Measurement of Pig Production Profitability in Zangon Kataf and Jema'a Local Government Areas of Kaduna State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author KPD designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors JGA and OO managed the analyses of the study, author JAN managed the literature searches. All authors read and approved the final manuscript.

ABSTRACT

The study aimed at measuring the profitability of swine farmers, as well as determining the influence of the farmers' socio-economic characteristics on their output. It was conducted in Kaduna State, Nigeria using structured questionnaire administered to 120 swine farmers. The respondents were randomly selected from Jema'a and Zangon Kataf Local Government Areas and information relating to objectives of the study was obtained. Descriptive statistics, multiple regression model, t-test of significance and net farm income were used to analyse the data. The study revealed that swine production in the study area predominantly carried out by women of active age. Profitability ratios showed that swine production was profitable with a return per naira invested (38kobo), profit margin (27%), gross ratio (73%) and a net farm income (N 3,178.55 per pig). The cost of feed, purchase of piglets and family labour constitutes the major variable cost items (81.96%), with an average sale of N11, 624.77 and average total cost of N8, 446.22The result also showed that swine production was influenced by socio economic characteristics: production experience, household size, herd size, age and level of education were significant *(P=.05 and .01)*. Z-test also revealed a significant difference *(P=.01)* between farmers' costs and returns. High cost of piglets, high cost of feeds, outbreak of diseases and high piglet mortality rate were the major constraints faced by

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farmers. The study recommends that producers should be assisted with financial capital to be able to effectively rear pigs and also expand the scale of production.

1. INTRODUCTION

Nigeria is estimated to have about 4.4 million pigs, 78 percent of which are found in the sub-humid zones of Northern Nigeria [1]. The swine industry in Nigeria has not yet fully developed like the ruminants and poultry industries because pigs are not generally accepted by majority of the population specifically in the Northern states, due to culture and religion which makes it a taboo for pork to be eaten by some people [2]. Most of the pigs are reared in the extensive system, and their productivity has been reported to be low. Efforts have been directed therefore towards improving their productivity through adequate nutrition [3], improved health and management [4], breed development specifically through cross – breeding with superior exotic breeds. Apart from the pig's importance in the national human diet, the urgency of increasing pig production efficiency is highlighted by factors such as stable source of revenue, value added for crop production and the creation of export potential for meat. Decisions about adopting new technologies or entering into pig production contracts should be based on sound economic analysis [5]. The cost of production usually increases due to disease infestation [6], high cost of feed and theft, thereby adversely affecting the expected profit of the production. These problems have made most pig producers to keep few pigs because they cannot afford the initial cost of large operation, as such, production is on small scale. The foregoing therefore gave rise to research questions as: Do socio economic characteristics of farmers have influence on their output? Is pig production profitable? What problems are associated with the effective production of pigs?.

This paper aimed at analyzing the cost and returns of pig production while focusing exclusively on: describing and determining the influence of socio economic characteristics of farmers on their output; cost and returns in pig production and identifying the problems associated with pig production. Thus, two hypotheses were tested:

H_0: Socio economic characteristics have no significant influence on the output of swine farmers.

H_0: There is no significant difference between costs and returns of swine farmers.

2. METHODOLOGY

2.1 Study Area

The study was conducted in Kaduna State, Nigeria (lying between lat 09^0 02' and 11^0 32' North of the equator, 06^0 15'and 80^0 50' East of prime meridian).

2.2 Sampling

120 swine producers were surveyed during February to April 2008 to collect detailed information on the various costs and returns from different swine operations. Purposive and

random samplings were respectively employed in selecting the farmers. The levels of outputs and inputs vary widely with farm size (number of pigs).

2.3 The Data

The data used were obtained mainly from primary source, through the use of structured questionnaires with interview within the period of January to April, 2008. Information collected covered all areas related to the objectives.

2.4 Analytical Tools

Data obtained were analyzed using simple descriptive statistics (frequencies, means and percentages), Net Farm Income, profitability ratios, likert rating scale, multiple regression analysis and t-test of significance. The SPSS statistical package was used.Total economic cost and net return, as defined below, were computed per pig produced. Although a number of other measures, such as net cash income, net farm income, and returns on total assets are also used to determine farm profitability, this study used net farm income as a measure of profitability of swine production. [7] also used this approach to determine factors associated with profitability of farrow-to-finish swine producers in Iowa.

The net farm income (NFI) is given by:

NFI = Gross cash income - Total variable costs - Total fixed/Depreciation costs – cost of owner-capital.

That is, NFI=GI–TC ....(1)

Where,

Gross cash income (GI) is the total cash received by farmers. It includes returns from the sales of weaned piglets, table hogs, breeding animals and feeder pigs to other herds for finishing in naira (N).

