and Abia States, to the South-west by Akwa Ibom State and the Republic of Cameroon to the East. Humid tropical climate of 1300–3000 mm rainfall and 30 °C mean annual temperature prevails over the State except on the Obudu Plateau where the climate is sub-tropical with temperatures of 15 °C – 23 °C. The total land area of the State is 23,074 square kilometres distributed over 18 Local Government Areas (LGAs). The State has a projected population of 4.2 million people [23] spread across three agricultural zones, namely Calabar, Ikom and Ogoja zones.

The vegetation spans from mangrove swamp and rainforest in the south to the derived savannah in the North. The soils of the region are largely clayey loam and food crops such as rice, yam, cassava, soybean and maize, as well as cash crops such as cocoa, oil-palm, banana and plantain are grown in the State. Major livestock reared include poultry, pigs, goats and sheep, while micro livestock reared in the State include snails, rabbits and honey bees. Honey production is very prominent in the state especially in the northern part. The three agricultural zones are:

1. The Calabar agricultural zone which consists of Calabar municipal, Calabar South, Bakassi, Akpabuyo, Odukpani, Akamkpa and Biase local government areas.
2. The Ikom zone which consists of Boki, Ikom, Obubra, Abi, Yakurr, and Etung local government areas.
3. The Ogoja zone consists of Ogoja, Bekwarra, Yala, Obudu and Obanliku local government areas.



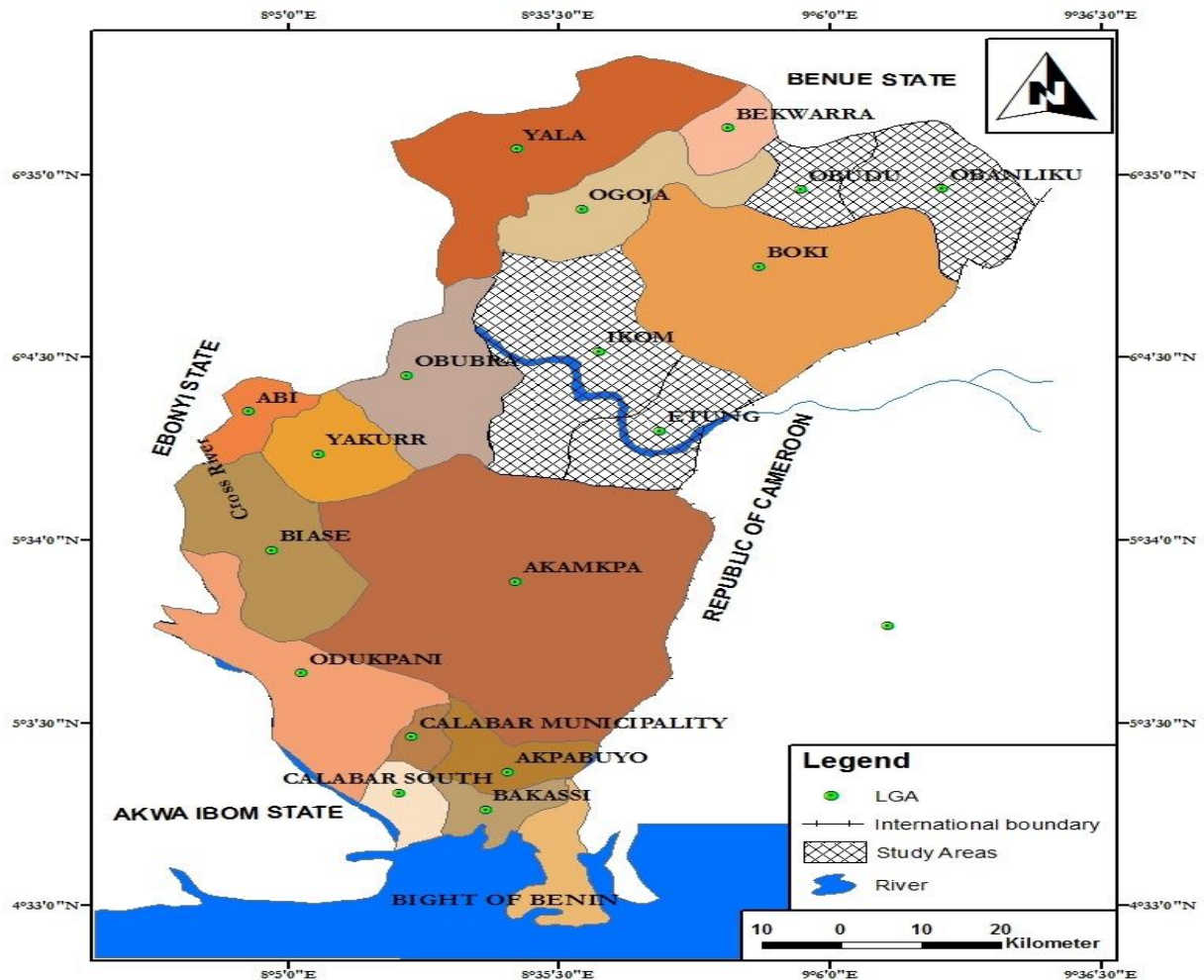


Figure 1: Map of Cross River State showing the study area

Population of the study and Sampling Procedure

The population of the study was made up of all honey bee farmers in the selected local government areas from which a sample size of 156 farmers comprising of all (146) registered farmers and 10 unregistered farmers [24]. This is due to the peculiarity of the agricultural enterprise. Given that it is not a popular farming production type within the State, the population of the respondents had to be increased with unregistered bee farmers found by snow balling sampling technique. The population was sampled using Multi stage sampling procedure. In the first, purposive sampling was employed, to select two out of three agricultural zones in the State. Purposive sampling was also deployed in selecting four local government areas from the already selected agricultural zones in the second stage. The basis for purposive sampling of these areas is due to the predominance of bee farmers. The local governments were Obanliku, Obudu, Etung and Ikom. Third stage census

sampling was employed to select the 156 bee farmers from the selected local government areas. From Obanliku, 117 farmers, Obudu, 14, Etung, 16, and Ikom, 9.

Method of Data collection and Data Analysis

The data for this study were collected from primary sources using structured questionnaire which elicited responses from the respondents. The study employed descriptive statistics such as descriptive tables, charts and inferential statistics such as Ordinary Least Squares multiple regression analysis, probit regression analysis and Principal Component Analysis to analyze data obtained.

Specifically:

- objective one was realized using descriptive statistics which included percentages, means, descriptive tables and chart.
- objective two was achieved using Ordinary Least Squares multiple regression analysis.
- objective three was achieved using probit regression analysis.
- objective four was achieved using Principal Component Analysis.

