

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

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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(₦ 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 ₦11, 624.77 and average total cost of ₦8, 446.22. The 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 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

Keywords: Swine production, socio-economics, costs and returns, constraints

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

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28 in the extensive system, and their productivity has been reported to be low. Efforts have
29 been directed therefore towards improving their productivity through adequate nutrition
30 [3], improved health and management [4], breed development specifically through cross –
31 breeding with superior exotic breeds. Apart from the pig's importance in the national human
32 diet, the urgency of increasing pig production efficiency is highlighted by factors such as
33 stable source of revenue, value added for crop production and the creation of export
34 potential for meat. Decisions about adopting new technologies or entering into pig production
35 contracts should be based on sound economic analysis [5]. The cost of production usually
36 increases due to disease infestation[6], high cost of feed and theft, thereby adversely
37 affecting the expected profit of the production. These problems have made most pig
38 producers to keep few pigs because they cannot afford the initial cost of large operation, as
39 such, production is on small scale. The foregoing therefore gave rise to research questions
40 as: Do socio economic characteristics of farmers have influence on their output? Is pig
41 production profitable? What problems are associated with the effective production of pigs?

42

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

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

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

50

51 **2. METHODOLOGY**

52

53 **2.1 Study area:** The study was conducted in Kaduna State, Nigeria (lying between lat 09°
54 $02'$ and $11^{\circ} 32'$ North of the equator, $06^{\circ} 15'$ and $80^{\circ} 50'$ East of prime meridian).

55

56 **2.2 Sampling:** 120 swine producers were surveyed during February to April 2008 to collect
57 detailed information on the various costs and returns from different swine operations.
58 Purposive and random samplings were respectively employed in selecting the farmers. The
59 levels of outputs and inputs vary widely with farm size (number of pigs).

60
61 **2.3 The data:** The data used were obtained mainly from primary source, through the use of
62 structured questionnaires with interview within the period of January to April, 2008.
63 Information collected covered all areas related to the objectives.

64
65 **2.4 Analytical tools:** Data obtained were analyzed using simple descriptive statistics
66 (frequencies, means and percentages), Net Farm Income, profitability ratios, likert rating
67 scale, multiple regression analysis and t-test of significance. The SPSS statistical package
68 was used. Total economic cost and net return, as defined below, were computed per pig
69 produced. Although a number of other measures, such as net cash income, net farm
70 income, and returns on total assets are also used to determine farm profitability, this study
71 used net farm income as a measure of profitability of swine production. [7] also used this
72 approach to determine factors associated with profitability of farrow-to-finish swine producers
73 in Iowa.

74 The net farm income (NFI) is given by:

75
$$NFI = \text{Gross cash income} - \text{Total variable costs} - \text{Total fixed/Depreciation costs} - \text{cost of}$$

76
$$\text{owner-capital.}$$

77 That is, $NFI = GI - TC$ (1)

78 Where,

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

82 **Total cost (TC)** is the sum of total variable costs, **total** fixed/depreciation expenses and cost
83 of owner capital measured in naira (₦)

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

88 **Total fixed/Depreciation costs** include capital depreciation and boar depreciation. Capital
89 depreciation was computed as annualized capital by dividing the total value of capital by the
90 estimated total life span in years. The economic life span of swine houses was assumed to
91 be 10 years and the life of other equipment was estimated (based on farmers' responses) at
92 5 years. Boar depreciation was computed as purchase value minus cull value divided by the
93 breeding life of a boar (assumed to be 2 years).

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

96
$$ROI = \frac{\text{gross cash income}}{\text{total cost}} \dots\dots\dots(2)$$

97
$$PM (\%) = \frac{\text{net farm income}}{\text{gross cash income}} * 100 \dots\dots\dots(3)$$

98
$$GR (\%) = \frac{\text{total cost}}{\text{gross cash income}} * 100 \dots\dots\dots(4)$$

99 **The 5- point likert rating scale** was used to determine the constraints with mean score of
100 3.0 and above considered as major constraints, while those with mean score of below 3.0
101 were considered minor constraints faced by farmers in the study area. This was achieved as
102 described by [8].

