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ORIGINAL ARTICLE

INPUTS ACQUISITION AND UTILIZATION BY TURKEY PRODUCERS IN ZURU EMIRATE KEBBI STATE, NIGERIA

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ABSTRACT

The study examined inputs acquisition and utilization by turkey producers in Zuru Emirate of Kebbi State, Nigeria. Multi-stage random sampling technique was used to select one hundred and eighty seven (187) turkey producers from four Local Government Areas of the Emirate. Primary data were collected using interview schedule. Data analysis was carried out using descriptive statistics and multiple regression. Results revealed that majority (69.5%) of turkey producers in the study area were using commercial feeds in feeding their turkeys, most of them (87.2%) employed family labour to raise their birds. Similarly, majority (77.6%) of turkey producers had a live weight output of between 4.1 to 5.0 kg/bird and the average revenue per bird realized from sale was found to be ₦6, 529.33 for an average production period of 7 months. Results of the Cobb-Douglas production function showed that feeds (P<0.01), Labour (P<0.01), Water (P<0.01) and housing (P<0.05) had significant positive contributions to the output realized from Turkey production but medication had the reverse (P<.05). Results on the determination of the levels of resource-use revealed feeds, Labour, Water and housing were underutilized but medication was over utilized. The sum elasticities of production gave an estimated return to scale of 1.142 indicating increasing return to scale for turkey production in the study area. Based on the findings, it was recommended that turkey producers in the study area should increase the quantities of feeds, Labour, Water and housing space but decrease the level of medication utilized for them to achieve optimum production of output from the enterprise.

Key words: Inputs, Acquisition, Utilization, Turkey, Producers

1.INTRODUCTION

Turkey 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.

Turkey production for meat and eggs is practiced by urban and peri-urban dwellers. The turkey population in Nigeria is estimated at 0.2 million (Eduvie, 2002). This is said to constitute a major animal protein source in the country. In Nigeria, the supply of meat falls short of demand, most Nigerians are poorly fed and suffer from malnutrition due to lack of adequate protein of animal source (Ajala and Balogun, 2004). In a nutritional profile of Nigeria, Okoruwa *et al*. (2006) reported that the protein supply per capita was 44g, out of which animal products constituted less than 2%. With the continued rise in the cost of production of cattle, sheep and goat, which are the primary sources of animal protein in Nigeria, it has become very necessary to explore efficient and less common but potential sources of animal protein for economic viability (Okoruwa *et al*., 2006).

Turkey production in Zuru Emirate is relatively low compared to other poultry species (Broilers, Layers, Duck, Guinea fowl and Pigeon). While the sales and marketing of turkeys in the study area is carried out by residents with the highest sales recorded during festive periods such as Sallah, Christmas and New Year, the potentials of turkey production in the study area if properly harnessed, will increase farmer's income, improve household food security and nutrition thereby improving their livelihood. It is in view of the importance of turkey production in the study area that this study intends to examine the mode of inputs acquisition and utilization by turkey producers in Zuru Emirate so that suggestions for improvement can be made.

Agricultural productivity may be defined as the "ratio of index of local agricultural output to the index of total input used in farm production" (Shafi, 1984). It is therefore, a

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measure of efficiency with which inputs are utilized in production. Vries (1967) defined agricultural efficiency as "a measure of productivity expressing the varying relationship between agricultural produce and one of the major inputs, like land, labour or capital, while other complementary factors remaining the same".

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There are different types of economic models that have been used for measuring agricultural productivity among them are (1) growth accounting technique, (2) econometric estimation of production relationships and (3) nonparametric models. Each model can be used to measure aggregate agricultural output. Each model has different data requirements and is suitable for addressing different questions and has strengths and weaknesses. Growth accounting technique involves compiling detailed accounts of inputs and outputs, aggregating them into input and output indices to calculate a Total Factor Productivity (TFP) index (Dharmasiri, 2008). Goksel and Ozden (2007) have applied the TFP with Cobb-Douglas production function in agriculture to analyse the agricultural productivity. Cobb-Douglas production function (Cobb and Douglas, 1928) is widely used to represent the relationship of an output to inputs i.e. input-output relationship.