Measuring financial inclusion

According to the World Bank [25], the main types of indicators to consider when measuring financial inclusion are:

1. Access Indicators: it reflects the depth of outreach of financial services, such as the penetration of bank branches or point of sale (POS) devices in rural areas, account ownership or demand-side barriers that customers face to access financial information such as cost.
2. Usage Indicators: Measures encompass how clients use financial services, such as the regularity and duration of the financial product/ service over time, for example average saving balances, amount borrowed and number of transactions per account [25].
3. Quality indicators: Measures describe whether financial products and services match client needs, the range of options available to customers, and client awareness and understanding of financial products. This includes electronic payment and received electronic payment. Also assessing to understand how financial inclusion affects households' and firms' outcomes, such as firm-level performance or human capital investment [25].



Model Specification

Ordinary least squares regression

The multiple regression model specified for implications of financial inclusion on honey production among bee farmers was estimated as follows:

$$\text{Model: } Y = f(X_1 + X_2 + X_3 + X_4 + X_5 + X_6 \dots X_{10} + e) \dots \dots \dots (2)$$

Where, Y = output of honey (Litres)

X₁ = Account ownership of any type (1 = account ownership, 0 = otherwise)

X₂ = Access to credit (1 = access, 0 = otherwise)

X₃ = Savings (1 = saving, 0 = otherwise)

X₄ = Labour (Man days)

X₅ = Transportation cost (Naira)

X₆ = Bee hive quantity (Numbers)

X₇ = Household size (Number of persons)

X₈ = Educational level (years of schooling)

X₉ = Primary occupation (1 = bee farming, 0 = otherwise)

X₁₀ = Age (years)

e = error term

Y being the dependent variable represents the output of honey and is measured in litres per year and β₀ is the constant intercept.

This is in line with Egwu [19], who used this method to analyze the Impact of agricultural Financing on Agricultural Output, Economic Growth and Poverty Alleviation in Nigeria.

Probit regression model

The probit model was employed to analyze the drivers of financial inclusion, subject to the three major dimensions of financial inclusion: access to, use and quality of financial services.

Similar to Nwang and Bime [18], the probit model was expressed as follows:

$$y_i^* = \beta_0 + \beta_i x_i' + \mu_i \dots \dots \dots (3)$$

$$\therefore y_i = 1 \text{ if } y_i^* > 0; y_i = 0 \text{ if } y_i^* \leq 0$$

Where: y_i represented the ith farmer who is either financially included (1) or not (0)

x' is the latent variable that determines whether included or not and it is explained by a host of independent variables included in the vector (x')

β_i refers to the coefficients of the independent variables



β_0 is the intercept parameter and μ , the random variable with a normal distribution of the mean, 0 and variance 1.

Considering y_i as a threshold and y_i^* over, then an individual is assumed to be financially included. The threshold y_i just as y_i^* , if taken to be normally distributed, the regression estimates and information on y_i could be obtained. $P_i = P(y_i = 1|x) = P(y_i \leq y_i^*) = P(Z_i \leq \beta_0 + \beta x_i) = F(\beta_0 + \beta x_i) \dots\dots\dots (4)$

Where: $P(y_i = 1|x)$ refers to the probability of an event occurring at x which is a fixed value; Z is the standard normal variable, $Z \sim N(0, \sigma^2)$; and F is the cumulative normal distribution function (CDF).

As specified in the implicit function (equation 1), the maximum likelihood estimation method (MLE) is applied as expanded in the model below: $P(\text{FinIcl}=1/X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + u_i \dots\dots\dots (5)$

Where the dependent variable, $P(\text{FinIcl}=1/X)$ is the probability that the farmer is financially included given the vector of the observable variables. Furthermore, the model was split into three different models (10a, 10b, and 10c) concerning the dimensions of financial inclusion. This was to determine the effect of inclusion drivers based on each correlate and then identify the variables that significantly affect all three correlates (financial inclusion). This is similar to the study of Nwang and Bime [18].

Model 1/ Access correlate: $P(\text{Act}=1/X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + u_i \dots\dots\dots (6a)$

Model 2/ Use Correlate: $P(\text{Bor}=1/X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + u_i \dots\dots\dots (6b)$

Model 3/ Quality Correlate: $P(\text{Sav}=1/X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + u_i \dots\dots\dots (6c)$

Where the dependent variables are:

$P(\text{Act}=1/X)$ = Access; Dummy: 1 = Owns an account; 0 = Otherwise

$P(\text{Bor}=1/X)$ = Usage; Dummy: 1 = Borrows money; 0 = Otherwise

$P(\text{Sav}=1/X)$ = Quality; Dummy :1 = Saves money; 0 = Otherwise

And Independent variables are:

X_1 = Gender: 1 = Male; 0 = Otherwise

X_2 =Age of individual (Years)

X_3 =Marital status Dummy: 1 = Married; 0 = Otherwise

X_4 = Household size (Number)



- X_5 = Education level (Years of schooling)
 X_6 = Primary occupation Dummy: 1 = Full-time farmer; 0 = Otherwise
 X_7 = Experience Number of years involved in bee farming (years)
 X_8 = Distance to the nearest formal financial institution (Km)
 X_9 = Farm Income/ Revenue Total amount generated from bee product sales (Naira)
 X_{10} = Bee hive quantity (Numbers)
 X_{11} = Financial literacy
 u_i = error term

The probit model was used since the endogenous variables (financial inclusion dimensions) are dichotomous and explained based on probability. According to Gujarati [26], the probit model is suitable because of its applicability to the cumulative distribution function that favours binomial data.

Principal Component Analysis (PCA)

To analyze objective 4, to evaluate the major constraints to financial inclusion for bee farmers in Cross River State, the principal component analysis was employed. Principal component analysis using the promax rotated factors with Kaiser Normalization was used to analyze the constraints to financial inclusion among bee farmers in the study area. The factorability of the constraint variables was examined. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.732 which is adequate and acceptable based on the KMO classification. The Bartlett's test of sphericity ($\chi^2 = 389.67$) also was significant at $p < 0.01$ probability level which shows that the matrix is significantly different from zero (0), that is, the matrix is significantly different from identity matrix. This implied that there were sufficient intercorrelations to conduct the factor analysis. More so, variables with factor loadings of less than 0.40 were not used. To assess the constraints, a five-point Likert scale analysis was used to assess 13 constraints and the factors were as follows: Lack of collateral security, bureaucracy, distance to formal financial institutions, gender, low income, financial illiteracy, lack of trust, lack of information, high cost, inadequate formal financial institutions, low educational level, inadequate loans and belief system.

