Estimating Resource Productivity and Efficiency of Smallholder Broiler Production in Bida Metropolis, Niger State, Nigeria

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Abstract: The research determined resource productivity and efficiency in smallholder broiler production in Bida metropolis, Niger State, Nigeria. One hundred and one (101) smallholder broiler farmers were used for the study. Primary data were collected through interview schedule in 2015 and data analysis was carried out using production function. Semi log function was chosen as the best fit with R^2 value of 0.617, which implies that about 61% of the variation in the dependent variable is explained by the independent variables included in the model. Only feed was statistically significant at 1% probability level. On resource use efficiency, feeds, labour, water and medication were under-utilized, while floor space was over-utilized. It could be concluded that resources used in smallholder broiler production were inefficiently utilized. It is, therefore, recommended that smallholder broiler farmers in the study area should increase the quantities of under-utilized inputs and reduce the quantities of over-utilized inputs for optimal output. Similarly, smallholder broiler farmers in the study area should form cooperative society to enable them have easy access to credit facilities from financial institutions, acquisition of inputs at a subsidize rate and other forms of assistance from the government.

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1.0 Introduction

In Nigeria, poultry production has evolved gradually as a commercial venture since its introduction in the 1950s. The industry was a huge success as an incentive in augmenting the animal protein shortage occasioned by the fast declining cattle production that use to supply the required animal protein in human nutrition (Idachaba, 2004). The poultry sector initially relied on foreign sources for inputs supply that included the parent stock, day old chicks, feed ingredients, equipment and medications. Although government through its Veterinary Research Institute in Vom, plateau state introduced a 'free medication programme' for the poultry stock, which enhanced the growth of the industry during the 1960s, this advantage was short-lived as government effort in developing the agricultural sector was jettisoned in the '70s when oil-boom became the main stay of the economy (FOS, 1999). The far-reaching implications were that high cost and irregular supply of feeds, breeding stock and vaccines became the major constraints of the industry (Idachaba, 2004). Statistics provided by the CBN (2002) showed that the average annual growth rate of poultry meat in the country, from 1980-2002 was 1.93%, while the human population growth was 2.89%. Invariably the demand for poultry meat increased as the human population increased thereby putting the supply always at a deficit.

Broiler production is a means of livelihood and a way of achieving certain level of economic independence in Nigeria. Its production is carried out in all parts of the country with no known religious, social or cultural inhibitions associated with its consumption. Specifically, investment in broiler enterprise is attractive because the production cost per unit is low compared to other type of livestock; its meat is very tender and has short production cycle. Owing to these obvious advantages of broiler production, large number of farmers both men and women venture into their production mostly for income generation purpose (Nwajiuba and Nwoke, 2000), besides meeting the protein needs of the households.

Among poultry production sub-sector, broiler production is one of the most important economic activities to the smallholder farmers in Nigeria. In general, poultry production, overcome other livestock production sectors in many economic aspect such as higher rate of capital turnover, ease of management, and quick return to investment (Haruna and Hamidu 2004). In broiler production as well as other agricultural sectors, the core of economic efficiency is the resource productivity and efficiency. It means that given a certain level of inputs, broiler farmers should be able to achieve maximum profit. It is obvious that the less resources used to produce a given amount of output, the greater the profitability. This implies that

for farmers to achieve their goal in earning more profit the available resources used in production should be efficiently utilized. Inefficient use of these resources by farmers will end in more cost-effective efficiency to increase output (Effiong, 2005; Ike, 2008). The importance of resource efficiency in increasing production has been widely recognized by researchers (Ike, 2008; Okoye, 2006; Ike and Inoni, 2006; Nwaru, 2005). Given this background, this study examined whether resources are efficiently utilized by smallholder broiler farmers in the study area. Specifically, it examined the flock size, source of feeds and labour; determined the effect of productive inputs on smallholder broiler output; estimate efficiency of resources used in smallholder broiler production in the study area.

