ECONOMIC ANALYSIS OF CONTRACT FARMING AND TECHNICAL EFFICIENCY OF BROILER FARMERS

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ABSTRACT. The study assessed the effect of contract farming on broiler production in Osun State, Nigeria. 120 farmers comprising of broiler farmers participating and not participating in contract farming were selected using multistage sampling technique. Information was elicited from the farmers with the aid of a structured questionnaire. The data were analyzed using descriptive statistics, Stochastic Production Frontier and Ordinary least square regression model. The findings of this study revealed that majority (75%) of the farmers rated the activities of contracting farming to be good and favorable, as the contract farmers earn more from broiler production than their counterparts. Average technical efficiency of the contract and non contract farmers were 0.8209 and 0.6803, respectively. The results also revealed that years of experience in broiler production, education of farmer, off-farm income, membership in farmers association, access to credit, access to veterinary services and participation in contract farming significantly affected technical efficiency of broiler farmers in the study area. Therefore, the study recommends that there should be increase in the awareness of the benefits associated with contract farming in agrarian communities, so that more farmers are encouraged to participate, as this will improve their production efficiency.

Keywords: poultry; income; regression; household.

INTRODUCTION

Agriculture has been one of the main pillars of Nigeria economy. It has been important alternative and ultimate

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vehicle aimed at driving continuous growth and development, lessening hardship, and reduce food insecurity and malnutrition in developing countries (Food and Agriculture Organization, 2011). Regardless of the enormous dependence on oil export revenue, agriculture still accounts for more than 40% of the GDP, 90% of non-oil exports and over 70% of the 182 million populace are engaged in agriculture one way or the other, mostly in rural areas (FMARD, 2016; FAOSTAT, 2015; Fuentes *et al.,* 2012). Yet, the sector is majorly characterized by small holder farmers with low use of improved or modern inputs, low or no access to credit facilities, low productivity and marketing efficiency (Evbuomwan and Okoye, 2017; Mgbenka and Mbah, 2016; Taphee, 2015).

Contract farming is one of the modern farming methods that could develop agri-entrepreneurs and help to overcome the difficulties faced by small holder farmers in the agricultural sector. Contract farming is as an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at pre-determined prices (Eaton and Sherperd, 2011). It also refers to an agreement on agricultural production vis-à-vis buyers and farmers that institutes settings for the production and selling of farm house produce. Generally, the farmers agree to deliver certain quantities of a specific product within a particular time frame and the buyer might also supply some inputs in return to the farmer (Guo, 2005).

Several researchers have found out that participation in contract farming increased farmers earnings (Barrett *et al.,* 2012; Warning and Key, 2002). Adebisi *et al.* (2019) also stated that the inclusion of smallholder farmers in contract farming improved their household food security. Despite this glaring potentials associated with contract farming, empirical evidence on how it affects the efficiency of livestock farmers, especially in poultry production is thin. Therefore, the study seeks to fill the gap by examining the effect of contract farming on the technical efficiency of poultry farmers in Osun State. The objectives are to: evaluate the contract farming activities among broiler farmers in the study area; examine the technical efficiency of broiler farmers in the study area and determine the effect of contract farming on the technical efficiency of poultry farmers.

MATERIALS AND METHODS

Study area

The study was done in Osun State, Nigeria. Osun State has of 30 local government areas (LGA) and divided into three agricultural zones. The state lies on latitude 8° to the North and longitude 6° to the South, then it is marked by longitude 4° to the west and longitude 5° to the east (OSSADEP, 2004). It has tropical climate with wet and dry seasons, and fertile soil, which encourages the production of crops and livestock. The rainy season occurs between April and

October, while the dry season between November and March. The annual mean temperature for the state varies between 21.1 and 31.1°C and the annual rainfall is within the range of 1,000 mm in the derived savannah agroecology to 1,200 mm in the rainforest belt (Osun State Ministry of Agriculture, 2014). The occupation and economic activities of the people is around crop farming, livestock farming, trading, and artisanship (OSSADEP, 2004).

Data and sampling procedure

Primary data was used for this study and was collected through the use of a structured questionnaire. The population for this study was made up of broiler farmers in the state. Three staged sampling technique was used in the selection of the respondents: the first stage involve the random selection of Osogbo and Ife agro-ecological zones out of the three zones in the state, the second stage involve the random selection of three towns from each zone using the listing of poultry farmers obtained from Poultry Society of Nigeria, and in the third stage, 20 broiler farmers were randomly selected. In all, a total of 120 respondents were used for this study comprising of 60 contract and 60 non contract broiler farmers.

