

Economics of Broiler Production in Meme Division of Cameroon

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ABSTRACT The present study examined the economics of broiler production in Meme Division of Cameroon. The specific objectives of the research were to determine the efficiency of resource use in broiler production. Primary data were collected from a sample of 116 broiler farmers using a multi-stage random sampling method. The data were analysed using regression model. Marginal analysis of input shows that the farmers were inefficient in their production practices as indicated by the ratio of marginal value product (MVP) and marginal factor cost (MFC). The ratio revealed the over utilisation of chicks, feed and labour. Major problems facing broiler producers were low market prices, high cost of feed, veterinary services, transportation, lack of access to credit and extension services.

INTRODUCTION

The role of poultry industry in terms of its contribution to provision of animal proteins cannot be over emphasized. According to Haruna and Hamidu (2004), when compared to beef industry, poultry enjoys a relative advantage of ease of management, higher turnover, quick returns to capital investment and wider acceptance of its product for human consumption.

Chicken (*Gallus domesticus*) as an integral part of poultry, is a very important bird usually raised for economic benefits. Thus, in a developing country like Cameroon, where the utmost priority is to achieve self-sufficiency in food production with special emphasis on crop and animal products, it becomes imperative to encourage farmers to venture into chicken production. This is because the birds could be profitably produced under semi-intensive system of management with readily available resources at the farmers' disposal. Sonaiya et al. (1999) reported that village chicken in sub-Saharan African countries on the average account for 78% of the total poultry population.

According to Technical Centre for Agriculture and Technical Cooperation - CTA (2004), the second half of 1990 saw a sharp rise in imports of poultry into sub-Saharan Africa. Statistics from the Food and Agriculture Organization (FAO) of the United Nations as reported by CTA (2004) reveals that imports of poultry to the region more than tripled between 1995 and 2002 rising from 97816 tonnes to 318102 tonnes. At the same time, global exports almost doubled soaring from 5661000 tonnes to 9381000 tonnes.

In 2003, Africa imported some 182,000 tonnes of chickens from the European Union (CTA 2004). The bulk of the meat arrived by boats, deep-frozen at prices that defy competition. In Cameroon, the prices of imported chicken ranged from 1000 Fcfa to 1250 Fcfa per kilo, less than the cost price of locally produced chicken, which sells at 1350 Fcfa per kilo (CTA 2004). Such abnormally low prices are made possible by production conditions and consumer behaviour prevailing in European countries. This study was done to determine the efficiency of resource use in broiler production in Meme division of Cameroon.

MATERIAL AND METHODS

The Study Area

This study was conducted in Meme Division in the South West province of Cameroon. Meme Division is made up of three sub-divisions: Konye, Mbonge and Meme Central. Meme division is situated in the coastal area of Cameroon. It lies between latitude 4° 04' N and 5° 10' N and between longitude 8° 05' and 9° 09' E (Tsala et al. 1985). It falls within the Equatorial climate; (Cameroon type) with an annual rainfall of 3000-4000mm. Meme Division has distinct wet and dry seasons. The dry season lasts from November to February while the rainy season extends from March to October. Average daily temperature of Meme Division is 27°C (Tsala et al. 1985). Predominant economic activities are centred on agriculture. Food crops grown are maize, groundnut, cassava, cocoyams and plantains. Major livestock reared are goats, pigs and poultry.

Sources of Data and Sampling Procedure

Data for this study was obtained from both primary and secondary sources. The primary data were collected on the production activities of the chicken producers using structured questionnaires.

A multi-stage random sampling method was used. Meme Division has three (3) sub-divisions and 8 villages were selected randomly from each sub-division. A total of 120 chicken farmers were selected from the sampled villages in a ratio proportional to the size of their population. However, data from 116 farmers sampled were analysed while 4 others were discarded for incompleteness. This represents 96.66% of the total data sampled.