Total cost (TC) is the sum of total variable costs, total fixed/depreciation expenses and cost of owner capital measured in naira (N).

Total variable costs include all variable operating costs, including feed costs, hired labor expenses, veterinary supplies and services costs, breeding supplies and services cost, repairs and maintenance and other miscellaneous costs. Feed costs include purchased feeds (grains or concentrates).

Total fixed/Depreciation costs include capital depreciation and boar depreciation. Capital depreciation was computed as annualized capital by dividing the total value of capital by the estimated total life span in years. The economic life span of swine houses was assumed to be 10 years and the life of other equipment was estimated (based on farmers' responses) at 5 years. Boar depreciation was computed as purchase value minus cull value divided by the breeding life of a boar (assumed to be two years).

Profitability ratios: Rate of return on investment (ROI), profit margin (PM) and gross ratio (GR) were computed as:

$$\text{ROI} = \frac{Gross\ cash\ income}{Total\ cost} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

$$\text{PM (\%)} = \frac{net\ farm\ income}{gross\ cash\ income} * 100 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

$$\text{GR (\%)} = \frac{total\ cost}{gross\ cash\ income} * 100 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

The 5- point likert rating scale was used to determine the constraints with mean score of 3.0 and above considered as major constraints, while those with mean score of below 3.0 were considered minor constraints faced by farmers in the study area. This was achieved as described by [8].

The multiple regression model was used to test the first null hypothesis. The implicit form is expressed as:

$$Y = f(X_1, X_2, \dots\dots X_n) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5)$$

It is specified explicitly with the estimated parameters as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + e \dots\dots\dots\dots\dots\dots\dots(6)$$

Where,

Y = aggregate value of pigs produced in naira
β_0 = intercept of the function
X_{1i} = production experience of the ith farmer
X_{2i} = herd size (number of pigs) of the ith farmer
X_{3i} = household size of the ith farmer
X_{4i} = level of education of the ith farmer
X_{5i} = age of the ith farmer
$\beta_1 - \beta_5$ = coefficients of explanatory variables
e = error term

t-test of significance was used to test the second null hypothesis and is given by:

$$t = \frac{X_1 - X_2}{\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(7)$$

Where:

X_1 = Average return for farmers naira
X_2 = Average cost for farmers in naira
$\sigma_1^2 =$ Variance for farmers' return
$\sigma_2^2 =$ Variance for farmers' cost
n_1 = Sample size of farmers' return
n_2 = Sample size of farmers' cost

3. RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of Swine Farmers

The socio-economic characteristics of the respondents are presented in Table 1. The study revealed that majority of the respondents (53%) were women, which agrees with findings by [9]. The age of the farmers ranged between 21 and 60 years. 92% of the respondents were above 35 years, with a mean age of 40.3 years. This is in agreement with earlier findings by [9], that farmers were within an economic active age thereby making positive contribution to agricultural production. Most respondents (65%) had major occupation as farming, implying that swine production is just another form of diversification in farming. 78% of respondents had up to completed secondary education, meaning that the literacy level among the farmers was low. [10] observed formal education with positive influence on adoption of innovation. 80% had between 3-20 years of farming experience. Just as the saying 'experience is the best teacher'; this shows that the managerial ability of the farmers can be inferred to be reasonably good. The study also revealed that 88% of the respondents had herd size of 1-5, which were mostly acquired through purchase. The household size of most respondents (95%) ranged between 1 and 10 members. This means more mouth to feed, such that for a given farm size large households could produce a smaller market surplus [11]. However, in traditional agriculture, the larger the household size the more labour force is available for farm activities.

Table 1. Descriptive statistics of respondents' socio-economic characteristics

Variables	No of respondents	Percentage
Sex		
Male	56	47
Female	64	53
Age		
35 and below	10	8.
36 and above	110	92
Household size		
1-5	56	47
6-10	58	48
11-15	6	5
Level of education		
Tertiary	26	22
Secondary	46	38
Primary	34	28
None	9	12
Production experience		
20 and below	96	80
21 and above	24	20
Herd size		
5 and below	88	73
6 and above	32	27
Major occupation		
Farming	78	65
Otherwise	42	35

3.2 Profitability of Swine Farmers

The costs and returns structure (Table 2) revealed that cost of feeds ranked highest (35%), followed by the purchase of piglets (25%) and labour (22%) respectively of the total cost of production. This result agrees with findings by (12 and13] that feed cost constitutes the highest cost of the total cost of producing edible pork. It has been reported to be occasioned by the highly exorbitant prices of grains [14]. The net farm income was obtained as N 3,179 per pig, while the rate of return on investment was 138% (1.38), meaning that for every N1.00 invested in swine production, N0.38k is gained by the farmer. However, this profitability level is less than that obtained by [14] and [15], who reported a return per naira invested of 1.64 and 1.82 in their respective studies. Difference could be attributed to study area or location differences alongside proximity of market to production areas.

