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## Resource-Use Efficiency in Small-Holder Broiler Production in Oshimili North Local Government Area, Delta State

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**Abstract:** Resource-use efficiency among small-holder broiler farmers in Oshimili North Local Government Area of Delta State was examined. Primary data collected with structured questionnaire from randomly selected 100 respondents, were analyzed using appropriate statistics. The result revealed that small-holder broiler farming was profitable in the study area. Feed cost was dominant consisting of about 35.05% of total cost and about 37.70% of total variable cost of production. Labour and day-old chicks had inverse relationship with broiler output while medication though not significant and quantity of feed had positive influence on broiler output. Efficiency estimates showed that farmers in the area were generally inefficient in the use of resources while the most significant constraint facing these farmers was inadequate finance with a mean score of 2.60. In order to increase output and profitability as well as promote efficient utilization of resources in broiler production, government should as a matter of policy address the intractable problem of lack of access to farm credit by small-holder farmers, provide guaranteed funds at affordable interest rate and capture the significant factors affecting broiler production.

**Key words:** Efficiency, resources-use, small-holder farmers, broiler, Oshimili North

### INTRODUCTION

Poultry production forms an important component of the livestock sub-sector in Nigeria and is by far the largest livestock group estimated to be about 4,000 million, consisting mainly of chicken, ducks and turkey (Food and Agriculture Organization, 1999). Winrock International Institute for Agricultural Development (1992) also asserted that in terms of poultry production in Africa, Nigeria rates highest with a total of 190 million chickens. The significant improvement in poultry production has been maintained by the availability and use of improved vaccines which controlled mortality rates in birds, reduction in the tariffs on importation of day-old chicks and parent stock (Central Bank of Nigeria, 1999).

The poultry industry in Nigeria has undergone significant transformation since the early fifties, from a backyard, peasant and primitive household oriented husbandry of breeds of semi-wild chicken to the cash oriented, modern and large scale poultry. Poultry, broiler inclusive was introduced into Nigeria in the 1950s to supplement the fast declining rate of cattle production in a bid to supply the much required protein in the diets of Nigerians. According to Ikeme (1990), broiler birds in terms of their nutritive value ranks second to cow milk and the most economically produced animal protein. Its deficiency in the diet exerts adverse effects on human population due to abnormal development of the organs and body parts. The large share of livestock budget going to broiler production reflects its importance in

Nigeria economy. In 1999, out of Naira19,193,500 budgeted to the livestock sector, Naira11,680,000 (72.05%) of the budget was disbursed to poultry sub-sector.

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.

The evidence of this is the preponderance of producer-hawkers of broiler products both in urban and rural markets particularly during the festive periods, when their demands are highest and selling prices favourable. While it is obvious that more than economic profits are made, a condition necessary for more producers to enter the business under competitive environment, the question is, are they efficiently utilizing their scarce resources to enable them realize optimum profits from their investment? That is, do they achieve maximum profit for a given set of inputs? Although, some studies on efficiency in poultry enterprise have

been made (Ojo and Afolabi, 2000; Ojo, 2003), not much of such studies have been specifically documented on the resource-use efficiency in Oshimili North Local Government Area of Delta State. An understanding of these relationships would provide working tools for policy makers to design programmes that can contribute to measures needed to expand broiler production in the study area and Nigeria in general.

Given this background, this study examined whether resources are efficiently utilized by broiler producers in the study area. Specifically, it examined the socio-economic characteristic of the broiler farmers in the study area; determined the gross margin of broiler production; determined the effect of productive inputs on broiler output; estimate efficiency of resources used in broiler production in the study area; ascertained the constraining factors to high broiler output and revenue in the study area.

### **MATERIALS AND METHODS**

This research was carried out in Oshimili North Local Government Area of Delta State, Nigeria. This area is inhabited by Delta Igbos majority of whom are farmers producing on small scale. It has an estimated population of 69310 (National Population Commission, 2006). It is located between latitude 5° and 6°12' North and longitude 5° and 6°38' East. The area has rainforest vegetation and is marked by two distinct seasons - dry and wet seasons. The annual rainfall ranges from 1,500 - 2200 mm per annum with a mean daily temperature of 29°C.

Data used for this research were mainly primary and were obtained from broiler farmers using well structured questionnaires and interview schedule. Specifically, a two-stage sampling technique was used in selecting 100 small-holder broiler farmers from five communities viz Illah, Ugbolu, Ibusa, Ebu and Okpanam out of nine that make up the study area.

