



## Economic Analysis of Honey Production in Ogoja Agricultural Zone, Cross River State, Nigeria

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**Abstract:** Honey production has been advocated as a major contributor for livelihood improvement and poverty reduction for rural people. Producers of honey in the study area earned a net income of ₦4,183.72 per litre of honey produced, implying that the honey producers made good returns on investment. Honey production recorded a profitability index of 0.72 implying that honey producers earn 72 kobo profit from every ₦1 (naira) of sales. The enterprise shows positive returns on investment, largely driven by the quantity of honey produced and sold. However, producers' profitability is positively and significantly influenced by quantity of honey produced, selling price, education and experience, while marketers' profitability is positively and significantly influenced by quantity of honey sold, price sold, education and experience. Despite the favorable economic outlook, the honey value chain in the study area is constrained by lack of training in the production of bee value-added products, poor road network and high cost of transportation. Based on the findings from this study, the following recommendations are suggested: government and development agencies should promote the adoption of improved beekeeping technologies such as modern hives, as this will increase productivity, improve quality, and reduce post-harvest losses.

**Keywords:** profitability, honey production, beekeeping, return on investment, regression analysis, budgetary analysis

**Introduction:** Beekeeping, a practice of maintaining bee colonies in beehives for the purpose of honey production is a low input business enterprise with immediate return that directly generates economic gains for the participating farmers and integrates well with other agricultural practices (Adedeji and Joseph, 2023). Honey is produced by a species of bees called *Apis mellifera* through beekeeping and are a subset of bees which fall into the order of *hymenoptera* and suborder *apocrita*. Zaman *et. al.* (2024) noted that honey production plays significant roles in socioeconomic and environmental development; supplying a significant portion of domestic food and generating income for sustainable livelihood. As demand for honey continues to rise, understanding the dynamics of the honey production is essential for enhancing profitability and promoting sustainable practices within the industry. According to Gatzert *et. al.*, (2025) honey was ranked as the 710<sup>th</sup> most traded product globally in 2024, accounting for about 0.011 percent of total world trade. The top exporters included New Zealand, China, Argentina, India, and Brazil, with New Zealand leading at approximately \$273 million in exports. The authors further held that the United States emerged as the largest importer of honey, with imports valued at around \$745 million in 2024. Moreover, the honey market is projected to grow significantly, with estimates suggesting it could reach \$15.59 billion by 2032, driven by rising demand for natural sweeteners and an increase in beekeeping

activities. This data highlights the robust economic activity surrounding honey production and trade on a global scale. Nigeria equally has the potential of generating millions of dollars annually from local and international trade in honey and other hive products, as domestic consumption of honey stands at 380,000 metric tonnes (Adeokun *et. al.* (2022). Rural areas in Nigeria have a cost advantage in honey production due to lower labor and operational expenses, as well as reliance on natural ecosystems (Gratzer *et. al.* (2025). This makes their honey competitively priced and ensures profitability. Specialization in honey production creates jobs, improves household incomes, and fosters community development as earnings are reinvested in education, health, and infrastructure. Consequently, Mizero *et. al.* (2024) observed that strategic approaches to include leveraging digital tools such as blockchain for traceability and authenticity verification, vertical integration, where producers expand into processing and retailing, can help capture more value within the supply chain. Capacity-building initiatives, including training in modern beekeeping techniques and post-harvest handling, are essential for improving production efficiency and quality. Honey production is a profitable business that yields rapid return on a relatively minimal investment, often becoming self-sustaining within its first year of operation (Agbugba *et. al.* (2020). This practice requires minimal

Economic Analysis of Honey Production in Ogoja Agricultural Zone, Cross River State, Nigeria