RESULTS AND DISCUSSION

Socio-economic characteristics of Bee Farmers

The results of the socio-economic characteristics of bee farmers are presented in Table 1.

The results in Table 1 show that the majority (90.4%) of the bee farmers were male, while 9.6% were female. This is similar to the study by Maufueshiangha [17], which showed the percentage of male farmers to be dominant over female farmers. This may indicate that males are more interested in agriculture, it could also imply that



more males are financially included than females. This finding also is supported by Adegbite [1] who reported that male rural smallholder farmers have a higher level of financial inclusion than females do. This is also in line with what was reported by Nwang and Bime [18] where the majority of farmers that were interviewed were male (95.3%) and the men dominated on all fronts regarding access to (28.4%), use (16.1%) and quality (23.2%) of formal financial inclusion.

The results further revealed that a sizeable proportion (35.9%) of the bee farmers were within the age categories of 31-40 years. However, only 10.9% of the respondents were above 50 years of age. The mean age of the respondents was 38 years. Obisesan and Adeyonu [11] had a similar report in which the majority of the farmers also fell between the ages 31-40 years in their study and had a mean age of 44. The mean age obtained in this study indicates that they are in their prime years and are able to stand the rigours of farming activities.

The study revealed that the majority (85.9%) of the respondents were married, while 14.1% were single. This result shows that bee farming was dominated by married couples representing a higher workforce and suggesting higher chances of getting family labour for use in bee farming production activities. This result is similar to Kumar and Bhargawav [14], where the majority (92%) of the farmers were married and 7.6% were single.

Most of the respondents representing 55.8% attended secondary school, 18.6% attended primary school, and 24.4% had attained a first-degree university education. This is similar to the result by Obisesan and Adeyonu [11] which revealed that majority (81.2%) of the respondents had formal education while 19.11% did not have formal education. This shows that level of education was relatively high among bee farmers and this will afford them the opportunity to read, write and process information relevant to financial inclusion.

The mean household size was 7 persons. Household size has a direct relationship with farm labour and household expenditure. This is similar to the study by Obisesan and Adeyonu [11] where the farmers sampled had a mean household size of 7 persons.

Most of the respondents (64.1%) had less than 10 bee hives, while only 12.2% had more than 30 beehives in the study area. This result agrees with the findings from the study carried out by Okezie, Kanu and Anyanwu [27] on influence of socioeconomic variables on output of honey in Kwuanu local government area of Abia State, which revealed that the greater percentages of the respondents (48.33 %) were small scale bee producers. Increasing number of bee hives lead to higher



output and subsequently higher farm income which ultimately contributes positively to financial inclusion for the farmer.

In terms of membership to farmers' associations, only 47.4% of the respondents belonged to an association. This may mean that the ease of accessing credit by respondents who did not belong to an association may be hindered as most financial institutions may regard membership in an association as a condition for mitigating the risk of defaulting from loan repayment. Ajah *et al.* [13] in their study, stated that a larger majority of vendors with no access to credit (79.5 %) were not members of the credit association. Furthermore, the chance of a bee farmer being financially included is high when he/she belongs to an association. This is supported by Obisesan and Adeyonu [11] who stated that membership of association had significant positive effect on farmers' willingness to participate in financial inclusion.

The average farming experience was 10 years. This implies that the respondents had been engaged in bee production for a long period and hence had gained significant experience in the area of bee farming practices. This is similar to the study by Maufueshiangha [17] where the majority of the farmers had gained experience in farming for above 10 years. Experience is considered very important in bee farming and agriculture at large because of the higher skill building over the years. The mean monthly income of respondents in the study area was ₦264,270.83. This implies that bee production is profitable. This agrees with the study by Babatunde *et al.* [28] on economies of small-scale honey production in Nigeria: implications of poverty reduction and rural development. They stated that honey production is lucrative and highly remunerative. They also revealed that for every ₦1.00 naira invested into honey business, ₦3.35 naira was realized and honey business is profitable even on small scale [29].

Level of access, use and quality of financial inclusion among bee farmers

The results showing access, use and quality of financial inclusion among bee farmers are presented in Fig. 2. The findings of this study indicated that in terms of access to financial services, 33.3% had accounts with informal financial institutions, while 54.5 % had accounts with banks. In terms of use of financial services, 48.7% of the respondents borrowed money, while 58.3% of the respondents saved. However, further results indicated that in terms of the quality of financial inclusion, 40.4 % of the respondents made electronic payments and 39.7 % received electronic payments *via* mobile banking application. The World Bank [30] argues that access to and use of financial services like savings, payments, loans and insurance helps the poor move out of poverty by economically and socially empowering them.



The findings regarding the level of access showed that a total of 87.8% of the farmers were financially included. This indicates that the majority of the farmers had access to financial inclusion in form of savings accounts with banks and savings accounts with informal financial institutions. This result is similar to that of Kumar and Bhargawav [14], where the majority (99%) of the farmers were financially included in formal financial systems in terms of having a savings bank account.

The result also revealed that having an account at a financial institution did not guarantee the usage of financial services such as loans and savings as only 48.7% of the respondents borrowed and only 58.3% saved with a financial institution. This finding is similar to that of Obisesan and Adeyonu [11], the result of their study showed that 40.61%, 21.70% and 16.72% borrowed from friends and family, agricultural/microfinance banks and money lenders, respectively. They stated that the low rate of obtaining credit from banks might be associated with the terms and conditions attached to obtaining credit from formal institutions. Another reason why borrowing is low among the farmers may be that formal lending agencies are unable to meet the credit needs of these small-scale farmers, at the time needed considering the time bound operation of agricultural production in Nigeria.

