

Resource Use Efficiency In Poultry Egg Production In Maiduguri And Environs Of Borno State, Nigeria

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ABSTRACT

Poultry enterprise is significant to Borno State and the Nigerian economy as whole because it provides a good source of animal protein in form of meat and eggs. The study estimated resources use efficiency in poultry egg production in Maiduguri and Environs of Borno State, Nigeria. The specific objectives were to: examine the socio-economic characteristic of poultry farmers; examine the poultry egg production system practiced by farmers; and estimate the efficiency of resource used in poultry egg production. Purposive sampling technique was employed for the study. Ten (10) wards were purposively selected out of the existing fifteen (15) wards in the area. These are areas where poultry egg producers are predominantly found. From each of the ten (10) wards, five (5) poultry egg producers were randomly selected, giving a total sample size of fifty (50) respondents for the study. Data were obtained with the aid of structured questionnaire administered to fifty (50) poultry egg producers. Descriptive statistics and multiple regression model were used as analytical technique. The finding shows that majority (82%) of the respondents were male, 68% were married, 62% were within the age group of 31-35 years, while 42% had between 11-20 persons in their households in the study area. The result also indicates that 46% of the respondents had secondary education, 58% of the respondent had between ₦51, 000-₦100, 000, while 52% of the respondents had flock sizes ranging from 101-200. The finding shows that 26% of the respondent practised free range system, about 40% practised battery cage system while, 34% practised deep litter system of poultry production in the study area. The total sum of the elasticities of poultry egg production of the resources was 1.748. The finding also reveals that the ratios of the MVP to the MFC were less than unity (1) for all the inputs. It was recommended among others that: poultry egg producers should reduce the quantities of farm inputs such as family labour, hired labour, flock size, feed, depreciating cost of equipment and operating expenses to ensure increase in poultry egg production; and extension agents in the state should be properly trained and provided with all necessary technological packages required to teach and guide farmers on improved poultry egg production.

Keywords: Resource Use, Efficiency, Poultry Egg, Maiduguri, Borno State, Nigeria

INTRODUCTION

Before the discovery of oil, agriculture was the key area contributing to the Nigeria economy. It was the main source of foreign exchange earnings and accounted for over 60% of its Gross Domestic Product (GDP) in the 1960s. The shares of agricultural products both processed and unprocessed was high far back then. During the period, Nigerian economy was described as an agricultural economy because the engine of growth of the overall economy for the country

was agriculture (Wahab, 2011). Agricultural sector accounted for less than 50% of Nigeria's GDP in 2004 and since then the contribution of agriculture continue to decline which is now around 23% (CBN, 2014), and Nigeria has been facing serious poverty challenges and the insufficiency of basic food needs. The contribution of the livestock sub-sector to both the agricultural and national GDP had been on the decline over the years. The contribution of livestock to agricultural GDP has been reduced by two thirds while its contribution to national GDP has been halved. This has nutritional implications as human population has been growing steadily.

The livestock industry is very vital in the Nigerian economy because it provides a good source of animal protein such as milk, meat and egg that are rich in the essential amino acids required for body functions. Excess released from such products could as well be exported for foreign exchange (Adepoju, 2008). Livestock production, according to Ekunwe and Soniregun (2007) is an important part of farming in Nigeria agriculture. People depend on livestock production for supplies of food, clothing, fertilizer and draught power to sustain the economy. Livestock farming also serves as a subsidiary occupation to supplement the income of small and marginal farm families. Among livestock based vocations, poultry occupies a pivotal because of its enormous potential to bring about rapid economic growth, particularly benefiting the weaker section. Poultry egg production is one of leading key lucrative economic undertakings to the small scale farmers in Maiduguri, Borno State of Nigeria. The poultry egg production industries, alongside providing employment and a livelihood to thousands of people in Nigeria, also provides high quality nutritious food. The egg is a complete protein with excellent quality; one egg will give 6g of protein and egg-white protein has a biological value of 100, the highest biological value of any single protein (FAO, 2005). Poultry meat and egg accounted for about 30% of the total livestock output in Nigeria, of which eggs accounted for over 80% (Evbuomwan 2006). It needs low capital investment and yet assures quick returns within weeks and months in case of broilers and layers respectively. Eggs and poultry meat has emerged next to milk as a contributor to the output from livestock sector in recent years (Ekunwe and Soniregun, 2007). The percentage contribution of eggs and poultry meat was 4.47% in 1951-1952, which reached to later over 9% in 1995-1996 (Ekunwe and Soniregun, 2007). Poultry meat and egg accounted for about 30% of total livestock output in Nigeria, of which eggs accounted for over 80% (Evbuomwan 2006). Poultry production takes place in all parts of the country (Ekunwe and Soniregun, 2007), including Borno State of Nigeria. The poultry industry has become a diverse industry with a

