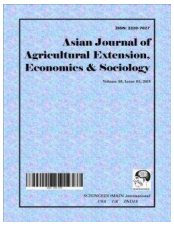

Asian Journal of Agricultural Extension, Economics & Sociology

29(1): 1-11, 2019; Article no.AJAEES.27980
ISSN: 2320-7027

Economics of Pig Production in Ezza North Local Government Area of Ebonyi State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author USI designed the study, wrote the protocol and supervised the work. Authors JPDC and MOO carried out all laboratories work and performed the statistical analysis. Author SOO managed the analyses of the study. Author USI wrote the first draft of the manuscript. Author JPDC managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2019/27980
Editor(s):
(1) Mohamed Taher Srairi, Department of Animal Production and Biotechnology, Hassan II Agronomy and Veterinary Medicine Institute, Morocco.
Reviewers:
(1) Rafael Julio Macedo Barragán, University of Colima, México.
(2) Adela Marcu, Banat´s University of Agricultural Sciences and Veterinary Medicine, Romania.
(3) A. M. Dlamini, University of Swaziland, Swaziland.
Complete Peer review History: http://www.sciencedomain.org/review-history/27888

Original Research Article

Received 28 June 2016
Accepted 01 November 2016
Published 20 December 2018

ABSTRACT

Economics of pig production in Ezza North Local Government Area of Ebonyi State, Nigeria was studied using sixty farmers randomly selected from three towns out of five that make up the study area. Percentage response, Net farm income and ordinary least square regression analyses were used to address the objectives of the study. The result showed that 78.3% of the respondents were male farmers, while the females accounted for 21.7%. The age bracket of 31-40 constituted the majority (36.7%) of the farmers in the study area. 76% of the sampled population were married and 15% were single. 80% of the respondents were educated, while 20% had no formal education. Majority of the pig farmers had flock size of less than 20 pigs. The farmers' socio-economic characteristic determinant factors to pig farmers' output were farming experience, rearing method,

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flock size and level of education of the farmers Result of cost and returns showed that pig production is a profitable venture in the study area. The findings further show that total variable cost constuted 86.3% of total cost of production, while fixed costs accounted only for 5.2%. The Net Farm Income (NFI) was ₦3421,190 with Gross margin of ₦350,330. The return to scale was 1.089, indicating increasing return to scale. The major constraints to pig production in the study area were lack of capital (25%), cost of feeding (13.3%), diseases (11.7%), lack of drugs (11.7%) and poor access to extension services (6.7%). The study recommended on the need to increase farmers' access to drugs, education and credit facilities.

Keywords: Economics; pig; production; Ezza North; local government area; Ebonyi State; Nigeria.

1. INTRODUCTION

Malnutrition is insufficient, excessive or imbalanced consumption of nutrients. According to the Food and Agriculture Organization (FAO), the number of people globally who were malnourished stood at 923 million in 2007, an increase of over 80 million since the 1990-92 base period [1]. World Health Organization (WHO) reported that malnutrition is the gravest single threat to global public health and the most vulnerable are elderly people, socially isolated people, poor people, pregnant and nursing mothers and children of under 5 years [2]. As result of malnutrition, several different nutrition disorders may develop, depending on which nutrients are lacking or consumed in excess [3]. Malnutrition generally has a negative impact on individual's learning capacity and physical development with consequences of low productivity and economic development especially among adults [4]. Under-nutrition, particularly as it relates to low intake of protein of animal origin is a major health problem in rural areas of Sub-Saharan African and south East Asia [5,6]. The scarcity of animal protein origin in the menu of most poor resource people could be associated to its high cost, increase in the world population and inadequate animal protein sources such as cattle, sheep and goat [7,8]. Studies show that securing sustained improvement in this nutrition-related health especially among the vulnerable groups entails the utilization of short gestation, unconventional and monogastric animals of which pig is the most favoured according to studies [2,9].