The Multiple Regression Model

The efficiency of resource use in broiler production was determined using the multiple regression model. To obtain the marginal product of some inputs used in broiler production, a production function was estimated using the ordinary least square (OLS) method. The implicit form of the production function model is presented thus:

$$Y = f(X_1, X_2, X_3, X_4, X_5, U_i)$$

Y = Output of chicken (number of birds)

f = f is a function of

X₁ = farmers age (years)

X₂ = Rearing experience (years)

X₃ = Farm size (number of birds)

X₄ = Feed (kg)

X₅ = Labour (man-day)

U_i = Error term

The study experimented with the linear, exponential, semi-logarithm and double log functions. The aim was to ensure the choice of an appropriate functional form (Table 1). The results were evaluated to select the lead equation based on economic, statistical and econometric criteria. The general forms of the equations are as shown below.

Linear Function

$$Y = \hat{\alpha}_0 + \hat{\alpha}_1 X_1 + \hat{\alpha}_2 X_2 + \hat{\alpha}_3 X_3 + \hat{\alpha}_4 X_4 + \hat{\alpha}_5 X_5 + U_i$$

Exponential Function

$$\ln Y = \hat{\alpha}_0 + \hat{\alpha}_1 X_1 + \hat{\alpha}_2 X_2 + \hat{\alpha}_3 X_3 + \hat{\alpha}_4 X_4 + \hat{\alpha}_5 X_5 + U_i$$

Semi-logarithm Function

$$Y = \ln \hat{\alpha}_0 + \hat{\alpha}_1 \ln X_1 + \hat{\alpha}_2 \ln X_2 + \hat{\alpha}_3 \ln X_3 + \hat{\alpha}_4 \ln X_4 + \hat{\alpha}_5 \ln X_5 + U_i$$

Double-log Function

$$\ln Y = \ln \hat{\alpha}_0 + \hat{\alpha}_1 \ln X_1 + \hat{\alpha}_2 \ln X_2 + \hat{\alpha}_3 \ln X_3 + \hat{\alpha}_4 \ln X_4 + \hat{\alpha}_5 \ln X_5 + U_i$$

Where,

Y = Output of chicken (number of birds)

X₁ = Farmers age (years)

X₂ = Rearing experience (years)

X₃ = Farm size (number of birds)

X₄ = Feed (kg)

X₅ = Labour (man-day)

U_i = Error term

$\hat{\alpha}_0$ = Constant term

$\hat{\alpha}_1$ to $\hat{\alpha}_5$ = Regression coefficients to be estimated

Marginal Analysis of Input Utilization

The marginal analysis of input utilization was used to estimate the resource use efficiency in broiler production (Alimi 2000). This is given thus:

$$r = MVP/MFC$$

Where,

MVP = Marginal value product of each input.

MFC = Marginal factor cost of each input.

r = Efficiency ratio

Getting MVP depended on which of the regression functional form tried gave the best fit. Generally, the MVP is defined as the product of the marginal physical product (MPP) and the unit price of output (P_y). The MFC of input can either be taken as the market price or geometric mean value of the input costs, or depreciation of durable assets. The broiler producers would be assumed to be purchasing their input in a purely competitive market. The values of MVP and MFC for this study were estimated as follows;

$$MPP = \hat{\alpha}_i Y_i$$

$$MVP = \hat{\alpha}_i X_i$$

$$MFC = P_i X_i$$

Where,

Y_i = Arithmetic mean value of broiler output.

$\hat{\alpha}_i$ = Marginal factor cost (unit price of input).

X_i = Arithmetic mean value of ith input considered.

P_i = Market price of ith input.

When the ratio is, $r < 1$, it shows over utilization of that resource and profit will be increased by decreasing the quantity used of that input.

When the ratio is, $r > 1$, it indicates under utilization of that resource and increasing the rate of use of that input will increase the level of profit.

Table 1: Summary of regression analysis

Functional forms	Dependent variables	Constraints ($\hat{\alpha}_0$)	Coefficient of independent variables					R ²	Standard error	F-value
			X ₁	X ₂	X ₃	X ₄	X ₅			
Linear Y	Y	- 34.08 (-1.429)	0.403 (0.851)	0.391 (0.785)	0.492*** (8.964)	0.0002*** (8.172)	0.293 (1.268)	0.967	37.97	637.9
# Exponential	LnY	3.749 (12.79)	0.003 (0.470)	0.008 (1.239)	0.001 (1.463)	0.000007** (1.969)	0.008*** (2.811)	0.602	0.467	33.33
Double Log	Ln Y	- 4.013 (-4.888)	0.145 (1.151)	-0.015 (8.783)	0.490*** (8.783)	0.423*** (7.486)	0.169 (1.18)	0.867	0.270	143.8
Semi Log	Y	-2012.9 (-5.032)	74.75 (1.221)	-0.871 (-0.05)	107.8*** (3.968)	101.7*** (3.695)	26.64 (0.393)	0.601	33.15	131.3

Source: Field Survey 2006.