variety of business interests such as egg production, broiler production, hatchery and poultry equipment business (Amos, 2006). Population explosion together with poor distribution of food are among the world's greatest problem today. In Nigeria, production of food has not increase at a rate that can meet the increasing population and there is no compensation for population increase by the total farm output (Adepoju, 2008). This was affirmed by the periods of (Federal Office of Statistics (FOS), 1996), that food production in Nigeria increase at the rate of 2.5% while food demand increase at a rate more than 3.5% due to the high rate of population growth of 2.83%.

Nigeria, like many other developing countries suffers from protein deficiency compounded as a result of rapid population growth, low productivity in the agricultural sector, rural urban migration, and decline in productivity of the livestock sub-sector (Abubakar, 2000). In same vein, Ojo (2003) also asserted that apart from Nigeria's agriculture not meeting up in its food production to meet the food requirement of the increasing population, its greatest problem is that of inadequate animal protein in the diet of a large proportion of the population especially in the rural areas which constitutes over 70% of the Nigeria population. Hence the significance of poultry and livestock in general for sustainable food production and fostering of widespread provision of animal protein cannot be over emphasized.

The food and agricultural organization of the United Nations (FAO) stipulates a daily requirement of 65gm-75gm total protein, out of which 40% should be derived from animal protein. The average level of animal protein consumption in Nigeria is 15g/head/day which is grossly below the Food and Agricultural Organization (FAO, 1998), recommended level of 35g/head/day for the production of livestock. Protein from livestock is said to be nutritionally superior to that of vegetable origin because it contains a complete range of amino acids that are essential for maintenance of health. Thus protein from livestock is required to supplement those from vegetable origin to correct the serious imbalances in the nutritive value of the Nigerian diet which are dominated by foodstuffs rich in carbohydrate (Evbuomwan, 2006). In realization of the importance of animal protein, the various governments in Nigeria have been pursuing Programmes at National, State and Community levels to boost the mass production of livestock products, to ensure the attainment of food and agricultural organization (FAO) (1998), recommendation of 35g per capita of animal protein per day.

The poultry egg production industry is faced with constraints such as technical know-how on proper use of farm inputs (labour, feed, cost of equipment) among others that results in low production of poultry and poultry products to attain the populace demand and for socio-

economic sustainability of livelihood. Egg production in Nigeria is also troubled by unstable trends in the economy. These problems make it very difficult to expand the scale production and new egg producers find it hard to start a business. Other problems that hinder egg production in Nigeria agricultural sector includes high cost of feed, outbreaks of diseases, and marketing problems (Nmadu, 2014). This situation has forced many small scale poultry farms to close down and those still managing to survive are producing at very high cost with serious input limitations. This study estimates the efficiency of resources use in poultry egg production in Maiduguri and Environs, Borno State, Nigeria to bridge the gap in existing literature on sustainable poultry egg production research in the study area. The study was design to provide answer to the following research questions: (i) what are the socio-economic characteristics of poultry farmers? (ii) what are the poultry egg production systems practiced by farmers? (iii) are resources efficiently utilized in poultry egg production?