resources and can be pursued domestically and commercially offering supplementary income and employment opportunities, particularly for economically disadvantaged population. Yadav *et al.* (2024) noted that as a vital sub-sector, beekeeping has substantial economic potential, producing high quality products such as honey, wax, pollen, propoli, royal jelly and bee venom. Furthermore, beekeeping contributes to agricultural productivity and environmental conservation through the natural pollination activities of bees, which enhance crop yields and support the maintenance of natural flora. According to Uke *et al.* (2023) honey is so much in use and consequently in demand that it can be termed a money spinner. Apart from being delicious and nutritious, it has been found useful in many industries especially for pharmaceutical purposes. Beekeeping can rightly be seen as a viable key in reducing poverty and malnutrition. By doing this one can obtain a large quantity of honey and other products for home consumption and commercial purposes. Many non-beekeepers also generate income from other bee-based business, like honey packaging, production of honey base cosmetics, candle making, medical practice predicated on bees and honey (bee therapy), bee keeping equipment for manufacturing, research, food service industry such as baking with honey, beverages and wine (Arage *et al.* 2020). Honey production in the Ogoja agricultural zone is highly profitable with significant potential for growth due to the zone's vast forest area and tropical climate. The zone has notable variation of agro-climatic conditions and biodiversity which favours the existence of diversified honeybee flora and vast number of honeybee colonies (Ugbe *et al.* 2024). Although beekeeping has been advocated as a major contributor for livelihood improvement and poverty reduction for rural people, it requires initial investment in equipment such as hives, protective gear, and processing units. In many rural areas within Ogoja Agricultural zone, access to affordable financing and necessary infrastructure for honey production remains a significant barrier, discouraging potential investors. Also, poor access to credit, and limited cooperative organization further constrain producers from commercial production. (Arage *et al.* 2020). Furthermore, reliable and up-to-date data on honey production (such as production volumes, productivity levels, and distribution) in Cross River state and Ogoja Agricultural zone in particular are lacking or inconsistent, making it

$$NFI = GM - TFC$$

$$GM = TR - TVC$$

Where;

NFI= Net Farm Income

GM = Gross margin (Naira)

TR = Total revenue (Naira)

TVC = Total variable cost (Naira)

TFC = Total Fixed cost (Naira) (Average annual depreciation cost for all input will be used)

TR =  $P_y \cdot Y$  Where:

$P_y$  = Price per unit output (Naira)

$Y$  = Total quantity of output (Liter per hive)

Return on naira invested (ROI) was obtained as follows:

ROI = Total revenue/Total production cost

Depreciation on capital equipment (these include depreciation on fixed cost items). This was estimated using the straight-line method given as shown in the equation below;

difficult to perform accurate economic analysis (Ugbe *et al.* 2024). It is against this backdrop that this research is designed to assess profitability of honey production in Ogoja Agricultural Zone in Cross River State, with the following specific objectives; analyze the cost and return for production of honey. To determine factors that influence the profit in honey production.

**Materials and Method: Study Area:** The study was carried out in Ogoja Agricultural zone (OAZ), Cross River State. The zone lies between latitudes 6°18' and 6°45' North of the equator and longitudes 8°20' and 9°35' East of the Greenwich Meridian (Fig. 2), bounded to the North by Benue State, to the West by Ebonyi and, Abia States, to the South by Ikom and Boki LGAs and the Republic of Cameroon to the East. It has humid tropical climate, and receives an annual rainfall of between 2500 mm to 3500 mm per annum and an average temperature of 30 °C during the dry season and 26 °C during the rainy season. Ogoja agricultural zone comprises of Ogoja, Yala, Bekwarra, Obudu and Obanliku Local government areas.

**Sampling procedure** A multistage sampling technique was used for the selection of 100 respondents for the study: in stage one two Local Government Areas (LGAs) were purposively chosen from the five LGAs of the zone based on the preponderance of honey production in the area, they were Ogoja LGA and Obudu LGA. In the second stage, fifty honey producers were chosen from each of the LGAs with the use of snowball method from the list of registered honey producers from the areas. Data used for this study were obtained from primary sources using questionnaires. The questionnaire was designed based on the study objectives. Data collected were analyzed using multiple linear regression analysis and budgetary analysis for objectives one and two respectively.

**Model specification:** Model for budgetary /profitability analysis The budgetary analysis involves the estimation of net farm income and returns on naira (ROI) invested which was used to determine the profitability of honey production in the study area. Thus, the net farm income was estimated on per farmer basis and per litre of honey produced as:

(i)

$$\text{Depreciation} = \frac{\text{initial value} - \text{salvage value}}{\text{life span}}$$

**Ordinary Least square regression**

Multiple linear regression utilizing OLS was used to ascertain the factors that influence the profit in honey production in the study area. Implicitly, the model is empirically estimated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots + \beta_n X_n + e$$

Y = Honey production profit (naira)

X<sub>1</sub> = labour cost (naira)