Analytical techniques

The data collected were analyzed with descriptive statistics, stochastic production frontier and ordinary least square regression model.

Descriptive statistics

Descriptive statistics, such as frequency, percentage and tabulation, use of central tendency and dispersion (mean, mode, median and standard deviation) was used to analyze the activities of contract farming and the income of poultry farmers.

Stochastic production frontier

The Stochastic Production Frontier function was used to estimate the efficiency of poultry farmers, which was specified by the Cobb-Douglas' frontier production function following the work of Tegegne *et al.* (2014). The implicit form is given as:

$$TEi = Y_i/Y_i^* = f(X_i; \beta) \exp(V_i - \mu_i) / f(X_i; \beta) \exp V = \exp(-\mu_i),$$

where: Y_i: The observed output; Y_i^*: The frontier output; TE: Ranges between 0 and 1. Explicitly, it is specified as:

$$InY = \beta_o + \beta_l InX_1 + \beta_2 InX_2 + \beta_3 InX_3 + \beta_4 InX_4 + \beta_5 InX_5 + (V_i - U_i),$$

where: In = Natural logarithms; Y = output of farmers (kilogram); X_1 = flock size; X_2 = labour (man days); X_3 = quantity of feeds (kilograms); X_4 = cost of drugs (naira); X_5 = cost of stocking (Naira); $\beta_1 - \beta_5$ = production function parameters to be estimated; B_0 = intercept; U_i is the negative random error, which is assumed to account for errors in technical efficiency in production. It is assumed to be half normally distributed $U_i \sim N(0, \delta^2 u)$ and ranges between zero and one. V_i, on the other hand, is the stochastic error term, which has zero mean and accounts for measurement errors and random factors beyond the farmers control, such as weather, disruption of input supplies, etc. It is assumed to be a normally distributed random variable $N \sim (0, \delta^2 v)$. U_i and V_i are assumed to be independent of

each other. The predicted efficiency index for the production function model was obtained using the FRONTIER version 4.1 programme.

Ordinary least square regression model

The ordinary least square (OLS) approach was used to determine the effect of contract farming on technical efficiency of the farmers. OLS was used because of it normality assumption for error term (ei), and it's estimator is said to be normally distributed, best, and unbiased linear estimator (Gujarati, 2008). The model one is implicitly specified as follows:

$Y = f(x_{10}, x_{11}, x_{13} \ldots X + ei)$,   (eq.1)

The model is explicitly specified as follows:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 \ldots B_9 x_9 + ei, \qquad \text{(eq. 2)}$$

where: α = intercept; Y = technical efficiency of the broiler farmers; β_1-β_9 = regression coefficient; ei = error term designed to capture the effects of unspecified variables in the model; x_1 = gender of farmer (binary variable: 1 = male, 0 = female); x_2 = marital status; x_3 = household size (adult equivalent); x_4 = output (kg); x_5 = farming experience (years); x_6 = education (years of schooling); x_7 = off farm income (Naira); x_8 = membership of farmers association (binary variable: yes = 1, no = 0); x_9 = access to credit (binary variable: yes =1, no = 0); x_{10} = access to veterinary service (binary variable: yes = 1, no = 0); x_{11} = contract farming (binary variable: yes = 1, no = 0).

RESULTS AND DISCUSSION

Evaluation of the activities of contract farming in the study area

The rating of farmers on their activities between them and the contracting organization is presented in *Table 1*.

Table 1 shows that more than 75% of the contract farmers rated the terms of the contract to be good. This shows that the contract farmers are satisfied with the program.

Table 1 - Evaluation of the activities of contract farming in the study area

Variables	Frequency	Percentage
Bad	0	0.00
Fair	15	25.0
Good	20	33.3
Very Good	20	33.3
Excellent	5	8.4
Total	60	100

Source: Field survey, 2019

Annual farm income from broiler production

Table 2 shows that 55% and 35% of the contract farmers and non-contract farmer earn ₦ 500,000 – ₦1,000,000, respectively, annually, as their farm income in the study area (1 ₦ = 0.00262806 USD). This shows that the contract farmers earn more and are better off than their counterparts. The mean farm income of the contract farmers and non-contract farmers households are ₦ 823,365 and ₦ 660,055. This shows that contract farmers earn more than non-contract farmers in the study area.