Note: Figures in parenthesis are calculated t-ratios

***: Indicate significance at 1% level

**: Indicates significance at 5% level

#: Indicates a lead equation

X₁: Farmers age (years)

X₂: Experience (years)

X₃: Stock size (number of birds)

X₄: Feed (kg)

X₅: Labour (Man hours)

When the ratio is, $r = 1$, it shows that the resource is efficiently utilized in the production. This is the best point to maximize profit.

Elasticity Coefficients

Elasticity of coefficients was used to determine the effect of increased utilisation of chicks, feed and labour to the total output for an exponential function. It was determined using the formula;

$$\beta_i x_i$$

Where,

β_i = regression coefficient of i^{th} variable input used.

x_i = mean of i^{th} variable input used.

RESULTS AND DISCUSSION

The explanatory variables used in the model are: farmers' age, rearing experience, stock size, feed and labour input. Four functional forms were fitted into the model. These are linear, semi-log, double log and exponential functions. The results are summarised in table 1. The lead equation was selected based on, probable economic theory criteria, the value of coefficient of multiple determination, the standard error of the estimated parameter, statistical test of the F-ratio and the significance of the coefficient of the explanatory variables.

Based on the sign of the constant (B_0) the lin-

ear, semi log and double logs functions had negative values while the exponential functions had a positive value. The significance of the coefficient of the explanatory variable with respect to their values was tested using student t-test at one and five percent level of significance. For linear, semi log and double log functions, stock size (X_3) and feed (X_4) were significant at 1% level. For the exponential function, X_4 was significant at 5% level and labour (X_5) was significant at 1% level.

The value of the coefficient of multiple determination (R^2) is also used to determine the lead equation. The higher the value of R^2 , the better the "goodness of fit" of the regression plane to the sample observations. The linear form was highest (0.967), followed by double log function (0.867), exponential (0.60) and semi log function was least (0.601).

The standard error of the estimated parameter was considered. The form with the smallest standard error was given priority. The double log had the smallest value (0.270) followed by exponential function (0.467). The linear (37.96) and semi log (33.15) had large values respectively. The standard error for the double log function was lower (0.270) than the standard error of the exponential function (0.467). However, the magnitude of F-ratio for the exponential form was lower than that of the double log function. Again all the coefficients associated with the explanatory variables in the exponential form were posi-

tive. Therefore, the exponential form was selected as the lead equation for analysis of input-output relationship in broiler production. The lead equation is thus presented as:

$$\ln Y = 3.749 + 0.003X_1 + 0.008X_2 + 0.001X_3 + 0.000007X_4 + 0.008X_5$$

The level of broilers production will vary with variation in rearing experience, stock size, feed and labour input. The coefficient for farmer's age (X_1) is positive. According to Johnson (1990), older people have more experience. The coefficient for experience (X_2) is positive. Johnson (1990) has observed that effective experience in agriculture is one that raises a farmer's effectiveness. The coefficient for stock size (X_3) is positive. The positive coefficient for the stock size suggests that an increase in the variable is consistent with increased output level. This is in consonance with the *a priori* expectation.

According to Iheanacho et al. (2000), an increase in X_3 means that more inputs would be utilised and consequently more output is expected under good management. The coefficient for feed (X_4) is positive and significant at five percent. Poultry are generally feed to appetite in the hope that maximum level of meat or eggs will be achieved (McDonald et al. 1998). The coefficient of labour (X_5) is positive and significant at one percent. This means that as the amount of labour increased, the output also increased. Iheanacho et al. (2000) had observed that this type of relationship is expected where the available labour is efficiently managed along with other resources, in order avoid redundancy and diminishing returns to labour.

