A Comparative Analysis of The Profitability of Pig Farming: A Study in Three Selected Chiefdoms in Rural Muyamba District, Sierra Leone

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Research Article

Abstract

Purpose*: The main objective of this paper is to examine the profitability of pig farming in some selected chiefdoms in Muyamba District, Sierra Leone.*

Method*: Data were obtained through a self-administered questionnaire from 150 pig farmers using a stratified sampling technique. Analyses were done using the Benefit-Cost Ratio and ordinary least squares (OLS) estimation technique.*

Results: *The profitability analysis shows that pig farming is profitable in the three selected chiefdoms in Muyamba (Kori, Fakunya, and Kamajel), with an overall Benefit-Cost Ratio (BCR) of 2.73. This indicates that pig farming is profitable in the Muyamba District, as the BCR is greater than 1. The results also revealed that the Kori Chiefdom is the most profitable, followed by the Fakunya and Kamajel Chiefdoms. Meanwhile, age, gender, years of experience, and access to finance are the key determinants of profitability among pig farmers in Muamba District.*

Implication: *The study recommends that the government increase access to finance for pig farmers through grants and microfinance programs.*

Keywords: Profitability, Pig Farming, Benefit-Cost Ratio, Muyamba District, Sierra Leone

1. Introduction

Pig farming has significant room to grow and prosper, particularly in nations with limited resources. In many regions of Africa, it plays a significant role in helping rural residents maintain a sustainable standard of living. Pigs are among the most common domesticated animals and are quite efficient at turning kitchen scraps and other local sources into food (Emebet et al., 2017). In 2002, more than 62% of the world's pig inventory came from Asian countries, making them the largest producers. Nearly 15% of the world's inventory is made up of nations in the European Union, with North America second at over 10%. Pigs are mainly raised in regions with access to natural resources, such as water, cereal crops, and arable land (Hedegepath, 2018).

Pig farming requires low labor and feed inputs and can be easily combined with domestic work. Pigs have been described as among the most prolific and fast-growing livestock species, capable of converting food leftovers into valuable products (Vicente et al., 2011). Despite all of these, the reality is that most people venture into pig farming with the popular local notion that "pig farming is not for profit-making but just a means to save or keep money". Those who go in for-profit obey one of two schools of thought based on the system of pig farming: "by fattening" or "by breeding". However, whether the reason or method, costs are incurred at various levels, and revenue is generated at some point. Often, these pig farmers cannot say with

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certainty whether they are making a profit or a loss, since records of the farming activities are rarely kept. Also, there are many constraints in pig farming, such as poor feeding practices, breeding, diseases, finances, and market availability, that, if not properly managed, can affect the profitability of the pig farm (Yemmafouo, 2014).

According to the 2015 Population and Housing Census, the pig population in Sierra Leone is the lowest at 0.99%, followed by chickens (65.2%), goats (12.3%), sheep (8.7%), ducks (6.0%), and cattle (7.0%). They serve a variety of purposes by offering reasonably priced meat and generating revenue that can be applied to clothing, medicine, and school expenses. The West African dwarf pig is the sole breed domestically raised, whereas the commercial pig industry includes a variety of breeds (Conteh, A. M., & Gogra, A. B., 2020). In comparison to exotic pigs, they are typically smaller, have thicker skin, can survive with little to no input, reach sexual maturity earlier due to constant contact with boars, and are better adapted and more resistant to illnesses and environmental factors. The free-range approach is used to fully control them. Because the pigs have access to improved nourishment and more mobility, the system is favored (Haldar et al., 2018).

In several settlements in Sierra Leone, pigs are allowed to scavenge during the day and return late at night because local feedstuffs are readily available. Depending on the availability of shelter and the owners' attitudes, the pigs may be contained or unconfined. Long hikes during feed scouting may increase energy loss and possibly lead to poor body condition, although pigs generally have a high feed conversion efficiency. Because they scavenge, they are susceptible to parasites and diseases that affect their ability to reproduce. There is no comprehensive record or statistics on the opportunities, challenges, and current state of pig farming in the nation due to inadequate research, the high percentage of illiteracy among indigenous pig farmers (IPF), and a lack of public interest in local pigs (Conteh, A. M., & Gogra, A. B., 2020). Studies by Haldar et al. (2017) and Emebet et al. (2017) have been conducted in some parts of Africa. On the contrary, there has been no independent study in Sierra Leone investigating the profitability and determinants of pig farming, especially in Muyamba District, one of the largest districts in Sierra Leone. This study, therefore, seeks to analyze the determinants of profitability of pig farmers and conduct a benefit-cost analysis of the pig farming activity to determine if it is a profitable venture in Muyamba and compare the profitability among the three selected chiefdoms in Muyamba district to determine which of the chiefdoms is more profitable in pig farming.

2. Literature Review

Estimation of economic returns plays a very important role in shaping farmers' decisions to adopt new technology and, consequently, their resource management decisions (Bamire et al., 2003). Empirical studies on the determinants of profitability and the benefit-cost analysis of pig farming differ across countries.