Pig production and consumption are gradually gaining prominence among non Muslim households in the Sub- Saharan Africa as close substitute to the high cost conventional protein meat sources of cattle, sheep and goat. This could be because of its inherent features as outlined by Okoli [10] and Mroz [2] including high fertility (20-30 piglets from 2-3 litres per year), high profitability of the enterprise and high survival rate especially under scarcity of inputs. Other potentials are good convert of agro-industrial waste products to meat cheaply and more rapidly than any other domestic animal and high carcass dressing percentage compare to other livestock (pig has 70% compared to 52.5% for cattle and 50% for sheep and goat [11,9]. Furthermore, pork is tender and nutritive in terms of the content and contains high protein and B-vitamins than any other livestock [3].

In recent times, piggery industry is engrossed with low production and productivity especially among small holder farmers that constitute the bulky of the farmers in Sub Sahara Africa. The slow development of swine industry in many developing countries as observed by [7] and [2] could be ascribed to religious unacceptability and management problems in terms of disease outbreaks, feed efficiency, lack of skills and knowledge of pig management and high cost of feed stuffs. Other limitations are poor infrastructural facilities, fear of inadequate market for piggery products, poor genetic breeds and absence of pig product processing industry in Nigeria [12,13]. Furthermore, in most rural areas of the developing countries the predominant type of pigs kept is the local breeds, although some pure breeds or their crosses are found in commercial and government farms [4] as against the pure breeds of large White, Duroc, Berkshire, Yorkshire, Landrace, Hampshire, Poland, China and Tam worth pigs found in most parts of the world as opined by NRC [14]. The aforesaid scenarios have resulted in among others; limited supply and low intake of pig meat protein, hence threatening the millennium development goal of meeting the average of 0.5kg animal protein intake per day as recommended by Food and Agriculture Organization (FAO) among house-holds in developing countries [13]. It is in view to address these problems that the broad objective of this study is focused on as this will help to revolutionalize pig production in the country. To

fully explore the broad objective of the study, the following research questions were addressed:

(i) What were the farmers' socio-economic characteristics?
(ii) What were the elasticity of production and return to scale in pig production?.
(iii) Was pig production profitable in the study area?
(iv) What were the limiting factors to pig production?

Specifically, the objectives of this study are to describe the socio-economic characteristic of the pig farmers; determine the effects of the socio-economic characteristics on farmers' output; determine the elasticity of production and return to scale; estimate the costs and returns in pig production and identify the limiting factors to piggery business in the study area.

2. MATERIALS AND METHODS

The study was conducted in Ezza North Local Government Area (LGA) of Ebonyi State. Ezza North comprises of twenty one (21) villages and five (5) towns which includes; Nwachi, Afor Izzo, Umuezeokeha, Okpohi and Orizor. It is located between longitude 7°31 and 7°31E, and latitude 5°41 and 6°45N, and altitude 116 meters above sea level. The LGA covers an area of about 305 km^2 with population of about 145, 619 people (17). It is bounded in the North by Ebonyi Local Government Area and Ohaukwu Local Government Areas, in the East by Ezza South L G A and Abakiliki LG A, in the South by Ohaozara LGA and in West by Ishielu L GA. The area is endowed with minerals, and has tropical climate with annual rainfall of about 1800mm - 2000mm, mean temperature of about 28°C - 42°C and relative humidity of 65%. The main crops cultivated in the area are rice, yam and cassava, they also engaged in livestock production namely sheep, goat, pig and poultry. The people also engage in other economic activities such as hunting, tailoring, barbing, petty trading mechanics, saloon and civil services.

Multi-stage random sampling techniques were used to select town, village and respondents. First, three (3) towns out of five were randomly selected. Secondly, four (4) villages were randomly selected from each of the selected towns; this brings a total of twelve villages. Finally, five (5) pig farmers were randomly selected from each of the twelve (12) villages. This gave a total of sixty (60) farmers for detailed study.