Objective of the Study

The main objective of the study was to estimate the efficiency of resources use in poultry egg production in Maiduguri and Environs, Borno State, Nigeria. The specific objectives were to: (i) examine the socio-economic characteristic of poultry farmers; (ii) examine the poultry egg production system practiced by farmers; (iii) determine the efficiency of resource used in poultry egg production.

LITERATURE REVIEW

Efficiency is a significant concept in production economics (Gaddi et. al., 2002), when resources are constrained and prospects of adopting better technologies are competitive. Efficiency studies helps in understanding the existing performance and opportunities to improve the production performance of a particular enterprise under consideration. Earlier studies on efficiency have revealed that it is possible to increase the productivity of the farms without actually increasing the inputs (Gaddi et. al., 2001, Ali and Choudhury, 1991; Umesh and Bisalaiah, 1991). Ala and Boniface (2009) studied economics of commercial poultry (layers) production in Sokoto Metropolis using production function and their findings revealed that labour input was over-utilized. The Marginal Value Product (MVP) of labour ₦1, 643.53, while the Marginal Factor Cost (MFC) was ₦100 per man-day. It indicates that, if other inputs were held constant (at their geometric means), increasing labour by 1man-day would increase the total value product by ₦1, 543.53. Evidently the acquisition cost is higher than the marginal value product; therefore labour is being used above the economic optimum level.

Contrary, Adepoju (2008) studied technical efficiency of egg production in Osun State, Nigeria using production reported that operating expenses (Labour, drugs and transportation) were efficiently allocated and utilized. The findings revealed that the coefficient of operating expenses was positive and also less than unity but not significant at 5% level of significance. This implies that the variables are efficiently allocated and utilized. This was supported by the finding of Ojo (2003) in study conducted on productivity and technical efficiency of poultry egg production in Nigeria using production function that operating expenses (labour, drugs and transport cost) were positive decreasing functions to the factors, indicating the variables allocation and use were in the stage of economic relevance of the production function (stage II).

Ojo (2003) asserted that the elasticity of feed consumed in poultry to the factor indicating overuse and in stage III of the production function. This was in consonance with the findings of Adepoju (2008) that the coefficient of feed was Negative implying that the total revenue from egg production decreases with increase in feed cost. The findings indicate that the factor allocation is already in stage III and to come back to the stage of efficiency the allocation has to be reduced. This assertion was further conformed the findings of by Ala and Boniface (2009) that feed is being used above the economic optimum level by poultry egg producers in Sokoto State. The findings revealed that the marginal value product (MVP) of feed was 42.98. This implies that other inputs are held constant (at their geometric means), increasing feed input by 1kg would increase the total value product by 42.98. While the unit cost of feed was 44.00 per kg. This indicates that the acquisition cost is higher than the marginal value product; therefore feed is being over utilized.

In his findings, Adepoju (2008) revealed that the coefficient of the number of birds raised to produce the eggs was 0.52 and highly significant at 5% level of significance. The coefficient was positive and less than unity implying that increasing the number of birds for egg production by one would increase the revenue accruable by 52 kobo. In other words, the allocation and utilization of these factors was in stage II of the production surface and thus it is efficiently allocated and utilized. Similarly, Ojo (2003) also affirmed that the variable of stock of birds was effectively allocated and used, as confirmed by haring estimated value between zero and unity.

The findings of Ala and Boniface (2000) on economics of commercial poultry (layers) production using production function indicated that the input (drug) was under-utilized. The marginal value product (MVP) of drug was ₦11, 342, while the unit cost was ₦150,

indicating that the Marginal Value Product was higher than the Marginal Factor Cost. This indicates that if other inputs are held in their geometric means, increasing drug by 1 liter would increase total value product by ₦11, 342. The under- utilization of drug was attributed to shortage of viable vaccine, cost, unavailability of veterinarian and lack of awareness.