Elasticity of Broiler Production

The regression coefficients of the explanatory variables are multiplied with the mean of the variable resources in the exponential function. As observed in table 2, the elasticity is less than one. This implies that output of broiler production is inelastic with respect to, stock size, feed and labour input. As a result, a change in the level of use of any of these explanatory variables will result in less than proportionate change in output.

Resource Use Efficiency

The resource use efficiency was calculated to determine whether resources were under-utilised

Table 2: Elasticity of broiler production

<i>Independent Variables</i>	<i>Elasticity</i>
Stock size	0.22
Feed	0.01
Labour input	0.66

Source: Field Survey 2006.

or over utilised. Optimal resource allocation requires that the marginal value product (MVP) be equal to the marginal factor cost or the unit price of the input. Comparison of the ratio of the MVP and MFC shows that all resulting ratios were less than unity for stock size, feed and labour indicating that the inputs were over used. This confirms the hypothesis that resources were not efficiently utilized. The results show that poultry farmers in the study are not efficient in broiler production as regards the three resources that were used in the analysis. However, of all the resources used, none of them has a negative MVP, indicating that the farmers are still producing within economically rational range. This finding is in consonance with the findings of Alimi (2000). In his study of resource use efficiency in food crop production in Oyo state, Alimi (2000) found that hired and family labour was within economically rational stage because of the non-negativity of their marginal value product (MVP). He further stated that despite the positive MVP, family labour was not optimally utilised because of its low value. The marginal value product (MVP) of feed, chicks and labour were determined and compared with their unit prices (marginal factor cost). The MVP of a day-old chick was found to be 0.205 Fcfa while the average was 400 Fcfa. The marginal analysis of input utilisation (r) for chicks is 0.00051. This is an indication that chicks are over utilised in the study area. Also, the MVP for feed was estimated at 0.0015 Fcfa and average unit cost for a kilogram of feed is 245 Fcfa. The value of r for feed was 0.0000061. This means that feed was over utilised in the study area. The MVP of labour was 1.66 and the wage rate per hour of a labourer was 100 Fcfa. The value of r for labour was 0.0166. This shows that labour was over utilised (Table 3).

Table 3: Marginal value product and prices of inputs

<i>Resource</i>	<i>MVP(Fcfa)</i>	<i>MFC(Fcfa)</i>	<i>MVP/MFC</i>
Chick	0.205	400	0.00051
Feed	0.0015	245	0.0000061
Labour	1.66	100	0.0166

Source: Field Survey 2006.

CONCLUSION

Broiler producers in the study area are not adequately trained. Their mean experience in broilers production is three years and they have little contacts with extension agents. These attributes have a negative effect on productivity. Broiler producers in the study area are small-scale farmers, retired civil servants, students etc. with a poor financial base and little access to loans. As a result, they cannot provide for the capital assets needed for rearing, processing and marketing of broiler products. This makes improvement in the quality and quantity of broilers output difficult. Though the industry is profitable, the analysis of marginal productivity reveals that resources were inefficiently utilized. Productivity would increase if farmers make a more effective and economic use of farm resources. The roads in the study area are seasonal roads. This leads to a high cost of feed, high cost of vaccines and medication, high cost of inputs and disorganisation in the poultry sector leading to poor planning of orders. This makes access to day old chicks difficult.

RECOMMENDATIONS

The study recommends the following:

- (i) The government, Non Governmental Organisations (NGOs) and Non Profit Organisations (NPOs) should ensure that extension messages are well disseminated to farmers to improve their productivity.
- (ii) Poultry producers generally should have access to credit facilities especially soft loans. This will help them to increase their stock size, slaughterhouses, transportation facilities and feed processing.
- (iii) Government should create a favourable

macroeconomic environment that would encourage increase in poultry production. Reduction in poultry products importation, provision of social infrastructure as roads, portable water, tax exemption on poultry production and processing equipment will positively affect the production of broilers.

- (iv) Poultry farmers in the study area could form cooperatives. Agricultural cooperatives play an important role in marketing agricultural products. They could also serve to provide broiler producers the opportunity to process and market their products in a joint business venture with other poultry producers. Producer cooperatives provide uniformity in quality by inspection during production, at culling (harvesting) and upon delivery.

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