Resource-Use Efficiency of Modern Beekeeping in Selected Local Government Areas of Kano State, Nigeria.

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ABSTRACT

The study examined the resource-use efficiency in modern beekeeping in Kano State. Three (3) Local Government Areas of the state were purposively selected for the study, due to the intensity of modern beekeeping activities. These Local Government Areas were: Bagwai, Gwarzo and Tudunwada. Ninety (90) registered modern beekeepers from these Local Government Areas were randomly selected. Input-output data were collected using structured questionnaire. The data were analyzed using multiple regression model. The results of the marginal analysis showed that all the resources used in the production of hive output in modern beekeeping were inefficiently utilized in the area. Resources such as the number of hives, family labour, feed supplement and baiting material were under-utilized, while durable capital, non-durable capital and hired labour were over-utilized. The study therefore recommends that the use of inputs such as the number of hives, family labour, supplementary feed and baiting material should be increased, while durable capital, non-durable capital and hired labour should be decreased to gain more profits

INTRODUCTION

The art and science of raising honey bee for man's economic benefits is called apiculture (Chinaka,1995). It refers to the practice and management of the bees in the hive (Ojeleye, 1999), which leads to the production of valuable materials such as honey, beewax, propolis, bee pollen, bee venom and royal jelly. Modern technologies of finding bees and keeping them were introduced into Nigeria in the early 1990's (Olagunju and Ajetomobi, 2003).

Production of any agricultural enterprise requires the use of resources (inputs) to obtain outputs and these resources could be aggregated into land, labour, capital and management. In order to achieve optimum production level, resources must be available and whatever quantities of available resources must be used efficiently (Alimi, 2000). Modern beekeeping as an agricultural enterprise also requires to satisfy the above requirements for optimal production and better gains of profits.

The question of efficiency in resource allocation in traditional agriculture is not trivial. It is widely held that efficiency is at the heart of agricultural production. This is because the scope of agricultural production can be expanded and sustained by farmers through efficient use of resources. For these reasons, efficiency has remained an important subject of empirical investigation particularly in developing economies, where majority of the farmers are resource-poor (Umoh, 2006).

Modern beekeeping is undertaken in some Local Government Areas of Kano State, and it serves as a source of food, employment and income. A study needs to be conducted to ascertain the level and efficiency of resource-use in modern beekeeping, which would go along way in educating the farmers on the direction of adjustments in resource-use for profit maximization. The objective of this paper is to evaluate the resources-use efficiency in modern beekeeping in Kano State.

METHODOLOGY

Study area

Kano State is made up of fourty-four (44) Local Government Areas covering a total land area of 20, 760km^2. The state is located within latitude 10° 33^{1}N to 12° 37^2 N and longitude 7° 14^1 E to 9° 29^1 E (KNSG,2004). Kano State

population of 9,383, 682 inhabitants who are mainly Hausa and Fulani by tribe (NPC, 2006). Agricultural land is put at 1, 754, 200ha while forest and grazing land has 75,000ha. Over 80% of the inhabitants of the state are farmers cultivating cereals, leguminous, vegetable crops and beekeeping (KNSG, 2004). The climate of the state is mainly the tropical wet-and dry-seasons. The rainfall pattern is unimodal with the highest peak during the month of August. The average rainfall is 600mm. the temperature is averagely warm all year round at 27°C ± 7°C (Olofin and Tanko, 2002).

Data requirement

Three (3) Local Government Areas of Kano State, viz: Bagwai, Gwarzo and Tudunwada were purposively selected because of the intensity of the activities of modern beekeepers in these areas. The lists of registered members of the Modern Beekeepers Association were collected from the Departments of Agriculture and Natural Resources of these Local Government Areas totaling 191. A simple random sampling technique was used in selecting thirty (30) modern beekeepers from the sampling frame of each Local Government Area, making a total of ninety (90) modern beekeepers, for the purpose of the study. Data for the study were generated through the use of sets of questionnaire administered to the selected modern beekeepers. Input – output data on modern beekeeping collected include number of hives, durable assets, non-durable assets, family and hired labour, supplementary feed, baiting material and output. Output data include the amount of honey, beeswax, royal jelly and propolis.