Structured questionnaire and oral interviews were used to capture primary data on farmers' socio-economic characteristics, management practices, inputs and output and problems encountered by swine farmers. Furthermore, test book, journal and other periodicals were used to source out secondary information.

Objectives I and IV were analyzed using percentage response. Budgeting techniques and profitability ratio were used to capture objective III, while multiple regression analysis was used to address objective II. Multiple regression can be presented as

$$Y = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + - - - - Xn + e \quad (1)$$

Where;

X_1 =Age (yrs), X_2 =Gender(male =1, female=0) , X_3 =Rearing Experience (yrs), X_4 =Feed consumed (kg), X_5 =Cost of drugs (N), X_6 = Rearing methods (intensive =1, extensive =0), X_7 =No. of dependents (no), X_8 = Flock size (no), X_9 = Credit(access =1, otherwise =0), X_{10} =Water (access =1, otherwise =0), X_{11} = Educational level(yrs), X_{12} = Labour (access =1, otherwise =0)

e = error term

Four production functional forms such as linear, double log, semilog and exponential were tried and explicitly represented as

Linear function

$$Y = b_0 + b_1 x_1 b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + ei \quad (2)$$

Double log function (Cobb Douglas):

$$\ln(y) = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + ei \quad ..... \quad (3)$$

Semi double log function:

$$Y = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + ei \quad (4)$$

Exponential function:

$$\ln Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + ei \quad (5)$$

The choice of the best functional form was based on the magnitude of the R^2 value, the high

number of significant, size and signs of the regression coefficients as they conform to *a priori* expectation.

2.1 Theoretical Framework of Multiple Regression

The multiple regression studies involve the nature of the relationship between a dependent variable and two or more explanatory variables. The techniques produce estimators of the standard error of multiple regressions and coefficient of multiple determinations. In implicit form, the statement that a particular variable of interest (y_i) is associated with a set of the other variables (x_i) is given as:

$$y_i=f(x_{1,}x_{2,....,}x_k) \quad (6)$$

where y is the dependent variable, and x_i.. x_k is a set of k explanatory variables.

The coefficient of multiple determination measures the relative amount of variation in the dependent variable (y_i) explained by the regression relationship between y and the explanatory variables (x_i). The F-statistics tests the significance of the coefficients of the explanatory variables as a group. It tests the null hypothesis of no evidence of significant statistical regression relationship between y_i and the x_is against the alternative hypothesis of evidence of significant statistical relationship. The critical F-value has n and n-k-1 degrees of freedom, where n is the number of respondents and k is the number of explanatory variables.

The standard error of regression coefficients is the measure error about the regression coefficients. The z-statistics is used in testing the null hypothesis that the parameter estimates are statistically equal to zero against the alternative hypothesis the parameter estimates the statistically different from zero. If the computed z-value exceeds the critical value, we reject the null hypothesis and conclude that the parameter estimates differ significantly from zero.

The nature of the relationship between an outcome variable (y_i) and a set of explanatory variables (x_i) can be modeled using different function forms. The four commonly used algebraic (functional) forms are: linear, log-linear or semi-log, linear-log, and power or double-log. The first functional form is the linear function expressed as:

$$y_i=b_o+ b_ix_1 +b_2 + \ldots+B_kx_k+e_1 \quad (7)$$

where the b_is are the parameters to be estimated and e_i is the stochastic error term. The elasticity estimates of the linear function are given as b_ix_i/y_o where $x_i$and y_i are mean values of x_i and y_i . the second functional form is the log-linear or semi-log function expressed as:

$$y_i= \exp(b_o+ b_ix_1 + \ldots+b_kx_k+e_1 \quad (8)$$

by taking the logarithm of both sides the function of expression (3) can be linearised as followings:

$$\ln y_i= b_o+ b_1x_1 + b_2x_2 +\ldots+b_kx_k+e_{1)} \quad (9)$$

Where e is the error term. The coefficient of elasticity given by b_kx_k

The third form is the linear-log function expressed as:

$$\exp(y_i)= \exp(b_o+e_1)[x_1^{b1} x_2^{b2}.....x_k^{bk}] \quad (10)$$

If linearized by taken the log of both sides, the above function will become:

$$Y_i = b_o + b_1 \ln x_1 + b_2 \ln x_2 + \ldots + b_k \ln x_k + e_i \quad (11)$$