Nonparametric models such as linear programming techniques are in use to calculate TFP. An advantage of the nonparametric approach is that it does not impose restrictive assumptions on production technology. The major disadvantage is that since the models are not statistical, they cannot be statistically tested or validated. The econometric estimation of production relationships is based on either the "production function" or the "cost function". An advantage of this model is that it permits quantifying the marginal contribution of each input to aggregate production. For example, one can determine the impact of one-per cent increase in fertilizer use on overall agricultural production, holding all other inputs constant. Many researchers use the Cobb-Douglas production function (Dharmasiri, 2009).

2.METHODOLOGY

Description of the Study Area

Zuru Emirate is one of the four Emirates in Kebbi state. The emirate comprise of four Local Government Areas (LGAs) namely; Danko-Wasagu, Fakai, Sakaba and Zuru. The emirate is located within latitudes 11^{o} and 12^{o} N and longitudes 4^{o} and 5^{o} E of the equator (KBSG., 2003). The state was carved out of the former Sokoto State in 1991; the Emirate is located in the extreme South-eastern part of the state and covers an area of approximately 9,000 square kilometers. It is located on a hilly terrain and is bounded to the north by Gummi Local Government Area of Zamfara State, North-west by Koko Local Government Area, South-west by Yauri Local Government Area, North-east by Bukuyum Local Government Area of Zamfara State and south by Rijau Local Government Area of Niger state (Girma, 2008).

The estimated population of the Emirate is 582, 106 people (NPC., 2006). The various indigenous cultural and ethnic groups of the Emirate are the Dakkarkari, Fakkawa, Dukkawa, Kelawa, Kambarawa, Katsinawa and Achifawa. Other non-indigenous ethnic groups in the area are the Hausa, Fulani, Yoruba, Igbo and other tribes found in Nigeria. The different religions found in the area are Islam, Christianity and traditionalist. Like any other African society, these came as a result of the interaction with the outside world (KBSG., 2003). However, the traditional worship of different deities is still upheld in the area with many festivals celebrated at various times of the year. The weather is marked by a single rainy season and long dry season, the average rainfall of the area is between 750mm and 1050mm/annum. Mean temperature range between 31^{0}C and 38^{0}C, the rainy season is between April to October. The climatic condition of the area is characterized by hot and wet seasons as in the tropics; the months of November to February are the hamattan period. The soil type is sandy loam and rich, which makes it suitable for agriculture (KBSG., 2003).

Animal husbandry is practiced side by side with crop production, even though on limited scale. The people of Zuru Emirate depend largely on the pastoral Fulani for meat, milk and butter. Hunting was the second important economic activity after crop production. Hunting was regarded as a supplementary occupation and was carried on throughout the year because it provides a means of getting meat for consumption. It also serves as a source of obtaining skins of animals for shoes, warfare robes and for making local drums. Other important economic activities are local handicrafts like pot-making and weaving by women and blacksmithing by men (Augi and Lawal, 1990). Turkey production in Zuru emirate is relatively low compared to other poultry species (Broilers, Layers, Duck, Guinea fowl and Pigeon). While the sales and marketing of turkeys in the study area is done by both residents and visitors with the highest sales recorded during the festive period such as Sallah, Christmas and New Year day. However, there is no known discriminatory attitude towards the production and consumption of turkey in the study area.

Sampling Procedure and Instrument for Data Collection

Zuru Emirate comprises of four Local Government Areas (LGAs) namely; Danko-Wasagu, Fakai, Sakaba and Zuru Local Government Areas comprising of eight, four, two and six administrative districts, respectively. Multi-stage sampling technique was used to draw the sample for the study. The first stage involved proportionate selection of four, two, one and three districts from Danko-Wasagu, Fakai, Sakaba and Zuru local government areas, respectively. The second stage involved purposive selection of two villages that were predominant in turkey production from each of the selected districts. The third stage involved selection of 40% out of the number of turkey producers from each of the selected villages as contained in the list of Turkey farmers in the Emirate obtained from Kebbi Agricultural and Rural Development Authority (KARDA) Zone III Zuru. At the end, one hundred and eighty seven (187) turkey farmers constitute the sample size for the study.