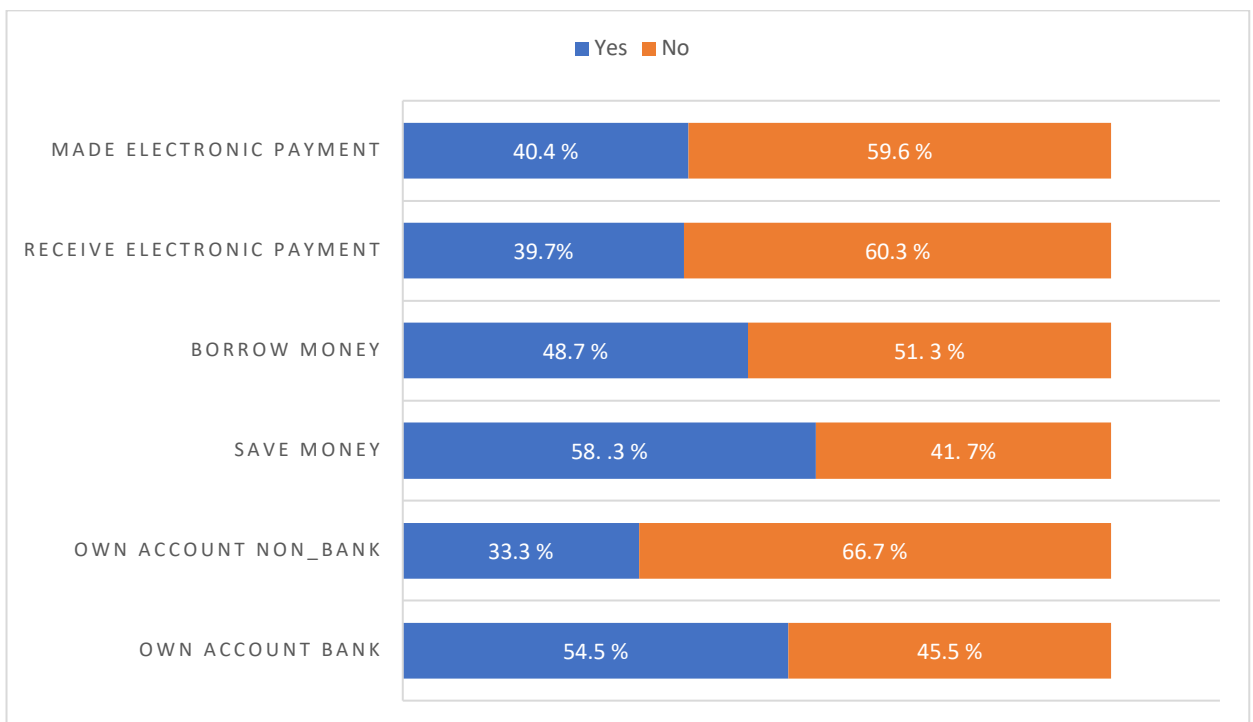


Figure 2: Access, use and quality of financial inclusion for bee farmers in Cross River State

Note: Own account Bank and Own account Non-Bank are categorized under access; saved money and borrowed money are categorized under use; made electronic payment and received electronic payment are categorized under quality

Analysis of usage levels reveals a low adoption rate for electronic payments. Results show that a minority of account holders leveraged mobile technology for either the receipt of revenue from honey sales or the procurement of apiculture inputs. From the results only 40.4% of the respondents made electronic payments and 39.7% received electronic payments for honey sales, implying that there is somewhat a low level of financial literacy and limited digital literacy among the bee farmers. According to World Bank [25], indicators of the quality of financial inclusion describe that if financial products and services match client needs, range of options available to customers, and client understanding of financial products. This may imply that receiving and making electronic payments among bee farmers may facilitate quick sales of agricultural outputs as well as improve the range of options available to farmers. This is due to the flexibility associated with electronic payments and thereby, reducing the barriers of long banking processes and the long distance to most formal financial institution which would in turn greatly enhance the quality of financial inclusion for the farmers.

Implications of financial inclusion on honey production among bee farmers

Financial inclusion variables and other factors affecting bee production were estimated using multiple regression analysis. The results of the estimated regression analysis are presented in Table 2. Four functional forms were tried: Linear, exponential, semi logarithm and double logarithms. The semi logarithm form was the lead equation of regression. It was best in terms of the coefficient of determination (R^2), adjusted R^2 , statistical significance of the estimated regression coefficients and expected signs of regression coefficient. The regression results were significant at 1% with an adjusted R^2 of 0.586, while the coefficient of determination (R^2) was 0.61 which implies that the independent variables were able to explain about 61% of the variation in bee output while the estimated F-statistics was 22.953 implying that the joint effect of the regression analysis was significant at 1% level.

As shown in Table 2, the performance of individual variables included in the regression analysis indicate that household size, education, age, occupation, account ownership, labour and number of hives significantly influenced the output of bee farmers in the study area. The parameter estimates of education, occupation, account ownership, labour and number of hives significantly and positively affected bee output while household size and age negatively affected bee farmers output.

The coefficient of household size (-0.06) was negative and significant at 1% level. This indicates that household size has a negative relationship with output of bee farmers. The implication of the result is that a unit increase in household size under static condition of other explanatory variables will result in a decrease of output level by 0.06%. This can be explained as most subsistence farmer households feed from



the agricultural produce and then sell what is left and this is a very common characteristic of subsistence agriculture in Nigeria. This result is similar to the finding of Umar *et al.* [31] in which honey bee production was negatively affected by household size. They noted that a proportionate volume of revenue is lost due to an increase in household size of the respondents, stating that the larger the household size of the respondent, the more he loses revenue from the production, which may be because honey is a delicious food that is directly consumed by people for many reasons and the family consumption from the honey produced reduced the quantity available for sale.

The coefficient of education (0.05) was positive and significant at 1% level. This reveals that education has a positive relationship with output of bee farmers. The implication of this result is that a unit increase in educational level of the bee farmers will increase the output by 0.05%. A higher educational level and specialized training in beekeeping significantly and positively influence honey production by promoting the adoption of modern techniques, which in turn leads to increased profitability and financial inclusion. Also, education and training directly impact a beekeeper's ability to manage colonies effectively, resulting in higher yields and better-quality products. Educated farmers are more likely to adopt modern practices and improved beehives. This result is in line with Umar *et al.* [31], whose findings showed that education was positive and significant at 5% level. The findings obtained in a study on socio-economic characteristics and factors affecting honey production income in selected Local Governments in Ibadan Metropolis by Adeokun *et al.* [32], also revealed that education was positive and significant at 5% level. It was asserted that education was a major factor affecting income in beekeeping.

The coefficient of age (-0.01) was negative but significant at 5% level. This indicates that age has a negative relationship with output of bee farmers. This indicates that a unit increase in the age of the farmers will lead to 0.01% decrease in the bee output. This is in line with the results of Ebe *et al.* [33], from their analysis of productivity of apiculture among Agricultural Development Programme (ADP) contact farmers in Ohafia agricultural zone of Abia State showed that the coefficient of age was negative and significant at 1%. This implies that the age of farmers can negatively influence honey production because older beekeepers generally experience a decline in physical strength and agility, which reduces productivity and efficiency in managing apiaries. This aging trend among farmers has implications for the adoption of modern technology, overall farm income and the long-term sustainability of the beekeeping industry. Similarly, Mbah [34] in his study titled profitability of honey production enterprise in Umuahia agricultural zone of Abia State revealed that the coefficient of age was negative and significant at 10%. He also stated that the



negative coefficient of age indicates that young people who are agile and stronger, are more productive than older people. However, this result is contrary to Umar *et al.* [31], whose findings revealed that age was positive and had significant influence on the output of bee farmers at 1%.