The elasticity of the linear-log function is calculated as. $b_k/\bar{y}_i$. The fourth functional form is the power or double-log function expressed as:

$$Y_i = b_o x_1^{bi} x_2^{b2} \ldots. X_k^{bk} \exp(e_t) \quad (12)$$

By taking the log of both sides the power function of expression (7) can be linearized as follows:

$$\ln y_y = b_o + b_1 \ln x_1 + b_2 \ln x_2 + + b_k \ln x_k + e_t \quad (13)$$

The elasticity coefficient of the power function is defined as the beta-values of the explanatory variables, b_ks.

3. RESULTS AND DISCUSSION

Table 1 revealed that majority (36.67%) of the pig farmers fell within the age range of 31-40 years. This farming group is youthful, can withstand the rigors and stains in farming and described by Ajala et al. [4] to be motivational, innovative and adaptive individuals. This was followed by 41-50 years age range (36.7%) and the least (10%) was 51 and above years. Furthermore, 78.3% of the respondents were

male, while female constituted 21.7%, implying that men dominated pig business, since its' capital and labour intensive nature and can be better accomplished by male folk [10,6].

Also, married (76.7%) had the highest percentages of the respondents, followed by singles (15%), while divorced had the least percentage (1.7%). This shows that the married are more involved in farming activities than single ones. Married swine farmers are more likelihood of having family members that could serve as source of family labour in the piggery business in order to save money that would have been given to hired labourer for any other family expenditure [10]. More so, the preference of singles particularly youths to worse poorly salaried white collar job to farming could explain level of youths' detest for farming [15]. In addition, majority (91.7%) of the pig farmers had formal education but at various levels and only 8.3% had not .The high level of schooling reported in the study area was against the often reported illiteracy status of the farmers in developing countries. Nevertheless, the level of educational attainment of farmer would not only enlarge his farm productivity but also boost his capability to comprehend and appraise new production technologies [16].

Moreover, 93.3% of the sampled pig farmers had been in pig production 1-10 years, followed by those with rearing experience of 11-20 years, (5%) and the least (1.67%); 21 and above. This implied that the bulk of farmers in the study area were experienced in swine production. The number of years a farmer has spent in farming business according to Ume et al. [6] and Okoli [10] could give an indication of the practical knowledge he/she had acquired on how he/she can surmount certain intrinsic farm problems.

More so, poor extension outreach was reported by respondents as indicated by 81.7%, while only 18.3% had contact. The ill motivation of the change agent as well as the wide ratio of extension agent - farmers as frequently reported in studies in most developing countries could be accountable for poor contact with farmers [17]. Okoli [10] study on rural credit market and resource use in swine production efficiency in Imo State of Nig made similar findings.

As well, drug and vaccine problems were complained by pig farmers in the study area and represented by 11.7% of the total respondents. One of the major problems of vaccine use in most developing countries is that most vaccines in use are imported and hence are less efficacies in action as their environments of production differ significantly from place of use. Also, there is problem of substandard drug in many markets in Africa particularly African countries that lack efficient drug regulatory and auditing agencies. Besides, the asymmetrical power supply as witnessed in most developing countries makes nonsense of keeping vaccines in cold chain before use in order to retain its efficacy [11].

Table 1 revealed also that majority (46.7%) of the farmers had household size of 6-10 people, while the least (6.7%); 16-20. Larger household size is a proxy to labour supply in pig production [10]. Moreso, majority (68.3%) of the pig farmers studied had flock size ranging from less than 20 pigs, while the least (5%) had flock size ranging from 42 and above. This result conforms to a prior knowledge that farmers in most developing countries are small scale in their pig rearing operation [14,18]. Nevertheless, the small flock size could be linked to poverty as pig rearing is highly capital intensive and most farmers in this farming class can hardly afford if they attempt to expand their production scope.