X<sub>2</sub> = cost of baiting materials (naira)

X<sub>3</sub> = chemical cost (naira)

X<sub>4</sub> = Quantity of honey produced (Litres)

X<sub>5</sub> = selling price (naira)

X<sub>6</sub> = age (years)

X<sub>7</sub> = education (years spent in school)

X<sub>8</sub> = household size(number)

X<sub>9</sub> = credit access (1= yes, 0 =no)

X<sub>10</sub> = membership in cooperative (1= yes, 0=no)

X<sub>11</sub> = experience (years)

X<sub>12</sub> = extension contact (no of visits)

X<sub>13</sub> = Sex (1= male, 0 = female)

β<sub>0</sub> = intercept and β<sub>1</sub>- β<sub>13</sub>= coefficients measured.

e = error term

**Result and Discussion: Cost and Returns Analysis of Honey Production:** The estimate of the cost and return in honey production by respondents is presented in Table 1. Among the total cost incurred by beekeepers, baiting material (₦83,804.7) was the highest cost and accounted for 25.6 % of the total costs, followed by cost of chemicals for pest control (18.47 %), and cost of labour (14.02 %). The estimated average total variable and total fixed costs were ₦194,587.7 and ₦132,8164 respectively. The result indicated that total variable cost accounted for 59.43 % of the total cost of production, while total fixed costs accounted for 40.47 % of the production cost. Further results indicated that each of the depreciated costs for all asset were less than 7 % of the total cost. The results further showed that the gross margin and net revenue per beekeeper were ₦803,418.3 and ₦670,602.26, respectively with an average quantity of 172 liters of honey sold per year per beekeeper. The analysis shows a total production cost per litre of honey in the study area to be ₦1,616.28 and gross revenue per litre of honey to be ₦4,669.14. The investigation indicated that honey producers in the study area earned a net income of ₦4,183.72 per litre of honey produced. This implies that the honey producers make good returns from their entrepreneur activities. Zaman *et al.* (2020) reported return/litre in their study to be ₦558.79. Return on sales gave a profitability index of 0.72 which implies that honey producers earn 72

kobo as net profit from every ₦1 (naira) of sales. With low profitability index of less than 1, honey producers need to adopt better management practices to be able to generate more profit. The rate of return on investment of 2.588 shows that honey producers operating in the study area earns ₦2.588K as profit on every N1 (naira) spent. This shows that, though the cost of running honey enterprise in the study area is high, a relatively high profit could still be achieved. The rate of return on variable cost is estimated to be 4.129 which imply that every N1 (naira) cost incurred on variable inputs generates about ₦4.129K. The operating ratio of 0.195 indicates that the total variable cost is about 19.5 percent of the total revenue which is low and indicates a good position of the business. In similar study by Ogunola *et al.*, (2024), an estimated net farm income of beekeeping per hive of 0.7m<sup>2</sup> was N27, 514.56 and the returns to naira invested of 1.65.

**Factors Influencing Profit Among Producers:** The multiple regression result of the factors influencing profitability among honey producers is presented in Table 2. The result showed labour cost, cost of baiting materials, cost of chemical to negatively and significantly influence profit among honey producers, while quantity of honey produced, selling price, education and experience positively and significantly influence profit among honey producers in the study area. The coefficient of labour cost (-1.257) was