The coefficient of primary occupation (0.33) was positive and significant at 5% level. This indicates that occupation has a positive impact on the output of bees. The implication of the result is that as a farmer concentrates more on bee production, the output level is expected to increase by 0.33%. This result is similar to the results of a study on factors influencing participation of farm households in watermelon production in some selected local government areas of Sokoto state carried out by Abubakar *et al.* [35]. They revealed that the coefficient of primary occupation was positive and significant at 1%. They stated that farmers whose primary occupation was watermelon farming had greater chances of participating in watermelon production.

The coefficient of account ownership (0.47) was positive and significant 1% level. The implication of this result is that account ownership which represents access to financial inclusion has a positive relationship with output of bee farmers. The result implies that a unit increase in access to financial inclusion will increase output by 0.47%. This may be because ownership of account facilitate savings, retained earnings and better management of farm income among farmers which in turn lead to increased output for the farmers. This result is similar to the findings of Shima *et al.* [36] in their study on access to credit and financial services on marketing of farm produce in Benue state where the coefficient of access to financial services and products was positive and significant at 5% on farmers output.

The coefficient of labour (5.11 E-06) was positive and significant at 1% level. This indicates that labour has a positive impact on the output of bee. The implication of the result is that a 10% increase in farm labour will increase output level of bee by 5.11 E-06%. This agrees with Babatunde *et al.* [28] who stated that labour positively and significantly affected honey output when other factors were held constant, the results from their study showed that a 1% increase in labour input increased honey yield by 0.31% in the study area.

The coefficient of the number of hives (0.04) was positive and significant at 1% level. This indicates that the number of hives has a positive impact on the output of bee. The implication of the result is that a unit increase in the number of hives will increase output level by 0.04%. An increase in the number of bee hives positively influences honey production primarily by allowing for a greater total number of foraging bees to collect nectar, directly increasing the total honey yield for the apiary. Studies have found that larger-scale beekeeping enterprises with more hives tend to have higher



honey yields per hive compared to smaller operations, possibly due to more efficient management and the ability to travel to better bee pastures. This also agrees with the finding by Ukanyirioha *et al.* [37] where the result indicated that number of bee hives was positive and significant to honey production.

Drivers of financial inclusion among bee farmers

Results on the drivers of financial inclusion are presented on the three different dimensions of financial inclusion: access, use and quality, and the results are shown in Table 3 to 5. From the results, the Log-likelihood values of -88.062, -84.58 and -89.09 were obtained for access, use and quality, respectively, while the likelihood ratio values of 38.88 ($p < 0.01$), 26.99 ($p < 0.01$), and 31.46 ($p < 0.01$), were obtained for access, use and quality, respectively. These statistics indicate a good model fit, and confirmed that at least one independent variable significantly affects financial inclusion and the respondents' decision to access financial services is jointly influenced by the explanatory variables. Furthermore, the respective pseudo R^2 of 0.808, 0.24, and 0.55 were obtained for access, use and quality, respectively, implying that the independent variables significantly explain the variation in the dependent variables.

In each of the three dimensions of financial inclusion (access, use and quality), four (4) out of the eleven (11) independent variables considered predicted a likelihood of accessing financial services. The significant variables for access include education, occupation, income and financial literacy, while for use the significant variables were age, experience, income, and number of bee hives. However, for quality of financial services, the significant variables were education, income, number of bee hives and financial literacy.

Access to financial services

From Table 3, the coefficient of education was positive and significant at 1%. This implies that educated bee farmers have a higher likelihood of being financially included than illiterate bee farmers. This could also imply that educated people easily comprehend the various financial products, which in turn increases the chances of their participation in the financial market. Also, the 0.03677 marginal effect suggests that being an educated bee farmer is associated with a 3.68% likelihood of accessing financial services for business growth via owning an account. This finding is supported by several studies [16, 20, 22] which reported that education is one of the main drivers that positively enhances financial inclusion.

Primary occupation coefficient was negative and significant at 1%. Primary occupation was considered a dummy variable with value of 1 if a respondent is into full time bee farming and 0 if otherwise. The analysis predicted a negative coefficient



which may suggest that farmers who are into full time bee farming have a less likelihood of being financially included than those who are into bee farming as a secondary occupation. A marginal effect of -0.338, means that farmers who are into full time bee farming are associated with a 33.8% likelihood of not owning an account for business growth. This could imply that farmers who are into bee farming as secondary occupation, earn additional income and hence may have higher incomes than farmers who are into bee farming as a primary occupation. This agrees with Mhlangha and Denhere [38] assertion that total salary, a proxy of total income for individuals had a positive significant impact on financial inclusion and that as people's income increases financial inclusion also increases.

The coefficient of income was positive and significant at 1%. This implies that farmers making more profit from bee farming have a higher likelihood of being financially included than those with lesser income. The estimated marginal effect value of 6.39e-07 though very minimal suggests that farmers making more income from bee farming have 6.39e-05% likelihood of owning an account. Farm income generated from honey sales significantly contributed positively to the inclusion of farmers in the financial markets (FMs). Therefore, access to inputs and proper agronomic practices can be achieved through subsidies and training in order to enhance the return (benefit) from production. The finding from this study agrees with Nwang and Bime [18] who reported that income is a strong driver of financial inclusion.

The financial literacy coefficient (7.1563) was positive and significant at 1%. This implies that being financially literate increases the likelihood of being financially included than those who had little or no financial literacy. The estimated marginal effect value of 0.2792 suggests that farmers who are financially literate have 27.92% likelihood of owning an account for business growth. Financially literate farmers are better able to practice budgeting, manage cash flow, and keep accurate records of income and expenses. This allows them to assess profit and loss more effectively and understand the overall financial health of their operation. This finding is supported by Mhlanga and Dunga [16] who noted that financial literacy had a positive influence on financial inclusion and that financial knowledge of the various products provided by the bank can act as a motivation for households to use these services.