Majority (81.7%) of the sampled pig farmers reared their pigs under intensive system, followed by those that raised their pigs under semi intensive system (13.3%) while the least (5%) reared under extensive system of management. Studies showed that rearing method plays a significant role in swine production as good and efficient housing makes management easier and helped the farmer to successfully rear up to 85% or more at the shortest possible time [3].

The Table 1 moreover, revealed that all the sampled pig farmers in the study area used water in pig production. Studies revealed that water is the single largest constituent of the body make up of a young pig (82%) and market hog body weight (55%) [3,19]. Nevertheless, [19] reported that high concentration of water (86-98%) in the pig manure could increase the cost of storage and disposal. Majority (75%) of the pig farmers had no access to credit facility, while 25% had access. The high interest rate often associated with commercial bank loans, lots of bureaucracy involved in procuring loan and as well as short term repayment could be invoked to explain the poor access to credit facility by most farmers, pig farmers inclusive [10].

Table 1. Distribution of respondents according to socio-economic characteristics

Variables	Frequency	Percentage
Age range		
21 – 30	15	25.00
31 – 40	22	36.67
41 – 50	17	28.33
51 and above	6	10.00
Gender		
Male	47	78.33
Female	13	21.67
Marital status		
Single	9	15.00
Married	46	76.67
Divorced	1	1.67
Widowed	4	6.67
Education level		
No Formal Education	5	8.33
Primary Education	7	11.67
Secondary Education	27	45.00
Tertiary Education	21	35.00
Farming experience (Yrs)		
1-10	56	93.33
11-20	3	5.00
21 and above	1	1.67
Respondents		
Yes	11	18.33
No	49	81.67
Respondents		
Yes	60	100
No	-	-
Household size (No)		
1-5	18	30.00
6-10	28	46.67
11-15	10	16.67
16-20	4	6.67
Farm size (ha)		
Less than 20	41	68.33
20 – 30	10	16.67
31 – 41	6	10.00
42 and above	3	5.00
Rearing method		
Intensive system	49	81.67
Semi-intensive	8	13.33
Extensive system	3	5.00
Respondents		
Yes	60	100
No	-	-
Respondents		
Yes	15	25.00
No	45	75.00
Labour source		
Family	29	48.33
Hire	20	33.33
Communal labour	4	6.67
Family labour hire	7	11.67

Source: Field Survey, (2015)

Based on the statistical and econometric criteria, Cobb Douglas production function was chosen as lead equation. The coefficient of determination (R^2) was 0.779, implying that 77.9% of the variation in the output of the pig farmers were accounted by various inputs included in the model, while the remaining 22.1% were due to error term. The statistical test of the coefficient of age was negative and significant at 10% probability level. This is in line with the finding of [16], who reported that manual labor and risk bearing ability decline with age. As expected, the coefficient of gender was negative and significant at 5% of alpha level. The very low participation of women in swine production is because of its labour intensiveness and could attest to the negative of the variable. In line to a priori expectation, the coefficient of farming experience had direct relationship with farmers' output and significant at 1% of alpha level. The aftermath of the farming experience as noted by Nwaru [20] is to optimize the farmers' capacity to maximize their output and profit at minimum cost. This can be achieved through efficient use of resources at their disposition.

The number of years spent in pig farming business by the farmers in line with *apriori* expectation was positive and significant at 5% probability level. Mroz 27] remarked that experience enables farmers to set realistic goals. As expected the coefficient of rearing method was positive and significant at 1% of alpha level. Studies show that pigs reared under intensive system perform better than pigs managed under free range system as all critical management practices such as proper feeding and watering, deworming, good sanitations, proper vaccines and drug administration for adequate growth pig is ensured [21].