Data was analyzed using descriptive statistics, gross margin analysis, multiple regression model, ratio of marginal value product of the broiler output to marginal factor cost of the inputs and likert type scale. Specifically, socio-economic characteristic of the farmers in the study area was achieved using percentages and frequency counts; profitability of broiler enterprise was achieved using gross margin model. The model is specified as thus:

$$GM = TR - TVC \quad (1)$$

$$\pi = GM - TFC \quad (2)$$

Where

GM = Gross margin

TR = Total revenue

TVC = Total variable cost

TFC = Total fixed cost

$\pi$  = Profit (net farm income).

The effects of production inputs on broiler output were achieved using multiple regression model. The model is specified as thus:

$$Y = F (X_1, X_2, X_3, X_4, e) \quad (3)$$

Where

Y = Broiler output (Kg)

X<sub>1</sub> = Labour (Man days)

X<sub>2</sub> = Medication (Litre)

X<sub>3</sub> = Quantity of feed (Kg)

X<sub>4</sub> = Number of day-old chicks which is a reflection of farm size

e = Stochastic error term

The regression was fitted for broiler output using the linear, semi-logarithm and double-logarithm. The lead equation from the three functional forms was chosen based on the value of multiple coefficient of determination (R<sup>2</sup>) as well as the sign and significance of the regression parameters. Resource-use efficiency of broiler producers was achieved by determining the Marginal Value Product (MVP) of broiler output and the marginal factor cost of the inputs. The MVP of any resource is the product of Marginal Physical Product (MPP) and the unit price of output (P<sub>y</sub>) (Adegeye and Dittoh, 1982) that is: MVP = MPP.P<sub>y</sub>. Depending on the functional form selected as lead equation, MVP values were obtained as follows:

For linear form - MVP = b<sub>y</sub>p<sub>y</sub>

For semi-log form - MVP = b<sub>y</sub>p<sub>y</sub>/x<sub>i</sub>

For double form - MVP = b<sub>i</sub>Y<sub>y</sub>p<sub>y</sub>/x<sub>i</sub>

Resource-use efficiency (R<sub>E</sub>) = MVP/MFC or MVP/P<sub>x<sub>i</sub></sub>

Where b<sub>i</sub> = regression coefficient of resource X<sub>i</sub>

Y<sub>y</sub> = Mean output of broiler

X<sub>i</sub> = Mean value of resource

P<sub>y</sub> = Price of poultry output

P<sub>x<sub>i</sub></sub> = Price of resource per unit = MFC

MFC = Marginal factor per unit

The MVP and MPC were calculated to know whether the inputs used were optimally, over or under utilized (Olayide and Heady, 1982).

#### **Decision rule:**

MVP/MFC > 1 (resources were under utilized)

MVP/MFC < 1 (resources were over utilized)

MVP/MFC = 1 (resources were optimally utilized).

A 3-point likert type was used to determine the constraints faced by the farmers in the study area. A high mean score of  $\bar{X} = 2.00$  shows significance of the constraining factors while  $\bar{X} < 2.00$  not significant.

Table 1: Socio-economic characteristic of small-holder broiler producers

Items	Frequency	Percentage (%)
<b>Age</b>		
Less than 30	8	8
31-40	8	8
41-50	46	46
51 and above	38	38
Total	100	100
<b>Gender</b>		
Male	67	67
Female	33	33
Total	100	100
<b>Marital status</b>		
Single	9	9
Married	68	68
Widow	13	13
Divorced	10	10
Total	100	100
<b>Educational background</b>		
No formal education	13	13
Primary education	36	36
Secondary education	41	41
Tertiary education	10	10
Total	100	100
<b>Household size</b>		
1-5	28	28
6-10	69	69
11-15	3	3
Total	100	100
<b>Level of involvement</b>		
Full time	14	14
Part time	86	86
Total	100	100
<b>Flock size kept</b>		
150-300	53	53
350-500	22	22
550-700	0	0
750-900	18	18
950-1100	7	7
Total	100	100

Source: Authors' computation

## RESULTS AND DISCUSSION

### Socio-economic characteristics of broiler producers:

The various socioeconomic variables of broiler farmers which could be relevant in influencing output were examined and presented in Table 1. The result indicates the age range between 41 - 50 and 51 and above make up 84% of the respondents and is considered to be the active stage of production process. This implies the predominance of middle aged who are energetic to face the challenges of broiler production. The remaining 16% comprised of those that are between the age ranges of less than 30 to 41 years. Sixty seven percent (67%) of the respondents are males. This could be because most females in the study area were saddled with domestic responsibilities. This finding is also in line with those of various authors that reported male dominance in broiler production (Ike and Ugwumba, 2011; Achoja *et al.*, 2008). Sixty eight percent (68%) of the respondents are married and this could be responsible for the relatively large household size which immensely contributed to family labour availability. Majority (87%) of the respondents received formal education. This therefore, enhances their abilities to adopt new technologies which could translate to increase broiler output. Most of the respondents (80%) were part-time broiler producers and had flock size of 150 - 300 (53%) in the study area. The results of the socio-economic characteristics also are in agreement with the findings of Oladeebo and Ambe-Lamidi (2007) and Waziri and Agbugba (2010).