The instrument for data collection was interview schedule, which was used as a source of primary data. Secondary information was collected from materials such as textbooks, journals, conference proceedings and other related literatures. The data for the study was collected with the help of trained enumerators.

Data analysis

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:

$Y = f(X_1, X_2, X_3, X_4, X_5, U)$……. (1)

Where,

Y = Weight of Turkey (kg);

f = Functional notation;

X_1 = Feeds (kg);

X_2 = Labour (man-days);

X_3 = Water (litres);

X_4 = Medication (litres);

X_5 = Housing Space (m^2);

U = Error term.

Four functional forms used were explicitly stated as follows:

Linear Function

$Y = b_o+x_1b_1+x_2b_2+x_3b_3+x_4b_4+x_5b_5+U$…….(2)

Semi-Logarithmic Function

$Y= bo+b_1\log x_1+b_2\log x_2+b_3\log x_3+b_4\log x_4+b_5\log x_5+U$…….(3)

Cobb-Douglas Function

$\text{Log}Y=\log b_0+x_1\log b_1+x_2\log b_2+x_3\log b_3+x_4\log b_4+x_5\log b_5+U$….(4)

Exponential Function

$\text{Log } Y = b_0+b_1x_{1+}b_2x_2+b_3x_3+b_4x_4+b_5x_5+U$…….. (5)

where;

b_o = Constant term,

b_1- b_5 = Regression coefficients.

The 4 production functions above were specified and estimated to obtain the best fit.

Resource Use Efficiency – The most widely used measure of resource use efficiency is the MVP/MFC ratio. The MVP/MFC is more reliable and statistically testable since it could be obtained from the coefficient estimates (Alimi, 2000). 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 production process in the study area. Efficiency of resources used was determined by the following ratio.

$$r = \frac{MVP}{MFC} \quad \text{…….. (6)}$$

Where;
MVP=MPP.py
$MPP_{xi}= dy/dx=b_i$

r = resource use Efficiency.

MPP = Marginal Physical Product.

MFC = Marginal Factor Cost.

Theoretically, a variable resource is optimally utilized when ratio of MVP to MFC is equal to unity. A ratio of less than unity is interpreted to mean that a variable resource is over utilized, while a ratio greater than unity is an indication of resource underutilization (Tanko, 2004).

Elasticity of Production (EP) and Return to Scale - The elasticity of production (EP) is a measure of responses of output to changes in the quantity or level of input used. It measures how the output changes with a change in the level of one input. It measures the percentage increase that will result in output as a result of one percent change in the level of a resource use. Return to scale can either be greater than one (>1), equals to one (=1) or less than one (<1), denoting increasing return to scale, constant return to scale and decreasing return to scale, respectively.

$$EP = \frac{MPP}{APP} \quad \text{…….. (7)}$$

Where;

EP = Elasticity of Production.

MPP = Marginal Physical Product.

APP = Average Physical Product.

3.RESULTS AND DISCUSSION

Sources of Feeds, Labour, Output and Revenue of Turkey Producers

Table 1 shows information pertaining to Sources of Feeds, Labour, Output and Revenue of Turkey Producers. Feed refers to food given to domestic animals in the course of husbandry. Feed can also be referred to nutritionally adequate food for animals other than man, compounded using a specific formula to be fed as the sole ration and is capable of maintaining life and or promoting production without any additional substance being consumed except water (http://www.investorwords.com). The Table showed that majority (69.5%) of the turkey producers used commercial feeds as against 30.5% that used self-formulated feeds. This may probably be due lack of technical knowhow of formulating feeds on the part of most turkey producers. It may also be attributed to the small scale nature of turkey production in the study area, where turkeys are allowed to scavenge for food during the day time. This could be the reason why feed cost was higher than other variable costs in turkey production in the study area. This is in line with the findings of Onwumere and Obasi (2010) that majority (52%) of turkey producers in Owerri used commercial feeds.