Use of financial services

Result from Table 4 indicate that the coefficient of age (-.03585) was negative and significant at 1%. This indicates that older bee farmers have less likelihood to be financially included than younger bee farmers. Furthermore, the -0.0143 marginal effect value suggests that being an older bee farmer is associated with a 1.43% less likelihood of borrowing money. Older farmers are often less likely to seek or receive



formal credit due to various factors, including risk aversion, lack of collateral, or being perceived as less productive by financial institutions. This limits their ability to invest in modern inputs (like quality seeds and fertilizers) and technology, which hinders productivity improvements and overall farm performance. Younger farmers tend to be more willing to take risks and adopt innovative farming technologies and practices. If financial inclusion initiatives disproportionately favor younger generations (for example, through digital platforms that older farmers may struggle to use), the agricultural sector may experience slower overall innovation, as the older, more experienced demographic is left behind. The result is in line with the findings of Yahaya and Gambo [39], who reported that age was a negative driver of financial inclusion at 5% in their study titled socio-economic determinants of financial inclusion in Niger State, Nigeria.

The bee farmer's coefficient of experience (0.059) was positive and significant at 1%. This implies that farmers having more experience in bee farming have higher likelihood to be financially included than those with less or no experience. The estimated marginal effect value of 0.023772 suggests that farmers with more experience on bee farming have 2.37% likelihood of borrowing money. Hence, experience just like knowledge in the mastery of farm operations enabled the farmers to be more productive. This in turn generated more farm income and with many years of farming, the farmers could realize the need for financial inclusion through which they were able to scale up their production by obtaining loans. This finding is supported by Nwang and Bime [18], who asserted that farmers with more farming experience exhibited a significantly higher likelihood of being financially included than their fellow counterparts with lesser experience.

The income coefficient (6.30e-07) was positive and significant at 5%. This implies that farmers making more profit from bee farming have a higher likelihood of being financially included than those who earn less from bee farming. The estimated marginal effect value of 2.51e-07 suggests that farmers making more income from bee farming, have 2.51e-05% likelihood of borrowing money for business growth. This is somewhat similar to Mhlangha and Denhere [38], who reported a positive significant impact of total salary on financial inclusion and that as people's income increases financial inclusion also increase.

The coefficient of number of bee hives (-.033) was negative and significant at 1%. This implies that farmers with more bee hives have less likelihood to be financially included than those with few numbers of bee hives. The estimated marginal effect value of -.01324 suggests that farmers who have more bee hives are 1.32% less likely to borrow money for business growth. The reason was that farmers were unable to properly manage larger farms and it resulted in low yields/ farm income



which in turn hinders financial inclusion. As such, larger farms do not necessarily imply higher yields. Thus, producers must think of proper ways of farm diversification and the incorporation of mechanization in the management of such large farms. This is similar to the findings from Nwang and Bime [18] where the land size was a driver that exhibited a negative relationship with financial inclusion and was statistically significant at 1% for the three dimensions of financial inclusion. According to them, when farm size increases, there is a greater likelihood of financial exclusion. Marginally, if farm size increases by a unit, there is a greater probability that access to formal financial services will fall by a likelihood of 0.16 units, use of formal financial services will drop by 0.04 units, and quality by 0.10 units.

Quality of financial services

The results from Table 5, show coefficient of education (0.0846) to be positive and significant at 1%. This implies that educated bee farmers are more likely to be financially included than illiterate bee farmers. Also, the 0.0326 marginal effect suggests that being an educated bee farmer is associated with a 3.26% likelihood of receiving payment via electronic transfer. Hence, education has a significant contribution to the knowledge and application of farm and financial principles. This finding is in line with Mhlanga and Denhere [38] who reported in their study that education had positive and significant influence on financial inclusion.

The income coefficient ($1.11e-06$) was positive and significant at 1%. This implies that farmers making more profit from bee farming have a higher likelihood of being financially included than those earning less. The estimated marginal effect value of $4.30e-07$ suggests that farmers making more income from bee farming have 4.30e-05% likelihood of receiving payment via electronic transfer. Nwang and Bime [18] asserted that farm income generated, significantly contributed positively to the inclusion of farmers in the formal financial markets. Therefore, an increase in farm income accounted for a greater likelihood of financial inclusion in the study area. The coefficient of number of bee hives (.0603) was positive and significant at 1% level of significance. This implies that farmers with more bee hives possess a higher likelihood of being financially included compared to those with few numbers of bee hives. The estimated marginal effect value of .02331 suggests that farmers who have more bee hives have 2.331% more likelihood of receiving payment via electronic transfer.

The financial literacy coefficient (2.897) was positive and significant at 1%. This implies that farmers who are financially literate are more likely to be financially included than those who had little or no financial literacy. The estimated marginal effect value of 0.11187 suggests that farmers who are financially literate have 11.19% likelihood of receiving payment via electronic transfer.



Major constraints to financial inclusion among bee farmers

Principal component analysis using the promax rotated factors with Kaiser Normalization was used to analyze the constraints to financial inclusion among bee farmers in the study area. These constraints were listed according to the proportion of variance associated with them and were classified under three major factors: PC 1 (Social factor), PC 2 (Financial factor) and PC (Loan procurement factor).

Factor 1 (Social factor): The constraints that loaded high in factor one comprised of lack of trust (0.727), gender, (0.713), belief system (0.71), financial illiteracy (0.705), and low educational level (0.663).

Factor 2 (Financial factor): low income (0.701), high cost (0.69), long distance to financial institution (0.649), inadequate loans (0.46).

Factor 3 (Loan procurement factor): lack of information (0.847), bureaucracy (0.419), and inadequate formal financial systems (0.405).

Lack of trust was a major constraint that affected financial inclusion among the bee farmers and this could be due to the negative perception by farmers about financial services such as the fear of losing money or it may be from negative past experiences faced by the farmers such as exploitation. This finding is in line with the findings of James *et al.* [40] where the result from their study showed that lack of trust was a major constraint affecting financial inclusion in the study area. Gender was the next major constraint affecting financial inclusion and this may be because the farmers who majorly were male, felt that formal financial institutions are more favourable to females when rendering financial services. Also, belief system was a major constraint in the social factors affecting financial inclusion. This may be due to personal religious beliefs that caused unfavourable attitude from the farmers towards use of financial services. The finding of Ankita [15] agrees with these results, that unfavourable religious belief hinders financial inclusion.