As expected, the coefficient of flock size was positive and significant at 1% of alpha level, in agreement with *a priori* expectation that the more the flock size, the more the likelihood of increase in farmers' income. Ewuziem et al. [13] was of the view that flock size plays a significant role in farm success, since it reflects especially among small holder farmers in tropical and humid regions the availability of capital, access to credit and even good managerial ability. The coefficient of water is positive and significant at 1% of alpha level in agreement with a priori expectation that water is the single largest constituent of the body, making up to 82% of a young pig and 55% of market hog body weight [5]. This is in contrary with [19] who reported that high concentration of water in the

Table 2. Multiple regression result

Variables	Cob douglas	Exponential	Linear	Semi log
Constant	597.589	4.587	0.246	616.072
	(11.496)***	(16.882)***	(2.393)**	(1.957)*
Age	-2.181	-0.561	-0.268	-54.513
	(-4.336)***	(-4.502)***	(-1.971)*	(-1.496)
Gender	-14.143	-4.714	-0.021	-0.569
	(-0.887)	(-1.128)	(-0.156)**	(-0.022)
Experience	6.593	0.049	0.008	25.082
	(6.346)***	(3.268)***	(3.304)***	(2.082)**
Feed consumed	-0.41	0.133	-0.121	-0.157
	(-0.291)	(2.145)**	(-2.821)*	-3.007)***
Cost of drugs	1.051	0.020	0.006	-9.507
	(2.098)**	(2.502)***	(-1.338)*	(-3.276)**
Rearing method	10.410	0.212	0.025	3.200
	(5.078)***	(3.359)***	(5.063)***	(3.624)***
No. of dependents	0.001	8.239	0.146	20.211
	(0.002)	(1.095)	(0.951)	(0.698)
Farm/flock size	0.043	-0.094	0.377	67.428
	(3.106)***	(-1.128)	(2.731)***	(2.588)***
Credit	-9.019	-0.005	0.051	13.801
	(-2.030)**	(-0.225)	(-2.637)***	(4.286)***
Water	3.052	0.048	0.027	68.428
	(2.097)*	(-2.503)**	(5.067)**	(-1.078)*
Educational level	0.408	0.019	0.134	-0.225
	(3.238)***	(0.720)	(2.577)***	(-0.757)
Labour	6.002	0.115	0.005	712.073
	(-3.222)	(-2.232)	(5.603)***	(-0.480)*
R^2	0.841	0.801	0.779	0.830
F-value	15.891***	5.587***	5.121***	15.021***

Source: Field Survey, (2015)

, ** and * implies significance at 10%, 5% and 1% respectively*

pig manure (86-98%) increases the cost of storage and disposal.

The table also revealed that the coefficient of cost of drug/vaccine was negative and significant at 10% alpha level. This is in line with a priori expectation that the major problem in the use of these drugs is high cost, limited availability and apparent difficulty in getting these drugs to the farmers at the right time [11]. The estimated coefficient of credit was negative against *a priori* expectation and significant at 5% alpha level. The diversion of agricultural credit to nonfarm uses and ignorance of credit facilities by most of the farmers according to Pathraja and Oyedipe [15] could be correlated to the negative sign of the variable. However, credit accessibility aids farmers in adoption of farming innovations for higher output, capital formation and marketing efficiency [16]. The coefficient of labour was positively related to the dependent variable and significant at 1% risk level. This finding concurs with a priori expectation that the more labour inputs are injected into a production system, the higher the farmers' output. This is contrary to Ume et al. [6] who reported that diminishing return in production is often associated with excessive use of labour particularly family type in which many farmers in Sub Saharan African do not consider when computing their profits.

The elasticity of production as asserted by [21] is a concept that measures the degree of responsiveness of output to changes in inputs. The estimates for the parameters of stochastic frontier production are the direct elasticity of production for the various inputs given the Cobb Douglas specification of the model. The value of the return to scale of pig production in the study area as shown in Table 3 was 1.089. This figure is greater than unity, indicating increasing return to scale. Therefore, the pig farmers in the study area were said to be operating in stage 1 (irrational stage) of production, which implies that pig enterprise in the study area is not yet operating at optimum scale of production. To remedy this situation, there is need for farmers to inject more variable inputs into their pig

production in order to boost their production and productivity. This finding concurred with [4,3] who posited that the actual cases of increasing returns occurred relatively to low level of output that characterized small scale farming in the developing countries.