Labour is the work done by human beings and not the human beings themselves. Labour could be skilled or unskilled, labour can also be family, hired or communal. Major human resource in any agricultural production is labour. The sources of labour for turkey production in the study area were mainly family and hired labour. It was revealing that most (87.2%) of the turkey producers used family labour. Those that used both family and hired labour accounted for 10.2%, while those that use hired labour only accounted for the remaining 2.6%. The reason for using more family labour could be that most turkey producers in the study area have children and dependants that easily provide labour required for production. This coincides with findings of Ajala *et al*. (2007) that greater proportion (62%) of turkey producers in Zaria used family labour. Conversely, the reason for low hired labour could be due to small size of production of the producers in the study area and that it is rather regarded as a family business in which personal involvement is part of the goal.

Table 1: Distribution of Turkey Producers According to Source of Feeds, Labour, Turkey Output and Revenue.

Variables	Frequency	Percentage
Source of Feeds		
Commercial	130	69.5
Self-formulated	57	30.5
Total	**187**	**100**
Source of Labour		
Hired Labour	5	10.2
Family Labour	163	87.2
Both Family and Hired Labour	19	2.6
Total	**187**	**100**
Turkey Output (kg)		
2.0 – 3.0	14	7.5
3.1 – 4.0	28	14.9
4.1 – 5.0	92	49.2
5.1 – 6.0	53	28.4
Total	**187**	**100**
Range of Revenue (₦)/Bird		
3000 – 4000	74	39.6
4100 – 5000	58	31
5100 – 6000	29	15.5
6100 – 7000	17	9.1
7100 – 8000	9	4.8

Source: Field Survey, 2013.

Output is a measure of physical product produced during a particular period or it is the physical quantity of product realised as a result of using certain quantity of inputs. Turkey output is the matured turkeys produced (live weight/kg) over a period of time. Distribution of the turkey farmers according to the output realized. It is revealing form the Table that majority (77.6%) of turkey producers have a live weight output of between 4.1 to 5.0 kg/bird. The average live weight output was 3.98 kg/bird, while the minimum and maximum output (live weight/bied) was 2.2 and 5.9 kg, respectively. Lance (2003) stated that the exotic turkeys can attain standard weight of 10.45 to 16.36 kg between 34 to 36 weeks of age. These according to him can be expected only when the birds were fed well balanced diets and kept free from diseases, parasites and other stress factors that can lower feed intake and lower growth rates. This implied that most turkey producers in the study area rear local breeds and to some extent cross-breed of turkeys that may not attain the standard weight. This finding is contrary to the finding of Emmah (2006) who reported an average turkey output (live weight) of 10.03 kg in Kaduna and Zaria towns of Kaduna State. This higher output (live weight) of turkeys recorded in Kaduna and Zaria towns as compared to that of Zuru Emirate may not be unconnected with the fact that turkeys produced in Kaduna and Zaria are exotic breeds, while those produced in Zuru Emirate are local and cross breeds. Another reason may be as a result of poor feeding of turkeys associated with system of management. Majority of turkey producers in Kaduna and Zarria practiced the intensive system where turkeys are expected to be properly fed, which means higher feed intake and higher output. While majority of turkey producers in Zuru Emirate practiced the semi-intensive system of management where turkeys are fed only in the morning and evening, which means lower feed intake and lower output.