2.0 Methodology

2.1 Study Area

Bida is a town and traditional Emirate in Niger State, it is located in West–central of Nigeria. The town is on the Bako River a minor tributary of the river Niger and lies at the intersection of roads from Jebba, Zurrgiru and Agaie. Originally of small settlement of Bani (Bini) people a subgroup of the Nupe, it was capture about 1531 by Tsoede (Edegi) the founder of the Nupe kingdom and the etsu Nupe (King of the Nupe people). When the kingdom was conquered about 1806 by Fulani warriors, its central region was incorporated as the Nupe Emirate in the Fulani empire-Emir Usman Zaki proclaimed himself etsu Nupe in 1835, and after defending Umar Bahaushe a rival Fulani Emir in the Nupe civil war (1847-56) at Bida, he named Bida to replace the Emirate's old capital at Raba (Babba) 67 miles (110km) West (http://www.wikipedia.org). The estimated population of the metropolis (Bida) is ninety two thousand six hundred and twenty (92,620) people (NPC, 2006).

Modern Bida is well known for its crafts, notably brass and copper goblets, other metal products, glass beads and bangles, raffia hats and mats, and locally dyed cotton and silk cloth. The craftsmen work by hand on their own premises in distractive wards and are organized into close-knit guilds. Most of the town's predominantly Nupe population lives in mud houses that are group into customary compounds. The town is the chief collecting point for the swamp rice cultivated in Fadamas ("flood plain") of the Niger and Kaduna rivers Bida also trades in yams, sorghum, millets, Shea nuts, tobacco, cotton, peanuts (groundnuts), palm oil and kernels, onions, indigo, sugarcane, fruits, goats, sheep and poultry (http://www.wikipedia.org).

2.2 Sampling and Data Analysis

Bida Metropolis is made up of six (6) administrative districts namely: Dzukogi Masaba, Dzukogi Abutsado, Banwuya, Banyagi, Bangaye and Bangbara. All the districts were be used for the study; simple random sampling technique were be used to select smallholder broiler farmers proportionate to the population, through a sampling frame obtained from Bida poultry farmers association. Thus, a total of one hundred and one (101) smallholder broiler farmers constitute the sample size for the study. Primary data will be collected with the aid of structured questionnaire containing both open and close ended questions.

Analytical Tools

Data were analyzed using descriptive statistics and production function. Production function could be defined as the technical relationship between inputs and outputs. It has been widely used to acquire information on productivities of resources, elasticity of production, and return to scale (Tanko, 2004). The estimation of input-output relationship involves the specification of production function, which depicts the factor-product relationship (Heady and Dillon, 1972). The production function model used is implicitly stated as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, U) \quad \ldots\ldots (1)$$

Where,

Y = Live Weight of Broiler (kg);
f = Functional notation;
X_1 = Feed intake (kg);
X_2 = Labour (man-days);
X_3 = Water (litre);
X_4 = Medication (litre);
X_5 = Floor Space (m^2);
U = Error term.

Four functional forms used were explicitly stated as follows:

Linear Function

$$Y = b_o + x_1b_1 + x_2b_2 + x_3b_3 + x_4b_4 + x_5b_5 + U \quad \ldots\ldots (4)$$

Semi-Logarithmic Function

$$Y = bo+b_1\log x_1+b_2\log x_2+b_3\log x_3+b_4\log x_4+b_5\log x_5+U \quad \text{..... (5)}$$

Cobb-Douglas Function

$$\text{Log}Y = \log b_0+x_1\log b_1+x_2\log b_2+x_3\log b_3+x_4\log b_4+x_5\log b_5+U \text{... (6)}$$

Exponential Function

$$\text{Log } Y = b_0+b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+U \quad \text{..... (7)}$$

Where;
b_o = Constant term,
b_1- b_5 = Regression coefficients.

The production function above was specified and estimated in four functional forms to obtain the best fit. The functional forms include linear, semi-log, Cobb-Douglas and exponential.