Table 2 - Distribution of respondents according to their annual farm Income

Farm income (₦)	Contract farmers (N=60)		Non-contract farmers (N=60)	
	Frequency	Percentage	Frequency	Percentage
< 500,000	14	23.3	30	50.0
500,000 – 1,000,000	33	55.0	21	35.0
> 1,000,000	16	26.7	9	15.0
Total	60	100.0	60	100.0
Mean	823,365		660,055	

Source: Field survey, 2019

Level of technical efficiency of poultry farmers

This section presents the level of technical efficiency of farmers who practice contract farming and those who didn't.

Table 3 shows the summary of level of technical efficiency of broiler farmers in the study area. The average technical efficiency of farmers who practiced contract farming is 0.8209, while the mean technical efficiency of farmers who didn't practice contract farming is 0.6803. This shows that the contract farmers were more efficient in the combinations of their various input resources to produce maximum numbers and weight of poultry birds.

Table 3 - Distribution of farmers by level of technical efficiency (n=120)

Level of technical efficiency	Contract farmers	Non-contract farmers
0.40 - 0.49	2(3.33)	2 (3.33)
0.50 - 0.59	4 (6.66)	7 (11.60)
0.60 - 0.69	46 (76.6)	18 (30.00)
0.70 - 0.79	7 (3.96)	32 (53.33)
0.80 - 0.89	1 (73.30)	1 (1.66)
≥0.90	0 (0.00)	0 (0.00)
Minimum	0.4930	0.5220
Maximum	0.8750	0.9320
Mean	0.6803	0.8209
SD	0.0765	0.0789

Source: Field Survey, 2019

Effect of contract farming on the efficiency of broiler farmers

The effect of contract farming on the technical efficiency of broiler farmers is presented in *Table 4*. *Table 4* shows the result of the effect of contract farming on the technical efficiency of broiler farmers. The results revealed that years of experience in broiler farming, education of farmers, off-farm income, membership in farmers association, access to credit, access to veterinary services and participation in contract farming significantly affected technical efficiency of broiler farmers in the study area. The coefficient of years of experience of farmers in broiler

production was positive and significant at 10%, which denotes that farmers who have more experience in broiler production efficiently combined their inputs to produce the desired output. The coefficient of education was positive and significant at 10%, which implies that the more educated a farmer is, the higher the tendency to be efficient in broiler production. Also, the coefficient of off-farm income of the respondents was positive and significant at 1%, implying that farmers who have off farm income were more efficient.

Table 4 - Effect of contract farming on the efficiency of poultry farmers

Variable	Coefficient	Std. error	t-stat
Age	-558.955	1273.393	0.662
Marital status	13071.88	32982.78	0.693
Household size	1102.62	5086.768	0.829
Flock size (number)	3931.085	5086.768	0.504
Experience	749.873**	341.404	0.032
Education	5193.573**	2012.635	0.012
Off farm income (Naira)	0.47517***	0.119841	0.000
Membership of farmers association	34570.59*	20131.34	0.089
Access to credit	0.1994476*	0.257930	0.062
Access to veterinary service	2.800102***	6412.165	0.000
Contract farming	24752.09**	9920.81	0.014
Constant	185405***	55758.76	0.000
R^2	0.4949		
Adjusted R^2	0.3957		

Source: Field survey, 2019; * significant at 10%, ** significant at 5%, ***significant at 1%

The coefficient of membership in farmers association was positive and significant at 10%, indicating that farmers who are in poultry association were more likely to be efficient than farmers who are not members of poultry farmers association. This is because participation in farmers associations fosters the spread of new and useful farming techniques that can improve productivity and efficiency of the farmers.

Moreover, the coefficient of access to credit was positive and significant at 1%, which implies that farmers who had access to credit facilities have more tendency to be more efficient in the combination of inputs used than farmers who did not have access to credit facilities.

The coefficient of access to veterinary services was positive and significant at 1%, which implies that farmers who had access to veterinary service have tendency to be more efficient in broiler production than farmers who did not have access to veterinary service. The coefficient of participation in contract farming was positive and significant at 1%. This shows that participation in contract farming by the broiler farmers have greatly increased the efficiencies of the farmers.

CONCLUSIONS

This study concluded that participation in contract farming improved the technical efficiency of broiler production among farmers in Osun State. It is, therefore, recommended that there should be more awareness of the benefits associated with contract farming in agrarian communities as this will improve farmer's productivity and efficiency.

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