Table 3. Production elasticity and return to scale

Variables	Elasticity of production
Feed consumed	-0.041
Cost of drugs	1.052
Farm/flock size	0.043
Credit	-9.019
Water	3.052
Labour	6.002
Return to scale	1.089

Source; Field Survey; 2015

Table 4 showed that the average total cost of production incurred by the respondents was ₦101,810. The total cost comprises of the variable and fixed costs and from the table, the variable cost represents 86% of the total costs of production, while fixed costs accounted for 5.29%. Additionally, feed cost represents 50.5%, labour cost; 28.97%, while the cost of drugs, disinfectants and vaccines represent; 6.83%. The average gross revenue was ₦444, 000 per respondent. The average gross margin per respondent was ₦350, 330. The average Net farm income per respondent was ₦342, 190. Therefore, the average Net farm income per pig was ₦19, 010. 6. This indicated that pig production is a profitable venture.

The rate of return on investment in the study area was 54%. This means that for every ₦1.00 invested, 54K is gained in the business. Also, the opportunity cost of capital (interest rate) was 28% which is for every ₦1.00 saved in the bank, 28k is gained as interest. This showed that it is better to invest in pig production than to save in the bank. Benefit-cost ratio (B C R) shows that pig production is a profitable business since it is greater than 1. The same thing applied to gross margin ratio (G M R). The expense structure ratio (E S R) results also indicated that pig production has good financial strength. Conclusively, the various profitability ratio techniques employed indicates that the business is profitable. Thus, it is profitable to produce pig in the study area. [17,2] made similar findings.

Table 4. Gross margin analysis of pig production

		Mean revenue/cost per farm	Mean number of pigs per farm	Percentage contributions
A	**Returns**			
	Sales of pork	204,000	8	
	Sales of live pigs	240,000	10	
	Total	444,000	18	
B	**Variable cost**			
	Cost of feed	54,670	50.54	
	Cost of labour	28,720	28.97	
	Cost of drugs, disinfectants and vaccines	10,280	6.83	
	Total	93,670	86.34	
C	**Fixed cost**			
	Depreciation of building	5,320	3.25	
	Depreciation of equipment and machinery	2,820	2.04	
	Total	8,140	5.29	
D	**Grand total**			
	B + C	101,810	91.63	
E	**Gross margin**			
	A – B	350,330		
F	**Net farm income**			
	E – C	342,190		
	Rate of return of investment	54%		
	Opportunity cost of capital	28%		
	Benefit – cost ratio	1.53		
	Expense structure ratio	0.066		
	Gross margin ratio	2.87		

Source: Field Survey, (2015)

Table 5 revealed that 13.3% of the respondents reported that feed was difficult to procure because of its high cost. The high cost of feed could be associated with high cost of grains and other feed concentrates in which livestock in general are in competition with man. About 25% of the respondents had no access to credit facilities. Lack of financial assistance is a titanic problem hindering large scale production of pigs in the study area. Nevertheless, lack of collaterals, high interest rates, short-term repayment and ignorance of loan source are hindrances to farmers' access to credit [17].

Table 5. Problems encountered by the pig farmers in the study area

Constraints	Frequency	Percentage (%)
Feed and feeding	8	13.3
Lack of capital	15	25.0
Inadequate equipment	6	10.0
Lack of drugs	7	11.7
Veterinary posts	5	8.3
Diseases	7	11.7
Housing	3	5.0
Marketing of products	2	3.3
Lack of extension services	4	6.7
Poor breed	3	5.0
Total	**60**	**100**

Source: Field Survey, (2015)

Furthermore, 11.7% of the respondents complained of high cost, adulteration, limited availability of drugs at the right time. This finding concurs with [1,9] who reported that substandard drug is a bane to animal development industry in many developing countries of the world especially where drug import testing and auditing is very poor.