negative and significant at 5% . This means that increasing labour cost by 10 % will decrease producer's profit by 12.57 %. The negative coefficient for labour cost indicates that increased spending on labour reduces honey producers' profitability. This outcome is consistent with broader findings in agricultural economics where labour represents a significant component of variable costs and can depress net returns if not effectively managed. Higher labour costs may arise from hiring external workers for hive management, harvesting, and processing, thereby reducing net margins. The result obtain herein is in line with previous studies (Akinmulewo *et al.*, 2017; Ibeneme, 2018; Arowolo and Oladejo, 2020) which indicated that labour costs, including management and maintenance activities are a major expenditure in honey production and can significantly influence profitability, and this corroborates the findings of this study. The coefficient of cost of baiting materials (-1.057) was negative and significant at 1 %. This means that increasing cost of baiting materials by 10 will decrease producer's profit by 10.57 %. Cost of baiting materials (used to attract and maintain colonies or feed bees) also showed a significant negative effect on profitability. Like labour, baiting materials constitute a part of variable input costs. When these costs increase without proportional gains in honey yield or quality, they reduce profitability. Although specific literature on "baiting cost" in honey production is limited, the broader agricultural literature on variable costs; such as bee feeds, supplements, and hive inputs; supports the premise that rising material costs without corresponding productivity gains reduce net returns (Paudel, 2025). The coefficient of chemical cost (-1.027) was negative and significant at 1 %. This means that increasing chemical cost by 10 % will decrease producer's profit by 10.27 %. This further implies that higher costs reduces the profit of farmers. This is expected because as chemical cost increase, the margin between revenue and expenses narrows, lowering net profit. Chemical expenses (for pest and disease control) significantly reduced profitability as, honey production requires periodic application of chemicals for managing pests such as varroa mites or fungal infections. Quantity of honey produced (6819.617) was positive and significant at 1 %. This means that further increasing the quantity of honey produced by 1 % will increase producer's profit correspondingly in the study area. The large positive coefficient for production quantity suggests that higher honey output significantly enhances profitability. This result is well supported in the literature (Zaman *et al.*, 2020; Uke *et al.*, 2023), yield is a primary driver of revenue in beekeeping, and increased production often translates directly into higher sales and returns. Studies have shown that beekeepers with higher production volumes typically achieve better profitability because fixed and variable costs are spread over more output, improving economies of scale (Ugbe *et al.*, 2024). The coefficient of selling price (193.808) was positive and significant at 1 %. This means that further increasing the selling price of honey in the study area by 1 % will increase producer's profit by 193.8 %. The positive effect of selling price on profitability shows the importance of market conditions. When selling prices are higher, revenue per litre increases, boosting net returns (Chiemela *et al.*, 2022; Adeokun *et al.*, 2022). Education

(3398.99) was positive and significant at 10%. This implies that an increase in years of education will increase farmer's profit correspondingly. This further implies that the educated honey producers will make higher profit than producers with no formal education. Education is known to equip farmers with improved knowledge of practices, management, and effective input use. Better-educated farmers tend to adopt modern techniques that increase productivity and reduce losses, thus boosting profits. The result obtain in this study is in line with previous studies (Arage *et. al* 2020; Tadesse *et. al.*, 2021) which shows that education positively affects productivity and income. Finally, the coefficient of experience (1781.401) was positive and significant at 10 %. This implies that an increase in years of experience will increase producer's profit correspondingly. Experience positively affected profitability, indicating that beekeepers with more years in apiculture earned higher net returns.

**Conclusion:** The study indicated that honey production in Ogoja Agricultural zone is a profitable agribusiness venture. The enterprise showed a positive returns on investment largely driven by the quantity of honey produced and sold. However, producers' profitability was positively and significantly influenced by quantity of honey produced, selling price, education and experience. Despite the favorable economic outlook, the honey value chain in the study area was constrained by lack of training in the production of bee, poor road network and high cost of transportation. Based on the findings from this study, the following recommendations were suggested: government and development agencies should promote the adoption of improved beekeeping technologies, regular training programs should be organized to improve producers' knowledge of hive management, disease control, harvesting techniques, processing, packaging and policies aimed at reducing the cost of key inputs such as transportation and labour should be encouraged.

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**TABLE 1. Cost and Returns Analysis of Honey Production**