Statistical analysis

Data collected for the purpose of this study were analyzed using multiple regression model. The model was specified as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, u)$ ..... (1)

Where:

Y = Total Output (Liters)
X_1 = Number of hives
X_2 = Durable assets (₦)
X_3 = Non-durable assets (₦)
X_4 = Family labour (man-days)
X_5 = Hired labour (man – days)
X_6 = Supplementary feed (Kg/Liter)
X_7 = Baiting material (Liter)
u = Error term
f = functional notation

The above production function was specified and estimated in five (5) functional forms. The functional forms tried include the linear, exponential, semi-log, Cobb-Douglass and quadratic. The functional form which gave the best fit in terms of R^2 value, the number of significant independent variables, the appropriateness of the signs on the parameter estimates and F-ratio was he linear which was therefore selected as the lead equation. The linear functional form was specified as:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + u \quad \text{..... (2)}$$

For the linear function, the Marginal Physical Product (MPP) was given by the value of the coefficient in respect of each variable that is b_1. The Marginal Value Product (MVP) in respect of each variable was obtained as the product of MPP with the unit price of the output (Py) that is b_1Py. The Marginal Factor Cost (MFC) was obtained as either the market price if purchased from competitive input market or the geometric mean values of the input costs, or depreciation if durable assets. The average annual depreciation value of a durable asset was used as the MFC because it is the part of the cost of the durable asset consumed within the production period.

The ratio of MVP to MFC of each input was computed to measure the resource – use efficiency. Alimi (2000) states that economic theory postulates that a firm maximizes its profit with respect to an input if the ratio of its MVP to its MFC is one. A ratio less than unity shows over-utilization of that resource, while a ratio greater than unity portends under-utilization of the input. Therefore, reduction in the use of over-utilized resource and increasing the under-utilized resource are recommended to exploit more profits.

The absolute value of the required adjustment needed in MVP to attain efficiency in resource allocation (D_i) as obtained from Iheanacho *et al.*(2000) was determined using the relation:

$$D_i = (1 - 1/r) \times 100 \quad \text{..... (3)}$$

Where:

D_i= Absolute value of the required adjustment for MVP to attain efficiency
R= Ratio of MVP to MFC
100= The factor (%)

RESULTS AND DISCUSSION

Results of Regression Analysis

The results obtained from the estimation of the linear production function, which gave the best line of fit considering the *apriori* expectations are presented in Table 1

The regression results from the linear production function indicate that about 69 per cent (R^2) of

the variation in the hive output was explained by the explanatory variables included in the model. These variables include the number of hives, durable capital, non-durable capital, family labour, hired labour, supplementary feed and baiting material. The remaining 31 per cent not explained by the explanatory variables could be attributable to the error or random disturbance in the model. Also, the F-ratio of 25.79 was significant of 1% level implying that the explanatory variables included in the model have strong explanatory power. The F-ratio is a measure of joint significance of all the explanatory variables included in the respective models. The intercept amounted to 60.57, meaning that about 60.57 liters of the hive output could be obtained at zero cost, though not statistically significant. The regression coefficients with respect to number of hives, durable capital, family labour, quantity of supplementary feed and baiting material were positively signed, implying that any increase in any of these inputs, holding other variable inputs constant, would increase the hive output by a proportion corresponding to its regression coefficient. It should however be noted, that family labour and baiting material were not statistically significant.

The regression coefficients of non-durable capital and hired labour were negatively signed, implying that any increase in any of these inputs, holding other variable inputs constant, would reduce the amount of the hive output by the value corresponding to the regression coefficient of the input in question, though hired labour was not statistically significant.

Marginal Value Productivities and Resource-use Efficiency in Modern Beekeeping.

Evaluation of resource-use efficiency allows the firms to know their operational status in order to adjust their production activities appropriately. The evaluation of resource-use efficiency of modern beekeeping using linear regression in the study area is presented in Table 2.