**Profitability of broiler production:** The structure of costs and return in small-holding broiler production among the farmers is presented in Table 2. Findings indicate that variable cost items constitute the bulk (92.89%) of the total cost in broiler production. Therefore, they are

Table 2: Cost and return analysis on average small-holder broiler production

Item	Amount (Naira)	% In cost class	% Of total cost
Total Revenue (TR)	338,805.20		
<b>Variable Cost (VC)</b>			
Day old chicks	69,116.90	30.57	28.40
Feed expenses	85,231.45	37.70	35.02
Medication	4,004.75	1.77	1.65
Maintenance	25,881.35	11.45	10.63
Miscellaneous	229.75	0.10	0.09
Litter expenses	958.57	0.42	0.39
Labour expenses	40,636.70	17.97	16.70
Total Variable Cost (TVC)	226,059.47	99.98%	
Gross Margin (GR - TVC)	112,745.73		
<b>Fixed Cost (FC)</b>			
Depreciation	17,314.90		7.11
Total Fixed Cost (TFC)	17,314.90		
Total Cost (TC)	243,374.37		99.99%
Mean net revenue	95,430.83		
Mean net revenue per bird	305.87		

Source: Author's computation

Table 3: Linear production function estimates for broiler production

Variables	Estimated coefficient	Standard error	t-statistics	p-value
Constant	141763	44554.7	3.18177	0.002
Labour	-1.99312	0.651388	-3.05981	0.003**
Medication	4.57730	17.1620	0.266711	0.790 <sup>ns</sup>
Feed weight	273.558	26.5176	10.3161	0.000**
Chick	-1.11431	0.418124	-2.66502	0.009**

R<sup>2</sup> = 0.78; Adjusted R<sup>2</sup> = 0.77; DW = 1.76; N = 100; F-statistic 82.4473(0.00).

\*\*\* = Significant at the 1% level; ns = not significant. Source: authors' computation

very crucial to the success in small-holding broiler production in the study area. Similarly, feed accounted for about 37.70% of Total Variable Cost (TVC) and 35.02% of Total Cost (TC) and is therefore, important in the determination of the success of the farmers under the prevailing environment.

On the average, a farmer in the study area was able to make a net revenue of about Naira95,430.83 from broiler production in a farming season and Naira305.87 per bird that reached market size. This shows that broiler production is profitable though they are producing at small-scale level. These findings agree with the findings of Ike and Ugwumba (2011) who reported about 78.84% of feed cost and profitable broiler enterprise. This can be improved upon if measures are taken to utilize feed efficiently by the introduction of highly improved, high feed conversion efficient broiler breeds. Increase in the level of scale of operation is also advocated so that the high cost of inputs will be distributed among large number of birds which cuts down the cost of rearing a bird to maturity.

**Factors that affect broiler output:** Table 3 shows the result of multiple regression. The linear functional form was chosen as the lead equation given the R<sup>2</sup> value of 0.78, Adjusted R<sup>2</sup> of 0.77, F-statistic of 82.45 and significance of the regression parameters. The estimated regression equation is given as:

$$Y = 14.1703 - 1.99312X_1 + 4.57730X_2 + 273.558X_3 - 1.11431X_4 + u$$

(3.18177) (-3.05981)\*\* (0.266711)<sup>ns</sup> (10.3161)\*\* (-2.66502)\*\*

Where the variables are as defined in equation (3) and the figures in parentheses are t-ratios. The coefficient of multiple determination (R<sup>2</sup>) of 0.78 indicates that about 78% changes in output of broiler were explained by the explanatory variables and F-ratio of 84.45 is significant at 1% level. The estimates showed that labour and number of day-old chicks had an inverse and significant (p<0.01) relationship with broiler output. This implies that higher amount of labour and day old chicks used will negatively affect the poultry output. This finding contradicts that of Ike and Ugwumba (2011) and Waziri and Agbugba (2010) that reported positive effect of labour (man days) on broiler output though significant at 1% level. The significant relationship between labour and broiler output may be attributed to high availability of