Table 2. Cost and returns structure of swine producers

Items	Mean cost/Pig (N)	Mean percentage
A. Returns		
Sales of Pork		
Sales of live pigs: Weaned piglets	2443.13	18.69
Adult/Matured pigs	9181.64	81.31
Total returns	11624.77	100
B. Variable Cost		
Cost of feed	2987.70	34.81
Cost of piglets/breeding stock	2168.73	25.27
Cost of labour	1878.18	21.88
Cost of drugs/vet services	285.52	3.33
Cost of clipping and castration	72.17	0.84
Breeding/mating cost	496.35	5.78
Transportation cost	274.23	3.20
Total variable cost	8162.88	96.70
C. Fixed Cost		
Depreciation on buildings	199.07	2.32
Depreciation on equipments	45.94	0.54
Repairs and maintenance	38.33	0.45
Total fixed cost	283.34	3.30
D. Total Cost = B + C	8446.22	100
E. Gross Margin = A – B	3461.89	
F. Net Farm Income = A – D	3178.55	
G. Return on investment=A/D*100		138
H. Profit margin=F/A*100		27
I. Gross ratio=D/A*100		73

3.3 Constraints Encountered by Swine Farmers

Table 3 revealed only four (4) items rated above the decision (mean) score of 3.0. These are high cost of piglets, high cost of feeds, outbreak of diseases and high piglet mortality rate, indicating that they are the major constraints faced by farmers in the study area. This agrees with [9] and also validates claims by [4] that livestock enterprises in Nigeria are beset by some problems, major among which is the high cost of production inputs.

Table 3. Constraints encountered by swine producers

Constraints	Mean Score (Xs)	Ranking
High cost of piglets (breeding stock)	4.02*	1st
High cost of feeds	3.90*	2nd
Outbreak of diseases	3.21*	3rd
High mortality rate	3.10*	4th
High cost of transportation	2.75	5th
High cost of drugs and veterinary services	2.16	6th
Inadequate capital/finance	1.50	7th
Labour availability	1.24	8th
Poor housing	0.85	9th

*Major constraints

3.4 Hypotheses

The multiple regression analysis result (Table 4) revealed the coefficient of multiple determination (R^2) obtained as 0.63. This implies that 63% of the variation in the output of swine farmers can be explained by the selected socio-economic variables. The F-value (18.98) obtained is also statistically significant (P=.01), implying that the overall model is fit. Of the variables included in the model, production experience, herd size, level of formal education and age were significant. Production experience, herd size and level of formal education had positive influence on the farmers output (meaning that a unit increase in each of these variables leads to an increase in output by a magnitude of the coefficient). Age, on the other hand had a negative influence on the farmers' output, implying that the older the farmer, the more experienced he/she is and the greater the output.

Table 4. Estimated regression coefficients for socio-economic characteristics of swine farmers

Variables	Coefficients	Standard errors	t-values
Constant	-14121.290	18759.299	-0.753
Production experience	1372.184	459.749	2.985*
Herd size	12050.323	1561.927	7.715*
Household size	2027.320	1405.287	1.443
Level of education	8746.736	3084.721	2.836*
Age	-778.188	411.245	-1.892**
R	0.798		
R^2	0.637		
Adjusted R^2	0.604		
F	18.976*		

** P= .05, * P= .01

The result (Table 5) obtained from the Z- test of significance (two tailed test) revealed a significant difference between the costs and returns of swine farmers. The calculated Z-value (3.16) was found to be greater than the table value (1.96 and 2.58) at 5% and 1%probability level. Thus, the null hypothesis was rejected.

Table 5. t- test of significance for profitability

Variables	Mean	Variance	Calculated t-value	Tabulated t-value	Level of significance
Returns	52,244.30	1,218,873,439	3.16	1.96	0.05
Costs	36,574.58	252,409,605.9		2.58	0.01

4. CONCLUSION

It can be concluded that swine production in the study area is predominantly practiced by women of active age and is profitable as it is not the only farming activity practiced by the respondents. Socio economic characteristics of swine farmers have significant influence on their output. There is a significant difference between the costs and returns of swine farmers. High cost of piglets, high cost of feeds, outbreak of diseases and high piglet mortality rate are the major constraints faced by farmers. Hence, it is recommended that producers should be assisted with financial capital to be able to effectively rare pigs and also expand the scale of production.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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