Revenue is the amount of money that a business received during a specific period of time, including all net sales, exchange of assets, interest and any other increase in owner's equity. It is the gross income from which costs are deducted to determine net income. Revenue can also be defined as the total money value of all output produced whether sold, consumed or in stock. Revenue is calculated by multiplying the price at which goods or services are sold by the number of units or amount sold (http://www.investorwords.com). The distribution of the turkey producers according to revenue generated from the sales revealed that 39.6% of turkey producers generated ₦3000-₦4000, 31% have a range of revenue between ₦4100-₦5000, 15.5% have revenue of ₦5100-₦6000, 9.1% have ₦6100-₦7000 and 4.8% have ₦7100-₦8000 per bird. The average revenue per bird was found to be ₦6, 529.33 for an average production period of 7 months. This finding therefore, disagreed with the finding of Emmah (2006) who reported revenue of ₦186, 667 per farmer with an average flock size of 67 birds over an average production period of 8 months in Kaduna and Zaria towns. This clearly indicated that revenue accruing to turkey producers is higher in Zuru as compared to Kaduna and Zaria towns. The reason for this disparity in revenue could be attributed to the fact that matured turkey (with average weight of 3.9kg) is sold at an average price of ₦6, 529.33 in Zuru, while in Kaduna and Zaria towns, a matured turkey (with average weight of 10.03kg) is sold at an average price of ₦2, 800.

Production Function Analysis of Turkey Production.

Production function was employed to determine the nature and magnitude of the relationship between inputs and output in turkey production in the study area. Data generated from the study were subjected to several algebraic forms of production functions such as linear, semi-logarithmic, double log and Exponential functions. Results of the production function showed that Double log function gave the "best fit" in terms of the *apriori* economic criteria of the magnitudes of the coefficients, signs and significance of the R^2 , F-ratio, T-ratio and standard error, thus chosen as the lead equation as presented in Table 2 for turkey production.

The results showed an R^2 value of 0.821, which implies that about 82% of the variation in dependent variable (weight of turkey) is explained by the independent variables (X_1-X_5) included in the model while the remaining 18% was explained by other factors not included in the model and could also be due to errors in the estimation. The F-ratio (166.329) was statistically significant at 1% level indicating

that the explanatory variables included in the model adequately explained the dependent variables. The standard error of the estimated parameters was also considered. The functional form with the smallest standard error was given priority. Double log had the smallest value (0.22365) of standard error. The regression coefficients with respect to feeds (X_1), labour (X_2) and water (X_3) were positive and statistically significant at 1%, while housing space (X_5) was also found to be positive but statistically significant at 5%. This implied that further increase in the use of these inputs by 1 unit, will lead to further increase in turkey output by 0.241, 0.471, 0.194 and 0.183 respectively. The regression coefficient of medication (X_4) was negative but statistically significant at 5%. This implied that a further increase in the use of medication by 1 unit will lead to further decrease in turkey output by -0.128. This is in line with the findings of Emmah (2006) who reported regression coefficients with of feeds (X_1), labour (X_2) and water (X_3) to be positive and statistically significant.

Table 2: Production Function of Turkey Production.

Variables	Regression Coefficient	T-ratio
Constant term (b_o)	2.419	10.994
Feeds (X_1)	0.255	3.842***
Labour (X_2)	0.643	13.114***
Water (X_3)	0.183	3.681***
Medication (X_4)	-0.123	-3.984***
Housing Space (X_5)	0.184	3.356**

Source: Field survey. 2013. $R^2 = 0.821$, F-ratio = 166.329***, Standard Error = 0.22365. Note *** and ** implies statistically significant at 1 and 5% levels respectively.

Table 3: Economic Efficiency of Inputs of Turkey Production.

Variables	MPP	MVP(₦)	MFC (₦)	MVP/MFC	Efficiency
Feeds (X_1)	0.255	418.2	108	3.872	Under-utilized
Labour (X_2)	0.643	1054.52	180	5.858	Under-utilized
Water (X_3)	0 .183	300.12	0.8	375.15	Under-utilized
Medication (X_4)	-0.123	-201.72	5.0	-40.34	Over-utilized
Housing Space (X_5)	0.184	301.76	234	1.289	Under-utilized

Source: Field survey. 2013. Py = unit price of output = ₦1, 640

Table 4: Elasticity and Return to Scale of Turkey Production.

Variables	Elasticity of Production
Feeds (X_1)	0.255
Labour (X_2)	0.643
Water (X_3)	0.183
Medication (X_4)	-0.123
Housing Space (X_5)	0.184
Return to Scale	**1.142**

Source: Field survey. 2013.