|                                       | Total Cost/returns (₦) | Average cost/returns(₦) |                | Cost/returns per litre |
|---------------------------------------|------------------------|-------------------------|----------------|------------------------|
|                                       |                        | Value                   | Cost share (%) |                        |
| <b>Variable cost (VC)</b>             |                        |                         |                |                        |
| Labour cost                           | 4590000                | 45900                   | 14.2           | 266.75                 |
| Baiting material                      | 8380470                | 83804.7                 | 25.60          | 4874                   |
| Chemicals for pest control            | 6046300                | 60463                   | 18.47          | 351.39                 |
| Smoker material and fuel              | 442000                 | 4420                    | 1.35           | 25.69                  |
| <b>Total variable cost (TVC)</b>      | <b>19458770</b>        | <b>194587.7</b>         | <b>59.43</b>   | <b>1130.86</b>         |
| <b>Fixed cost (FC)</b>                |                        |                         |                |                        |
| Rent                                  | 4929000                | 49290                   | 15.5           | 286.45                 |
| <b>Depreciation cost on equipment</b> |                        |                         |                |                        |
| Extractor                             | 1904541.39             | 19045.41                | 5.82           | 110.68                 |
| Beehives                              | 2279032.71             | 22790.33                | 6.96           | 132.45                 |
| Bucket                                | 1826355.99             | 18263.56                | 5.58           | 106.14                 |
| Rope                                  | 579331.90              | 5793.32                 | 1.77           | 33.67                  |
| Tourchlight                           | 885609.29              | 88569                   | 2.70           | 51.47                  |
| Matchet                               | 297626.98              | 2976.27                 | 0.91           | 17.30                  |
| Smoker                                | 580105.48              | 58015                   | 1.77           | 33.71                  |
| Total fixed cost (TFC)                | 8352603.75             | 1328164                 | 40.57          | 485.42                 |
| Total cost (TC)                       | 27811373.75            | 327403.74               | 1000           | 1616.28                |
| <b>Revenue</b>                        |                        |                         |                |                        |
| Quantity sold (litres)                | 17207                  | 1727                    |                |                        |
| Price per litre                       | 5800                   | 5800                    |                |                        |
| Total Revenue (TR) (₦)                | 99800600               | 998006                  |                |                        |
| Gross margin (TR-TVC)                 | 80341830               | 803418.3                |                | 4669.14                |
| Net revenue (NR) = TR-TC              | 71989226.25            | 670602.26               |                | 4183.72                |
| <b>Profitability analysis</b>         |                        |                         |                |                        |

|  |       |       |
|--|-------|-------|
| Return on sales (NR/TR)                      | 0.721 | 0.672 |
| Rate of return on variable cost (TR-TVC/TVC) | 4.129 | 4.129 |
| Return on investment (ROI)(NR/TC)            | 2.588 | 248   |
| Operating ratio = TVC/TR                     | 0.195 | 0.195 |

Source: field survey 2025

**Table 2 Factors Influencing Profit in Honey Production**

| Variables                  | Linear      |             | Double log  |             | Semi-log    |             |
|----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                            | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| C                          | -1481149    | -18.531***  | -7.152      | -2.703***   | 9.512997    | 16.510***   |
| Labour cost                | -1.257      | -2.517**    | -0.114      | -178        | -3.92E-06   | -189        |
| Cost of baiting material   | -157        | -8.283***   | -040        | -0.934      | -3.60E-07   | -0.381      |
| Chemicals cost             | -127        | -7.144***   | -0.216      | -2.579**    | -1.69E-06   | -1.607      |
| Quantity of honey produced | 6819.617    | 5553***     | 1.977       | 24.680***   | 0132        | 14.588***   |
| Selling price              | 193.808     | 25.465***   | 1.620       | 6.666***    | 0003        | 4.942***    |
| Age                        | 578.204     | 150         | 054         | 0.501       | -0005       | -0.128      |
| Education                  | 3398.99     | 1.930*      | 013         | 0.275       | 0111        | 0.863       |
| Household size             | -1706.999   | -0.582      | 092         | 1.533       | 0043        | 0.200       |
| Credit access              | 19063.96    | 1.107       | 006         | 075         | 0085        | 068         |
| Cooperative                | -31520.3    | -1.746      | 0.101       | 1.173       | 0955        | 0.730       |
| Experience                 | 1781.401    | 2.226**     | -050        | -0.963      | -0078       | -1.332      |
| Extension contacts         | -6644.967   | -1.293      | 041         | 0.603       | 0113        | 0.300       |
| Gender                     | 34129.83    | 1.344       | -0.101      | -0.845      | -0677       | -0.370      |
| R <sup>2</sup>             |             | 0.980       |             | 0.897       |             | 0.763       |
| Adjusted R <sup>2</sup>    |             | 0.977       |             | 0.881       |             | 0.726       |
| S.E. of regression         |             | 8390260     |             | 0.399       |             | 0.605       |
| F-statistic                |             | 326.117     |             | 56.850      |             | 2107        |
| Prob(F-statistic)          |             | 0000        |             | 000         |             | 000         |

Source: Field survey, 2025

Note: + = Lead equation, \*, \*\* and \*\*\* represent significance at 10 %, 5 % and 1 % levels of significance, respectively