Furthermore, Financial illiteracy was a major constraint affecting financial inclusion among the farmers and this may be due to poor knowledge of the benefits accruable from use of financial services and products and skills needed for certain financial products. The finding is in line with the results obtained by Nwang and Bime [18] who reported that financial illiteracy was a major constraint affecting financial inclusion in their study area. The last constraint in the social factor component was low educational level and this may be due to some of the farmers having no or only primary level of education and as a result may have difficulty in reading and writing, limiting their participation in formal financial transactions. Low income was the top constraint among financial factors and this may be because the farmers feel they do not have enough disposable income to participate in saving and other financial

products available to them in the study area. This result agrees with the findings of Ankita [15] who in his study confirmed that low income was a major constraint of financial inclusion in their study area. Long distance to formal financial institution was a major constraint in the study area. The difficulty and high monetary cost encountered by the farmers may discourage them from accessing and using financial services in the study area. This result is in line with the results from several studies [11, 18, 41] affirming that long distance to formal financial institution was a strong constraint affecting financial inclusion. Moreover, high cost was a strong constraint that affected financial inclusion among farmers within the study area. The high cost of services associated with financial services and products such as the opening and maintaining of accounts, loan fees and debit cards purchases may hinder financial inclusion. Furthermore, inadequate loan loaded high among financial factors and this could be because the loan offered by financial institutions may be too small and hence discouraged farmers from accessing loan within the study area. Loan procurement factors included lack of information, bureaucracy and inadequate formal financial institution. Lack of information was a top constraint and this may be due to improper information and unfamiliarity with financial services and products offered by the financial institutions in the study area which in turn limit farmers' access and use of financial services. The finding agrees with Nwang and Bime [18], who identified lack of information as a major constraint affecting financial inclusion in their study. Bureaucracy was another major constraint under this factor, as the problem of queuing up at banking halls or financial institutions to acquire financial products such as accounts opening, making deposits, or even to obtain loans makes it difficult and hence further discourages the farmers in the study area. Obisesan and Adeyonu [11] and Ankita [16] affirmed that bureaucracy was a major constraint affecting financial inclusion in their study. Inadequate formal financial institution was a major constraint affecting financial inclusion in the study area and this could be due to the formal financial institutions found in the study area not offering a broad range of adequate financial services that are needed by the farmers according to their preferences and needs per time.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

Financial inclusion is a vital mechanism for the enhancement of honey production and productivity in Cross River State. This study analyzed financial inclusion among bee farmers in Cross River State, Nigeria. Results showed that majority of the bee farmers were male, young, smallholder farmers, had Bee farming as their primary occupation and were financially included in terms of access but excluded in terms of use and quality.



Moreover, the study concluded that financial inclusion had positive and significant influence on honey production. The parameter estimates of education, occupation, account ownership, labour and number of hives significantly and positively affected bee output while household size and age negatively affected bee farmers output.

Income, financial literacy, education, number of bee hives were the significant drivers of financial inclusion across the three dimensions. Lack of trust, gender, belief system, financial illiteracy, low educational level, low income, high cost, long distance to formal financial institutions, inadequate loan, lack of information, bureaucracy, and inadequate financial systems, were the major constraints to financial inclusion in the study area.

Access to financial inclusion was high while use and quality were low. Financial institutions could partner with the government to create saving products for farmers such as affordable savings account labeled for agricultural spending, such as for the purchase of inputs from agro industries who partner with the financial institutions offering the savings product.

Moreover, financial technology companies could create opportunities for farmers to sell directly to customers on their platforms under special conditions instead of being the middle men, this would boost farmers' use of digital financial services and boost the overall quality of their financial inclusion experience.

Account ownership was significant to agricultural production among the farmers, hence banks as well as non-bank financial institutions could encourage more farmers to access and maintain accounts within their institution with attractive offers, special rewards for active farmers, higher profit on savings and easier account maintenance procedures.

Furthermore, bee farmers are smallholder farmers and hence are low income earners. Government could help by creating palliative measures and packages to boost the low income of farmers, which would in turn reduce the diversion of loans meant for agricultural production by farmers, as well as reduce the problem of spending all their savings from agricultural proceeds, without investing some part as retained earnings.

Financial literacy, income, education and number of bee hives were the strongest drivers of financial inclusion. Government and non-governmental bodies can organize financial literacy training programmes that will enlighten farmers on the need for participation in financial inclusion services; consequently, their adequate participation would improve their income and further drive financial inclusion, which could in turn boost their overall production.



Lack of trust, low income and lack of information were the major constraints affecting financial inclusion in the study area. Financial institutions could build the trust of farmers by prioritizing efforts to understand and address their unique needs and a strong focus on customer service by carrying out customer surveys targeted at the underserved players of the agricultural industry who are mostly farmers.

Furthermore, financial institutions could partner with other institutions such as government bodies and information agencies to make known innovative and affordable financial products and services created with farmers as special targets.



Table 1: Socio-economic characteristics of respondents

Variable	Frequency	Percentage
Sex		
Male	141	90.4
Female	15	9.6
Total	156	100
Age		
≤30	43	27.6
31-40	56	35.9
41-50	40	25.6xxxj
>50	17	10.9
Total	156	100
Mean (SD)	38(9.62)	
Marital status		
Single	22	14.1
Married	134	85.9
Total	156	100
Education level		
Primary education	29	18.6
Secondary education	87	55.8
BSc	38	24.4
MSc	1	0.6
PhD	1	0.6
Total	156	100
Household size		
<5	62	39.7
5-10	77	49.4
11-15	15	9.6
>15	2	1.3
Total	165	100



Mean (SD)	7(3.29)	
Number of bee hives		
≤ 10	100	64.1
11-20	25	16.0
21-30	12	7.7
>30	19	12.2
Total	156	100
Mean (SD)	14 (15.1)	
Farming experience		
≤ 5	39	25
6-10	59	37.8
11-15	39	25
>15	19	12.2
Total	156	100
Mean (SD)	10(5.6)	
Member of association		
Yes	74	47.4
No	82	52.6
Total	156	100
Income		
≤ 100,000	92	59
100,001-200,000	19	12.2
200,001-300,000	18	11.5
300,001-400,000	6	3.8
400,000-500,000	2	1.3
>500,000	19	12.2
Total	156	100
Mean (SD)	264270.83(157371.87)	