According to Ojo (2003) technical efficiency (TE) of poultry egg farmers varied due to the presence of technical inefficiency effects in poultry egg production in Nigeria. The variables of years of schooling, experience and age of the poultry farmers decrease the farmers TE while the location of the poultry farms increases. This was further confirmed by the findings of Adepoju (2008) that only location of the poultry egg farm positively improved the TE while other socio-economic variables such as education, poultry keeping experience, and age of the poultry farmers in the model are negative and insignificantly influence the TE. The returns to scale (RTS) of the poultry egg production was 0.77, it was positive and less than unity indicating that eggs production was in stage II (rational zone) of the production function and that inputs allocation and utilization are efficient.

THEORETICAL FRAMEWORK

The production function method was employed to estimate the efficiency of resources use in poultry egg production. Based on the microeconomics theory of production function, firm's production function describes the technology or technical relationship between the input(s) and output(s) of production methods of the poultry egg farmers. In order to determine the economic efficiency of the resources used in poultry egg production, the marginal value product (MVP) of each resource was compared with its marginal factor cost (MFC) and the efficiency indicators calculated. Economic efficiency is a combination of technical and allocative efficiency respectively. It aim at maximizing benefits while minimizing costs. According to Nicholson (1978) economic efficiency is the same as pareto efficiency. An allocation of resources is Pareto efficient if no one individual (or activity) can be made better-off without making someone else (or another activity) worse-off. Hardwick et. al. (1988) opined that the concept of pareto efficiency can be used to evaluate different ways of allocating resources.

The study adopted the method used by Oladeebo (2006) and (Ng'eno, 2010), where the marginal value productivities (MVPs) for each resource is computed and compared with their respective acquisition cost, marginal factor cost (MFC). The mean estimates (output and input costs) of the log-linearized Cobb-Douglas production function were used in the calculation of MVPs of each of the resources (inputs) with its MFCs. A statistically

significant difference between a resource's MVP and MFC suggests sub-optimality in the utilization of that resource (Ng'eno, 2010). The MVP of a particular resource is given as:

$$MVP = MPP_{x_i} \cdot P_Y \dots\dots\dots (i)$$

Based on Cobb-Douglas production function which was double log-linearized, the marginal physical product (MPP) and the corresponding values of MVP were obtained as follows:

$$MPP_{x_i} \cdot P_Y = MFC, \dots\dots\dots(ii)$$

Where:

$$MPP_{x_i} \cdot P_{Y_i} = MVP, \quad \text{But: } MPP = \beta_i Y/X_i \text{ while } MVP = \beta_i Y/X_i \cdot P_Y$$

$$MFC = \beta_i Y/X_i \cdot W_{x_i} Y \dots\dots\dots(iii)$$

Where:

- β_i = regression coefficient per resource,
- Y_i = mean output of poultry egg
- X_i = mean value of resource (farm inputs)
- dY/dx_i = derivative of total output (Y_i) with respect to factor inputs (X_i)
- W_{x_i} = cost of resource x_i per unit of farm input
- P_{Y_i} = price of egg i per unit
- MFC = marginal factor cost
- Resource use efficiency (r) = $MVP/MFC, \dots\dots\dots (iv)$
- P_{Y_i} = estimated by average selling price of output (eggs per year per farmer)
- MFC (W_{x_i}) = estimated as average acquisition cost per resource per year per farmer
- (X_0) = Optimal level of resource use is given by:
- $\beta_i Y/X_i \cdot P_Y / X_0 = \beta_i Y/X_i \cdot W_{x_i} Y (MFC) \dots\dots\dots (vi)$

Therefore, when Resource use efficiency (r) = 1, resources are optimally utilized,
 When $r < 1$ resources are over utilized, When $r > 1$, resources are underutilized.

RESEARCH METHODOLOGY

Study Area

Maiduguri is situated between latitudes $12^{\circ} 30''N$ and $14^{\circ} 30''N$ and longitudes $10^{\circ} 30''E$ and $14^{\circ} 45''E$ (MLS, 2011). Maiduguri comprises of 15 wards and shares boundaries with Konduga, Jere and Mafa Local Government Areas with estimated population of 2,733,696 in 2008 based on 3.8% growth rate (NPC, 2006). The study area lies within the Sudan savanna

of the country's vegetation with amount of rainfall ranging from 300-700mm/annum, with minimum and maximum temperature of 19⁰C and 48⁰C respectively. The predominant ethnic groups in the study area are the Kanuri, Shuwa, Hausa and sprinkles of Fulani. Crop production and livestock farming are the predominant occupation of the people while other economic activities include trading and craftsmanship. Major crops grown in the region include maize, millet, guinea corn, rice, cowpea, fruits and vegetables.