family labour during the production period. The unpaid family labour inputs reduced the total cost of labour used which could translate to high revenue from broiler production because with adequate hands, output will increase relative to the scale of operation. Day-old chick inverse relationship though it is against the a priori expectation, could be attributed to high mortality rate due to poor management. This finding agrees with the findings by Ike and Ugwumba (2011) and Waziri and Agbugba (2010) that reported number of chicks' negative effect on broiler output due to high mortality rate but does not agree with the finding of Chukwuji *et al.* (2006) that reported positive effect of stock size on broiler output. Quantity of feed consumed had a positive effect on broiler output and it is significant at 1% level of significance. This shows that for every 1% increase in quantity of feed consumed increases broiler output and revenue by 273.558 units which implies that farmers used high quality feeds. This finding does not agree with the findings of similar works done by Ike and Ugwumba (2011) and Waziri and Agbugba (2010) that reported negative effect on broiler output attributed to the use of low quality feeds but agrees with that of Chukwuji *et al.* (2006). Medication had a positive effect on broiler output and revenue though not significant.

**Efficiency of resource use in broiler production:** Table 4 shows the result of efficiency of resources used by broiler farmers in the study area. The resource-use efficiency is expressed as the ratio of the MVP and MFC. Resource use efficiency ratios of -0.744, 1.66, 273.04 and -8.9478 for labour, medication and feed quantity and day-old chick respectively were evident in the study. This implies that the broiler farmers were generally inefficient in the use of these resources. Labour and day-old chicks were grossly over utilized while medication and quantity of feed consumed were underutilized. Therefore, for optimal level of efficiency to be attained, broiler farmers must reduce the amount of labour by increasing their scale of operation while feed and medication utilization should be stepped up in the study area. All these are achievable if broiler farmers have access to credit at affordable cost. These findings conform to the findings of Oladeebo and Ambe-Lamidi (2007) and Vincent *et al.* (2010) that reported overutilization of hired labour and number of chicks and suggested reduction

Table 4: Analysis of efficiency in broiler production

Input	Marginal physical product (bi)	Price per unit output py (N)	Marginal value product (MVP) (N)	Price per unit input (PXI) (N)	Efficiency	Decision
Labour	-1.99312	1018.35	-2029.6	-2728.88	-0.24 < 1	Over-utilized
Medication	4.57730	1018.35	4661.29	4004.85	1.16 > 1	Under-utilized
Feed weight	273.558	1018.35	27577.78	1020.27	273.04 > 1	Under-utilized
Chick	-1.11431	1018.35	-1134.76	126.82	-8.95 < 1	Over-utilized

Source: Authors' computation

Table 5: Constraints facing small-holder broiler farmers in the study area

Constraints	Not serious (1)	Serious (2)	Very serious (3)	Total	Mean score	Ranking	Decision
Inadequate finance	6	56	198	260	2.60	1	Significant
High cost of feed	10	50	195	255	2.55	2	Significant
Disease outbreak	8	62	183	253	2.53	3	Significant
Inadequate market for poultry production	9	64	177	250	2.50	4	Significant
Loss of poultry to theft and dangerous animals	53	78	24	155	1.55	5	Not significant
Stock unavailability	80	16	36	132	1.32	6	Not significant
Inadequate labour availability	78	36	12	126	1.26	7	Not significant

Source: Author's computation

in labour use. It also agreed with findings of Vincent *et al.* (2010) that reported underutilization of cost of vaccine and drugs suggesting the need to increase expenditure on them and Oladeebo and Ambe-Lamidi (2007) suggesting reduction on feed expenditure though it was not in agreement with the findings of this work.

**Constraints facing small-holder broiler farmers in the study area:** Table 5 shows the constraining factors limiting the profits and efficient use of resources of the respondents in the study area. It shows that inadequate finance, high cost of feed, disease outbreak and inadequate market for broiler output were the constraints affecting the profit level of broiler farmers in the study area, while inadequate finance is ranked highest in the list with a mean score of 2.60 on likert type scale. This implies that the more broiler farmers access credit, the more their level of output all things being equal.

**Conclusion and recommendation:** Findings from this research showed that most females are not involved in broiler production and most respondents regarded it as a part-time venture. They are averagely literate since majority of them had more than primary education. The results of the multiple regression analysis showed that medication and feed quantity were positively related to broiler output while labour and chicks had inverse relationship with broiler output. The implications are that farmers are inefficient in allocating their scarce resources and therefore need to increase the quantity of some inputs and reduce some especially labour in order to maximize profit and attain economic optimum.

Arising from the findings, the following recommendations were made:

- Females should be actively involved in broiler farming as their male counterpart and on full-time basis in order to earn more income.

- They should increase their scale of operation which will distribute the over utilized labour to a large number of birds in order to be efficient.
- Government programme on Agriculture Credit Guarantee Scheme should be re-enacted to enhance the financing of broiler farming in the study area.

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