In addition, 6.7% of the respondents were faced with the problem of poor extension services. Extension services are needed to equip the pig farmers technically as well as to disseminate information to farmers on sources of inputs such as feed, improved piglets and drugs and vaccines [9]. However, [22] observed that the major problem of extension services in Sub-Sahara Africa is that year after year, extension workers who are hardly afforded in-service training and are rarely linked to research continue to disseminate the same messages repeatedly to the same audience. This situation has consequently arisen where the extension audiences have become technically redundant and obsolete.

Also, 8.3% of the sampled farmers encountered the problem of most of the veterinary posts are located in urban areas, hence limiting their access by most poor resourced pig farmers, who resort to use of Indigenous Known Technology (IKT), which are often less efficacy in treatment of their animal. The effect is annihilation of considerable number of the farmers' flocks [2,13]. In addition, 5% of the swine farmers complained of deplorable conditions of our rural and farm roads. These roads are impassable especially during rainy season, thus not only impairing greatly the evacuation of agricultural produce and inputs to rural and urban areas respectively but as well increasing cost of conveyance [6]. Problem of high cost of building materials to be used in constructing pig pen has resulted in many pig farmers using local materials such as bamboos to that effect. In consequence, pigs usually go unrestrained on households' economic things and his environment [4,3].

Finally, 11.7% of the respondents were faced with problem of disease such as mastitis, brucellosis, Africa swine fever, dysentery and coccidiosis with resultant effect chiefly high morality especially among piglets. MCkerrancher [7] reported that African swine fever is a major disease threat to pig production in the tropics as substantial numbers of pigs are decimated by this disease.

5. CONCLUSION AND RECOMMENDA-TIONS

Most of the respondents studied were above 30 years of age, predominantly, males and educated. The socio-economic characteristics that were positive and significant at varied levels of significant to the farmers output were farming experience, rearing methods, labour and farm size. The major constraints to pig production in the study area were: feeding, lack of capital, inadequate equipment, lack of drugs, diseases, veterinary posts, housing, marketing of products, lack of extension services and poor breed.

Based on the results, the following recommendations were proffered: to boost pig production in the study area:

(1) There is need for production incentive packages for the swine farmers at all production levels by the appropriate authority as these would help to encourage both old and new entrant farmers. Credits could be extended to them in form of purchase inputs

such as drugs and feed rather than in cash as this will encourage the use of the credit facilities or the intended purpose rather than for social satisfaction like marriage and burial ceremonies.

(2) There is need to ensure availability of standard and genuine drugs to the farmers at the right time. The veterinary personnel should be encouraged to establish veterinary posts in rural areas through provision of regular electricity to keep their vaccines in cold chain for optimal efficacy to be maintained.

(3) Pig farmers access to water by appropriate authority through sinking of boreholes, and pipe borne water.

(4) Ensure farmers access to credit through microfinance banks, commercial banks and other credit facilities at reduced interest rate, right time and affordable collateral,

(5) Extension services in the country should be boosted through employing qualified extension agents and these change agents should be adequately motivated in order to enhance their efficiency.

(6) National veterinary research institute(NVRI) at Vom should be adequately funded to ensure adequate availability of veterinary drugs and vaccines that are localized to our environment, instead of import of drugs and vaccines that are partially adaptive to our local condition.

(7) National livestock research institute (N L R I) should be mandated to develop improved piglets and distributed to all farmers at subsidized price. This will reduce the use of local breeds of pig by the farmers, whose production is not economical because of its poor growth.

(8) Government should help to subsidize pig equipments to ensure farmers access through giving waiver to their import duties.

(9) Price of building materials, such as cement, timber, zinc and others should be subsidized by government to enhance farmers' ease access.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/27888