Sources of Data and Sampling Technique

Primary and Secondary information sources were used for the study. The primary data were generated through structured questionnaires administered to randomly selected respondents. The secondary sources of information include textbooks, journals, articles, conference proceedings, bulletins, annual reports and other relevant publications. Purposive sampling technique was employed for the study. Ten (10) wards were purposively selected out of the existing fifteen (15) wards in the area. These are areas where poultry egg producers are predominantly found. From each of the ten (10) wards, five (5) poultry egg producers were randomly selected, giving a total sample size of fifty (50) respondents for the study.

Analytical Techniques

The analytical tools used for the study include descriptive statistics and multiple regression model.

Descriptive Statistics

The descriptive statistics used include frequency, percentages and rank order. These were used to analyze socio-economic characteristics and poultry egg production system to achieve objectives i and ii.

Production Function

Multiple regression model was used to determine the physical relationship between inputs and output obtained in poultry egg production (Tijani et. al., 2010) and the coefficients of the double-log function (elasticity) was used to estimate the efficiency of resource use in poultry egg production to achieve specific objective ii. The Cobb-Douglas production function was used in estimating the Marginal Value Product (MVP) of the resources used in poultry egg production. The only merit of this production function has been that the input coefficients constitutes the respective elasticities. The implicit form of the model is expressed as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, e) \dots\dots\dots (v)$$

Where:

Y = output of poultry egg production (crate)

- X_1 = family labour (man day/hour)
- X_2 = hired labour (man day/ hour)
- X_3 = flock size (number)
- X_4 = feed (kg)
- X_5 = depreciation cost of equipment (₦)
- X_6 = other operating expenses (₦)
- e = error term.

The different functional forms tried are stated explicitly as:

Linear function:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e \dots\dots\dots (vi)$$

Double-log (Cobb-Douglass) function:

$$\ln Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + e \dots\dots\dots (vii)$$

Semi-log function

$$Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + e \dots\dots\dots (viii)$$

Exponential function:

$$\ln Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e \dots\dots\dots (ix)$$

Different functional forms were tried for the analysis. These include linear, semi-log, double-log and exponential functions out of which the double-log function (vii) was chosen and used to estimate the technical efficiency of resource use in poultry egg production. The choice of the best functional form [lead equation] was based on both statistical and econometric criteria [T-test, F-statistics, and R^2], number of significant variables and the a priori expectation of the signs of the coefficients. It was expected a priori that the coefficients of $\ln X_1, \ln X_4$, and $\ln X_5$ would be positive, while those of $\ln X_2, \ln X_3$ and $\ln X_6$ would be negative. Also, farmers' resource use in poultry egg production was expected to be efficient. The following ratio was used to estimate the relative technical efficiency of resource use in poultry egg production (r).

$$r = \frac{MVP}{MFC} \dots\dots\dots (x)$$

Where:

MFC = cost of one unit of a particular resource.

MVP = value added to egg output due to the use of an additional unit of input calculated by multiplying the MPP by the price of output i.e $MPP \times p_0$.

If $r = 1$ resource is efficiently utilized, $r > 1$ resource is under-utilized and $r < 1$ resource is over utilized.

Economic optimum takes place where $MVP = MFC$. If r is equal to 1, it suggests that resource is not efficiently utilized. Adjustments could therefore be made in the quantity of inputs used and costs in the production process to restore $r = 1$. The elasticity of production which is the percentage change in output as a ratio of a percentage change in input used to calculate the rate of return to scale, which is a measure of a firm's success in producing maximum output from a set of inputs.

$$E_p = \frac{MPP}{APP} \dots\dots\dots (xi)$$

Where:

- E_p = Elasticity of production
- MPP = Marginal physical product
- APP = Average physical product

If $\sum E_p = 1$: Constant return to scale; $\sum E_p \leq 1$: Decreasing return to scale and
 $\sum E_p \geq 1$: Increasing return to scale.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondent

The socio-economic characteristics of the respondent examined include: gender, marital status, age, household size, educational level, annual poultry farm income, production system and flock size. The findings are presented in Table 1.