The results indicated that all the variables included in this study (number of hives, durable capital, non-durable capital, family labour, hired labour, feed supplement and baiting material) were not efficiently utilized based on the MVP/MFC ratio criteria. The results further revealed that the marginal value product of number of hives was ₦4737. This implies that if other factors are held constant, increasing the number of hive by one unit would increase the total value product by ₦4737. The marginal factor cost of hives was assumed to be the arithmetic mean of the depreciation on the hive per year, which was ₦280. The MVP/MFC ratio (r) for number of hives was 16.92 implying that number of hives was under-utilized and increasing the number of hives will increase profits. The absolute value of the required adjustment needed in MVP to attain efficiency in the allocation of the number of hives was obtained as 94.09 implying that the MVP needs to be adjusted by 94% so that MVP/MFC ratio (r) of unity could be exactly reached, a point at which efficiency in the use of hives would be obtained. Similar result was reported by Kizilaslan and Kizilaslan (2007) that increasing the number of hives increases the amount of hive output.

Going by the MVP/MFC ratio (r), durable capital, non-durable capital and hired labour all have ratio less than unity, implying that they were over-utilized. The reduction in the use of these inputs, all other factors held constant, would increase profits realizable in the modern beekeeping venture. The corresponding adjustments in the MVP needed for the attainment of efficiency in the use of these resources were obtained as D_i against each resource as presented in Table 2.

In the same vein, family labour, supplementary feed and baiting material were having an MVP/MFC (r) ratio greater than 1, implying that these resources were under-utilized. Increasing the use of these resources, holding other factors constant, would increase profits realizable in the modern beekeeping venture. For these resources also, the absolute values of the required adjustments in the MVP needed for the attainment of efficiency were presented in Table 2.

Arising from this is the need to encourage modern beekeepers to increase the use of hives, family labour, supplementary feed and baiting material. Also, modern beekeepers need to be encouraged to reduce the excessive use of durable capital items, non-durable capital items and hired labour. These would increase the profits realizable from modern beekeeping venture.

CONCLUSION

This paper identified some of the resources used and their efficiency in modern beekeeping in Kano State. Structured questionnaire was administered to collect data from ninety (90) randomly selected members of Model Beekeepers Association from three (3) purposively selected Local Government Areas where modern beekeeping is prominent practiced in the state. Data were analyzed usi

multiple regression technique. The results of the marginal analysis showed that all the resources used in the production of hive output in modern beekeeping were inefficiently utilized in the area. Resources such as the number of hives, family labour, feed supplement and baiting material were under-utilized, and increasing the use of these resources would increase profits. Other resources such as durable capital, non-durable capital and hired labour were over-utilized, and reduction in the use of these inputs would increase profits realizable in modern beekeeping venture.

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Table 1: Results of the estimated production function for modern beekeeping.

Variables	Regression Coefficient	t-value	R^2	F
Constant (a)	60.566	1.283^{ns}	0.693	25.787***
Number of hives (X_1)	7.895	3.632***		
Durable capital (X_2)	0.0035	2.102**		
Non-durable capital (X_3)	-0.059	-4.099***		
Family labour (X_4)	9.275	1.443^{ns}		
Hired labour (X_5)	-3.206	-0.452^{ns}		
Supplementary feed (X_6)	3.368	4.197***		
Baiting material (X_7)	7.915	1.471^{ns}		

*** = Significant at 1% level ; ** =Significant at 5% level ; ns=not significant ; Source: Calculations from Field Survey Data 2007/2008

Table 2: Evaluation of resource-use efficiency of modern beekeeping using linear regression in the study area

Variable	MVP	MFC	r	D_i
Number of hives	4737.00	280.00	16.920	94.09
Durable capital	2.10	800.00	0.003	33233.33
Non-durable capital	-35.40	216.60	-0.160	525.00
Family labour	5365.00	466.00	11.940	91.62
Hired labour	-1923.60	1110.00	-1.730	42.20
Supplementary feed	2020.80	46.85	43.130	97.68
Baitin material	4749.00	106.88	44.430	97.75

Source: Calculations from field survey Data 2007/2008