The most widely used measure of resource use efficiency is the MVP/UFC ratio. The MVP/UFC is more reliable and statistically testable since it could be obtained from the coefficient estimates (Tanko, 2004). Marginal value productivity analysis was used to determine the efficiency with which each variable was used. Marginal value productivity of factor was derived and compared with respective prices in order to determine how efficient resources were being used in broiler production in the study area. Efficiency of resources used was determined by the following ratio.

$$r = \frac{MVP}{UFC} \quad \text{..... (8)}$$

Where:
MVP=MPP.py
$MPP_{xi}= b_i X_i$
r = Resource Use Efficiency
MPP = Marginal Physical Product
UFC = Unit Factor Cost

3.0 Results and Discussion

3.1 Estimated Resource Productivity of Smallholder Broiler Production

Semi-log was chosen best fit with R^2 value of 0.617 which implies that about 61% of the variation in the dependent variable (weight of broiler) is explained by the independent variables included in the model. The remaining 39% could be due to residual error or other variables not included in the model. The F-ratio is statistically significant at 1% level, indicating that the explanatory variables included in the model more or less explained the dependent variable. The regression co-efficient with respect to feed is statistically significant at 1%. This implied that further increase in the use of this input by 1 Unit, will lead to further increase in broiler output by 7385.75. The importance of feed to broiler cannot be over emphasized; this is evident as timely, proper and adequate feeding of broiler determines to a large extent the output (weight) of broiler to be realized.

Table 2: Estimated Resource Productivity of Smallholder Broiler Production

Variables	Regression coefficient	Standard error	T-value
Constant	7692.010	4183.566	1.839***
Feed (x_1)	7385.746	1193.378	6.189***
Labour (x_2)	293.501	758.423	0.387
Water (x_3)	592.189	965.554	0.613
Medication (x_4)	2257.306	1777.948	1.270
Housing space (x_5)	-206.663	1313.160	0.157
R_2	0.617		
F-ratio	11.530***		

Source: Field Survey Data and Computation by the Researchers, 2016
***Significant at 1% probability level.

3.2 Resource Use Efficiency of Smallholder Broiler Production

The marginal value analyses of the inputs in smallholder broiler production in the study area revealed that the ratio of marginal value product to unit factor cost for feed, labour, water and medication are greater than 1, suggesting under-utilization of the inputs. This implied that the inputs were used under their economic optimum and productivity of smallholder broiler can be increased by increasing the level of these inputs used. Underutilization of feed, labour, water and medication could be as a result of the

costly nature of these inputs when their demand is at peak. This is in line with the findings of Asma *et al.* (2015) that reported under-utilization of feed in their study on Financial Profitability and Resource Use Efficiency of Broiler Farming in a Selected Areas of Bangladesh. Floor space had MVP/UFC ratio of less than 1 suggesting over-utilization of the input. Floor space was over-utilized because there might be abundance of space or it could be a attributed to small-scale nature of broiler production that do not require large floor space or floor space was not used according to specification.

Table 3: Resource Use Efficiency of Smallholder Broiler Production

Variables	MPP	MVP	UFC	MVP/UFC	Efficiency
Feeds	7385.75	9896.91	176	56.23	Under Utilization
Labour	293.50	393290	54	7283.15	Under Utilization
Water	592.19	793534.6	0.9	4116.48	Under Utilization
Medication	2257.31	3024795.4	18	168044.2	Under Utilization
Housing space	-206.66	-276924.4	48	-5769.26	Over Utilization

Source: Field Survey Data and Computation by the Researchers, 2015. Note: price of output = ₦1, 340.

4.0 Conclusion and Recommendations

From the findings, it could be concluded that the independent variables included in the models explained the output (weight) of broiler and that all the inputs used in broiler production are inefficiently utilized. It is therefore, recommended that smallholder broiler farmers should increase the use of under-utilized inputs and reduces over-utilized inputs for optimum output. Broiler farmers in the study area should form co-operative society to enable them have easy access to credit facilities from financial institutions, acquisition of inputs at a subsidize rate and other forms of assistance from the government. Training, seminar, workshop should be organized by relevant agencies to educate smallholder broiler farmers on modern broiler production, using better quality breeds of broiler and improved production technologies.

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