Resource Use Efficiency of Turkey Production.

A given resource is optimally allocated when there is no difference between its marginal value product (MVP) and its acquisition cost or its marginal factor cost (MFC). Marginal value productivity analysis was used to determine the efficiency with which each variable was used. For the Double log function, the marginal physical product (MPP) was given by the value of the coefficient in respect of each independent variable. The marginal value product (MVP) with respect to each variable was obtained as the product of MPP and the unit price of the output (Py). The marginal factor cost (MFC) can be obtained as either the market price of purchase from competitive input market or the geometric mean values of the input cost, or depreciation of durable assets. The market price was used as the MFC for variable inputs and depreciation value was used as MFC for housing space.

The ratio of MVP to MFC of each input was computed to measure the resource use efficiency. Alimi (2000) stated 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 unity. A ratio less than unity shows over-utilization of the resource, while a ratio greater than unity shows 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 output. The marginal value analyses of variable inputs are presented in Table 3.

Results showed that the ratio of marginal value products to marginal factor costs for feeds, labour, water and housing space are greater than 1, suggesting under-utilization of the inputs. Implying that the inputs were used under their economic optimum and productivity of turkey can be increased by increasing the levels of these inputs used. Medication had MVP/MFC ratio of less than 1 suggesting over-utilization of the input. Medication was over-utilized because there might be no much incidence of disease outbreaks. Moreover, the local breeds used were better immune to infestation, so turkey producers should not over-emphasize on medication. This implied that the input (medication) was used over its economic optimum and productivity of turkey can be increased by reducing the level of the input used. Under-utilization of feeds, labour, water and housing space implied that turkey producers will not be able to realize high output, while over-utilization of medication could be that medication is either cheaper, not used according to specification or local medication are used by producers in the study area. This is in disagreement with the findings of Emmah (2006) who reported that turkey producers in kaduna and Zaria towns under-utilized labour and over-utilized feeds and housing. Ironkwe and Akinola (2010) reported that the danger however, is that the inefficiency in resource allocation could limit the level of return to an enterprise and in turn affect its attractiveness.

Elasticity of Turkey Production.

The elasticity of production (EP) is a measure of response of output to changes in the quantity or level of input used. It measures how the output changes as a result of a unit change input. It measures the percentage increase that will result in output as a result of one per cent change in the level of a resource. (Olukosi and Ogungbile, 1989). However, the return to scale is determined by the addition of the production elasticity variables. Hence, the return to scale of production can either be greater than one (>1), equals to one (=1) or less than one (<1), denoting increasing return to scale, constant return to scale and decreasing return to scale, respectively. Table 4 showed the elasticity and return to scale of turkey production.

The summation of the elasticity of the inputs gave an estimated return to scale of 1.142 which is greater than 1,

thus depicting increasing return to scale. What this means is that output (weight of turkey) increases with change in the level of variable inputs (turkey producers in the study area were operating at increasing return to scale). This implies that turkey production is in stage one of the production function (irrational stage). At this stage producers are advised to use more resources thereby expanding production until it gets to stage 2. This is in agreement with the findings of Emmah (2006) who reported that return to scale of turkey production in Kaduna and Zaria towns was 1.30 indicating increasing return to scale. The result also agreed with the findings of Onyeagocha *et al*. (2010) in their study of Post-Avian Flu profitability and Resource Use Efficiency of Broiler Farmers in Akwa Ibom State, South-South Nigeria, that elasticity of inputs was greater than 1, suggesting that broiler farmers in the area are operating at increasing return to scale.

4.CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it is concluded that, Turkey producers in Zuru Emirate acquired their farm inputs from markets rather than producing them locally. The use of family labour in the study area was predominant.

Except medication, all other farm inputs were underutilized keeping the production level in stage 1. In order to produce at optimum level (I.e. increase the production level to stage 2), therefore, the quantities of variable inputs utilized should be increased**.**

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