Source: Field survey, 2024. SD = standard deviation



Table 2: Implication of financial inclusion on honey production

Variables	Linear	Exponential	Semi log +	Double log
Constant	-19.39510 (- 0.49)	- 495.9578 (-3.31) ***	3.914220 (9.36) ***	2.183789 (1.65) *
HHSIZE	-5.149137 (- 2.49) ***	-33.52059 (-2.09) **	-0.061225 (-2. 79) ***	-0.445646 (-3.15) ***
Education	3.417332 (1.81) *	23.32296 (0.95)	0.054856 (2.75) ***	0.408747 (1.88)
Age	1.213222 (1.75) *	63.05181 (1.82) *	-0.016413 (2.20) **	-0.386009 (-1.26)
Occupation	25.71582 (-1. 55) *	46.81863 (2.46) ***	0.335613 (2.16) **	0.473741 (2.83) ***
Experience	-1.827874 (- 1.55)	6.072193 (0.42)	-0.012813 (-1.02)	0.043331 (0.34)
Account ownership	24.48946 (1.55)	23.55862 (1.15)	0.476334 (2.86) ***	0.469098 (2.60) ***
Received E-payment	18.62722 (1.17)	44.31668 (2.20) **	-0.098739 (-0.59)	0.049976 (0.28)
Labour	0.000352 (2.27) **	25.57963 (3.75) ***	5.11E-06 (3.12) ***	0.268234 (4.46) ***
Number of hives	6.64588 (14.6) ***	64.88367 (7.07) ***	0.046754 (9.70) ***	0.502658 (6.21) ***
Borrowed money	-26. 27129 (-1.3)	-27.98223 (-1.12)	-0.168528 (-0.82)	-0.158789 (-0.72)
R ²	0.718	0.527	0.612	0.550
Adj R ²	0.699	0.494	0.586	0.518
F-statistics	37.012***	16.133	22.953	17.657

Source: Computed from field survey data, 2024

***, **, * = significant at 1, 5 and 10 % level, respectively

+ = lead equation

Figures in brackets are T values



Table 3: Drivers of access to financial inclusion: account ownership

Variables	Parameters	Coefficient	SE	dy/dx	SE	Z-statistic
Constant	β_0	-2.0157	.9462			-2.13**
HHSIZE	β_1	.042320	.04006	.01651	.01562	1.06
EDU	β_2	.09422	.0346	.03677	.01351	2.72***
AGE	β_3	.006967	.01290	.00271	.00503	0.54
OCCUPATION	β_4	-.86723	.2722	-.33843	.1057	-3.19***
EXPR	B5	.000915	.02214	.000357	.008643	0.04
INCOME	B6	1.64e-06	5.29e-07	6.39e-07	2.03e-07	3.09***
SEX	B7	-.077874	.39647	-.030390	.154739	-0.20
MSTATUS	B8	.21324	.35430	.083219	.13829	0.60
DISTANCE_FIN	β_9	.000144	.00472	.000056	.001845	0.03
NUMBER_BEEHIVES	β_{10}	-.0046741	.012150	-.001824	.004739	-0.38
FIN_LITERACY	β_{11}	7.1563	.51765	.279274	.201590	13.8***
Observations	156					
Pseudo R ²	0.808					
Likelihood ratio $X^2_{(11)}$	38.88					
Prob > chi2	0.0001					
Log likelihood	-88.062					

Source: Computed from field survey data, 2024

***, ** = significant at 1, and 5 % level, respectively

Table 4: Drivers of use dimension of financial inclusion: borrowed money

Variables	Parameters	Coefficient	Standard error	dy/dx	Std. error	Z-statistic
	β_0	-.079834	.88338			
HHSIZE	β_1	.021067	.036075	.008395	.014375	0.58
EDU	β_2	-.035854	.01310	.002417	.013001	0.19
AGE	β_3	-0.03585	0.0131	-.014287	.005222	-2.74***
OCCUPATION	β_4	.19348	.246987	.0771016	.098430	0.78
EXPR	B5	.059656	.02208	.023772	.008804	2.70***
INCOME	B6	6.30e-07	2.40e-07	2.51e-07	9.55e-08	2.6**
SEX	B7	-.15720	.38102	-.062645	.151833	-0.41
MSTATUS	B8	.31468	.32828	.125398	.130831	0.96
DISTANCE_FIN	β_9	.004119	.00500	.0016416	.001993	0.82
NUMBER_BEEHIVES	β_{10}	-.033248	.010496	-.013249	.004177	-3.17***
FIN_LITERACY	β_{11}	.66441	.47807	.264759	.190455	1.39
Observations	156					
Pseudo R ²	0.24					
Likelihood ratio X ² ₍₁₁₎	26.99					
Prob > chi2	0.0046					
Log likelihood	-84.58					

Source: Computed from field survey data, 2024

***, ** = significant at 1 and 5% level, respectively

Table 5: Drivers of quality dimension of financial inclusion: received electronic payment

Variables	Parameters	Coefficient	Standard error	dy/dx	Std. error	Z-statistic
Constant	β_0	-1.11085	.91355			-1.22
HHSIZE	β_1	-.047713	.040219	-.018427	.01549	-1.19
EDU	β_2	.0846243	.034357	.032682	.013246	2.46***
AGE	β_3	-.002361	.0130134	-.00091	.005025	-0.18
OCCUPATION	β_4	-.345369	.25969	-.133382	.10037	-1.33
EXPR	B5	-.011593	.021474	-.004477	.008289	-0.54
INCOME	B6	1.11e-06	5.04e-07	4.30e-07	1.97e-07	2.21***
SEX	B7	-.211446	.383263	-.081661	.147999	-0.55
MSTATUS	B8	.373613	.343616	.14429	.13272	1.09
DISTANCE_FIN	β_9	-.005352	.005588	-.002067	.00215	-0.96
NUMBER_BEEHIVES	β_{10}	.060346	.011922	.02331	.0046006	5.1***
FIN_LITERACY	β_{11}	2.8966	.48996	.11187	.01893776	5.91**
Observations	156					
Pseudo R ²	0.55					
Likelihood ratio $X^2_{(11)}$	31.46					
Prob > chi2	0.0009					
Log likelihood	-89.09					

Source: Computed from field survey data, 2024

*** = significant at 1% level



Table 6: Principal component analysis on constraints to farmers' access, use and quality of financial services

Constraints	PC1	PC2	PC3
Lack of trust	0.727		
Sex	0.713		
Believe system	0.71		
Financial illiteracy	0.705		
Low educational level	0.663		
Low income		0.701	
High cost		0.69	
Long distance to formal financial institution		0.649	
Inadequate loan		0.46	
Lack of information			0.847
Bureaucracy			0.419
Inadequate formal financial system			0.405
Eigenvalue	3.308	1.615	1.344
Variance (%)	0.21	0.155	0.117
Cumulative variance (%)	0.21	0.365	0.482
KMO	0.732		
BTS	389.67		
Df	78		
Sig	<0.001		

Note. Applied rotation method is promax; Variables with factor loadings of less than **0.40** were not used

PC 1= Social factor; PC 2 = Financial factor; PC 3 = Loan procurement factor



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