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

105
$$Y = f(X_1, X_2, \dots\dots\dots X_n) \dots\dots\dots(5)$$

106 It is specified explicitly with the estimated parameters as follows:

107
$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + e \dots\dots\dots(6)$$

108 Where,
 109 Y = aggregate value of pigs produced in naira
 110 β_0 = intercept of the function
 111 X_{1i} = production experience of the i th farmer
 112 X_{2i} = herd size (number of pigs) of the i th farmer
 113 X_{3i} = household size of the i th farmer
 114 X_{4i} = level of education of the i th farmer
 115 X_{5i} = age of the i th farmer
 116 $\beta_1 - \beta_5$ = coefficients of explanatory variables
 117 e = error term
 118 **t-test of significance** was used to test the second null hypothesis and is given by:

$$119 \quad t = \frac{X_1 - X_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \text{-----}(6)$$

120 Where:
 121
 122
 123 $\bar{X}_1$ = Average return for farmers naira
 124 $\bar{X}_2$ = Average cost for farmers in naira
 125 σ_1^2 = Variance for farmers' return
 126 σ_2^2 = Variance for farmers' cost
 127 n_1 = Sample size of farmers' return
 128 n_2 = Sample size of farmers' cost

129 3. RESULTS AND DISCUSSION

130 3.1 Socio-economic Characteristics of Swine Farmers

133 The socio-economic characteristics of the respondents are presented in table 1. The studies
 134 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

151

152 3.2 Profitability of Swine Farmers

153 The costs and returns structure (table 2) revealed that cost of feeds ranked highest (35%),
 154 followed by the purchase of piglets (25%) and labour (22%) respectively of the total cost of
 155 production. This result agrees with findings by (12 and13] that feed cost constitutes the
 156 highest cost of the total cost of producing edible pork. It has been reported to be occasioned
 157 by the highly exorbitant prices of grains [14]. The net farm income was obtained as ₦ 3,179
 158 per pig, while the rate of return on investment was 138% (1.38), meaning that for every
 159 ₦1.00 invested in swine production, ₦0.38k is gained by the farmer. However, this
 160 profitability level is less than that obtained by [14] and [15], who reported a return per naira
 161 invested of 1.64 and 1.82 in their respective studies. Difference could be attributed to study
 162 area or location differences alongside proximity of market to production areas.

163 **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= $F/A \times 100$	27
I. Gross ratio= $D/A \times 100$	73

164

165 3.3 Constraints Encountered by Swine Farmers

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

171 **Table 3: Constraints Encountered by Swine Producers**

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

172 *Major constraints

173

174 3.4 Hypotheses

175 The multiple regression analysis result (table 4) revealed the coefficient of multiple
 176 determination (R^2) obtained as 0.63. This implies that 63% of the variation in the output of
 177 swine farmers can be explained by the selected socio-economic variables. The F-value
 178 (18.98) obtained is also statistically significant ($P=.01$), implying that the overall model is fit.
 179 Of the variables included in the model, production experience, herd size, level of formal
 180 education and age were significant. Production experience, herd size and level of formal
 181 education had positive influence on the farmers output (meaning that a unit increase in each
 182 of these variables leads to an increase in output by a magnitude of the coefficient). Age, on
 183 the other hand had a negative influence on the farmers' output, implying that the older the
 184 farmer, the more experienced he/she is and the greater the output.

185 **Table 4: Estimated Regression Coefficients for Socio-economic Characteristics of**
 186 **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*		

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

188
 189 The result (table 5) obtained from the Z- test of significance (two tailed test) revealed a
 190 significant difference between the costs and returns of swine farmers. The calculated Z-
 191 value (3.16) was found to be greater than the table value (1.96 and 2.58) at 5% and
 192 1%probability level. Thus, the null hypothesis was rejected

193 **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

194 **4. CONCLUSION**

196
 197 It can be concluded that swine production in the study area is predominantly practiced by
 198 women of active age and is profitable as it is not the only farming activity practiced by the
 199 respondents. Socio economic characteristics of swine farmers have significant influence on
 200 their output. There is a significant difference between the costs and returns of swine farmers.
 201 High cost of piglets, high cost of feeds, outbreak of diseases and high piglet mortality rate
 202 are the major constraints faced by farmers. Hence, it is recommended that producers should
 203 be assisted with financial capital to be able to effectively rear pigs and also expand the scale
 204 of production.

205

AUTHORS' CONTRIBUTIONS

'Duniya, K.P.' designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. 'Akpoko, J. G. and 'Oyakhilomen, O.' managed the analyses of the study, 'Nandi, J. A.' managed the literature searches. All authors read and approved the final manuscript.

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