Table 1: Socio-economic Characteristics of the Poultry Egg Farmers

Socio-economic variables	Frequency	Percentage
Gender:		
Male	41	82
Female	09	18
Total	50	100
Marital status:		
Single	04	08
Married	34	68
Divorced	07	14
Widow	05	10
Total	50	100
Age:		
Less than 30	07	14
31 – 35	31	62
36 – 40	08	16
41 and above	04	08

Total	50	100
House hold size:		
1 – 15	10	20
6 – 10	11	22
11 – 20	21	42
21 and above	08	16
Total	50	100
Education level:		
Primary education	12	24
Secondary education	23	46
Tertiary education	06	12
No formal education	09	18
Total	50	100
Annual Poultry farm income (₦):		
Less than 50,000	06	12
51,000-100,000	29	58
101,000-200,000	12	24
201,000 and above	04	08
Total	50	100
Flock size:		
Less than 50	06	12
51-100	12	24
101-200	26	52
201,-300	04	08
301 and above	02	04
Total	50	100

Source: Field survey, 2011

The finding in Table 1 shows that majority (82%) of the respondents were male, while only 18% were female. This indicates that majority of the poultry egg farmers in the study area were male. This might be due to male farmers having many mouths to feed as household heads. They therefore engage more in poultry egg production to supply household foods and other basic needs. Besides, the purdah system (seclusion) of women that is practiced in most northern Nigeria States such as Borno State prevent women's active participation in agriculture (Tijani et. al., 2010). Furthermore, gender is a significant factor in agriculture because of its vital role in determining the farmers' agricultural activities. The result also shows that majority 68% of the respondents were married, while 10% were widow in the study area. This shows that majority of the respondents were married men and women, thus require extra income to cater for their families food and other basic needs.

The result further indicates that majority (62%) of the respondents were within the age group of 31-35 years, while 08% were 41 years and above in the study area. The finding indicates that most of the respondents were in their active and productive age group. The age of a farmer is a very important factor in agriculture because it can be used to determine the type of

agricultural activities performed by the farmers (Abubakar, 2004). For instance, in traditional agriculture younger farmers tend to engage in labour intensive farming activities than older farmers and children.

The result shows that 42% of the respondents had between 11-20 persons in their households, while 16% had 21 and above persons in the study area. The result concludes that most of the respondents had reasonable household size in the study area. Household size in traditional agriculture influences the availability of family labour, production goals and possible total area of land cultivated, which in turn affect output. The higher the productive household size the larger the area of land cultivated, thereby resulting to increase in output (Tijani, 2007). The result also indicates that 46% of the respondents had secondary education, while 12% had tertiary education in the study area. Majority of the respondents were literate, having attempted one form of education or the other. Farmer's efficiency in using information on new production technique increases with education and thus, their productivity (Amaza and Maurice, 2005).

The finding indicates that 58% of the respondent had between ~~₦~~51, 000–~~₦~~100, 000, while 8% had ~~₦~~201, 000 and above annual poultry farm income in study area. This implies that most of the respondents obtained low income in poultry production which might be due to small farm holdings. This supports the finding by Tijani (2007) that annual income of a farmer determine the farmers ability of the farmer to purchase and use improved technology which may bring about increase in productivity and subsequently leads to higher income, thus, the higher the annual income of a farmer, the greater the scale of agricultural production he can under take and higher the profit in farming vice versa. The finding also indicates that 52% of the respondents had flock sizes ranging from 101-200 while, 4% had 301 and above flock size in the study area. This implies that poultry farmers in the study area are small scale farmers. The small scale nature might be the reason for the low poultry farm income.

Poultry Production System

Poultry farmers in the study area were asked to indicate the most important poultry egg production system in ascending order. The findings are presented in Table 2

Table 2: Poultry Egg Production System

Production systems	Frequency	Percentage	Rank order
Free range system	13	26	3
Battery cage system	20	40	1
Deep litter system	17	34	2
Total	50	100	

Source: Field survey, 2010

The finding in Table 2 shows that 26% of the respondents ranked free range as the poultry egg production system largely practised, about 40% ranked battery cage system as second largely practised while 34% practised deep litter system of poultry production in the study area. This implies that larger proportion of the poultry farmers engaged in battery cage poultry management system probably due to easy handling of eggs and less loss.

Resource Use Efficiency in Poultry Egg Production

The resource use efficiency of poultry farmers was estimated using the Cobb-Douglas production function's coefficients (elasticities) of the various resources used in poultry egg production in the study area. The findings are presented in Table 3.

Table 3: Technical Efficiency, Elasticity of Production in Poultry Egg Production

Resources	MVP	MFC	MVP/ MFC (r)	Elasticity of Production (Ep)
Family labour (x_1)	0.082	400	0.00021	0.082
Hired labour (x_2)	0.064	450	0.00014	0.064
Flock size (x_3)	0.893	2500	0.00036	0.893
Feed (x_4)	0.020	2400	0.000083	0.020
Depreciating cost of equipment (x_5)	0.222	3000	0.000074	0.222
Operating cost (x_6)	0.467	4800	0.000973	0.467
Total				1.748

Sources: Field survey, 2011.

The sum of the elasticities of poultry egg production of the resources in Table 4 was 1.748. This implies that one percent increase in the quantity of all the variable inputs together will result in 1.748 percent decrease in poultry egg production. The result also indicates an increasing return to scale which is the characteristics of stage one of the production function. Measures of technical efficiency of resources used (r) such as Marginal Value Product (MVP) and Marginal Factor Cost (MFC) were also estimated. The finding in Table 4 reveals that the ratios of the MVP to the MFC were less than unity (1) for all the inputs. This implies that inputs such as family labour, hired labour, flock size, feed, depreciating cost of equipment and operating expenses were over-utilized. This suggests that the resources taken together are at present being over-utilized and so farmers can have more returns by reducing the quantities of these resources. This means that poultry egg production is likely to increase and hence revenue, if less of such inputs (family labour, hired labour, flock size and feed) had been utilized optimally. Economics efficiency would be achieved if poultry egg farmers use family labour, hired labour, flock size and feed efficiently.

CONCLUSION AND RECOMMENDATION

Poultry farming has become one of the most significant aspects of farming in Nigeria because it creates great business opportunity for entrepreneurs and provides employment for the job seeking citizens. Poultry products such as egg production is one of leading key lucrative economic undertakings to the smallholders in Maiduguri, Borno State of Nigeria. But, constraints such as technical know-how on proper use of farm inputs (labour, feed, cost of equipment) among others results in low production of poultry and poultry products to attain the populace demand and for socio-economic sustainability of livelihood. The study concluded that most of the farmers were male in their active and productive age group; and had low level of formal education. The study also shows that larger proportion of the poultry farmers engaged in egg production practised the battery cage poultry management system. The finding also indicates that resources such as feed, flock size and hired labour were over-utilized by poultry egg farmers in the study area. Based on the finding, the following recommendations are made:

- i. Poultry farmers should form agricultural cooperative groups that will enable them obtain credit from government and financial institutions.
- ii. Loan and credit facilities should be given to the farmers at low interest rate to help them boost their poultry egg production level in the study area.

- iii. Farm input such as drugs and vaccines should be made available to the farmers at the right time and at subsidized price.
- iv. Poultry egg producers should reduce the use of farm inputs such as family labour, hired labour, flock size, feed, depreciating cost of equipment and operating expenses to ensure increase in poultry egg production.
- v. Extension agents in the state should be properly trained and provided with all necessary technological packages required to teach and guide farmers on improved poultry egg production.

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