Muhindro et al. (2019) conducted a study showing that pig farming was indispensable to the tribal people of Manipur, India. The study tried to establish baseline information on the socio-personal and socio-economic status of small-scale tribal pig farmers in the state. Altogether, 400 tribal pig farmers rearing $\geq$ 2 pigs were randomly selected and interviewed from 4 blocks of Senapati district, Manipur. The study showed that the majority of tribal pig farmers (69.75%) belonged to the middle age groups (31-50 years). Most of the pig farmers were female (54%). The study also revealed that 72.25% of pig farmers belonged to medium-sized families (6–9), followed by 25.25% (small-sized families, up to 5) and only 2.50% (large-sized families, >9). The block-wise distribution of pig farmers by social participation showed that the majority (53.75%) in all four blocks had high social participation, followed by medium (33.25%) and low (13.00%). It was also observed that higher numbers of pig farmers rear 5-7 pigs (63.75%), followed by rearing above 7 pigs (19.75%) and rearing up to 4 pigs (16.50%). A greater number of pig farmers rearing more than 5 pigs reported making a profit. It is always important to understand the socio-economic status

of small-scale tribal pig farmers to inform interventions that enhance pig production and improve farmers' livelihoods and household food security.

Meanwhile, Marc et al. (2019) conducted a survey on African swine fever (ASF), erysipelas, and a range of other infectious and parasitic diseases that threatened the future of the pig industry in Cameroon's Western Highlands. Because biosecurity measures (BM) are known to reduce the risk of disease transmission, the goal of this study was to describe the pig farming management system and biosecurity practices on pig farms in Cameroon's Western Highlands. As a result, 97 farms were investigated using a questionnaire based on face-to-face interviews. Isolation, traffic control, and sanitation were the three components of biosecurity practices. According to the findings, the majority of farms were large (73.22%), farrow-to-finish (59.79%), and primarily raised crossbred animals (72.75%). The most commonly used BM for 'isolation' was as follows: maintaining a minimum distance between farms (56.06%) and dispatching animals of the same age in the same room (97.16%); for 'traffic control,' the following measures were used: Specific tools and equipment (96.86%) were assigned to a specific piggery; in terms of 'sanitation,' daily cleaning (97.06%) and the use of disinfectants (89.13%) were mostly implemented. Fencing was one of the least-implemented measures for 'isolation' (11.83%). Biosecurity was low, intermediate, or high for 73.71 percent, 21.55 percent, and 4.73 percent of farms, respectively. Because of this low level, ASF and other diseases are likely to remain endemic. The following are the most important measures of concern and improvement: not feeding kitchen waste to pigs; keeping other livestock species away from pigs; fencing the pig barn; quarantining newly arrived animals; not exchanging boars; and not selling sick animals. Failing to consider these factors had a serious negative effect on the profitability of pig farmers in the Western highlands of Cameroon.

Another study by Joseline et al. (2018) assessed the socioeconomic and technical characteristics of pig production systems in the humid forest within Cameroon's monomodal rainfall agroecological zone. For this purpose, a total of 45 smallholder pig farmers were selected using a snowball test from the study zone and investigated. A structured questionnaire was used to interview the pig farmers. Data generated included: socio-economic characteristics of the respondents, housing, breeding, feeding, health care, management practices, and challenges in pig production. The collected data were analyzed using descriptive statistics. The study revealed that most of the respondents (62.2%) were male, and 35.6% were between 40 and 69 years old. 82% of the pig farmers were married, and all (100%) were Christians. Regarding education, only 4.4% of the farmers had no formal education, while 55% had 10 years of experience in pig farming. The majority of the farmers (44.4%) jointly reared cross (exotic x local), local, and exotic pigs. 57.8% of farmers feed their pigs compounded feed containing kitchen and farm residues twice daily, morning and evening, in feeding troughs mostly made of plastic (37.8%). 84.44% of farmers housed their pigs to avoid destruction and diseases (64.44%). Piggeries were mostly made of wood (60.0%) and had concrete floors (57.8%). However, 22.2% of farmers practiced free-range production. The farmers mostly practiced free will (55.6%), and group mating and delivery occurred within the herd (62.2%). 77.8% of farmers experienced health problems, and 91.1% considered pig farming profitable. The main challenges faced by farmers were disease outbreaks and expensive feed costs (22.2%). Although pig production is profitable, there is no ready market. Nevertheless, pig production has a positive impact on the lives of rural dwellers.

Abiodun et al. (2017) examined the economics and determinants of pig production in Ogun State, Nigeria, using Obafemi Owode and Odeda Local Government Areas, where the enterprise is most prominent. The data used for the study were obtained from 60 respondents. Pig farmers were sampled through the snowball sampling technique. The data collected were analyzed using descriptive statistics, budgetary analysis, and the Ordinary Least Squares regression model. The study found that the mean age of the respondents was 36.6 years, and they were predominantly male (81.7%). Most (68.3%) of the farmers had no access to credit, with half of them married. Regarding costs and returns, returns on investment were positively associated with herd size, breed, and the type of management system in the study area. When controlling for years of production experience and herd size, with every 1 naira increase in variable costs, the return on investment

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decreased by ₦0.879 ≈ $0.0044 (P < 0.01). Similarly, when controlling for herd size and variable costs, with every 1 year of increase in production experience, the return on investment increased by ₦1.85 ≈ $0.0092 (P < 0.01). When controlling for number of years of production experience and variable costs, with every 1 naira increase in cost of stock, the return on investment increased by ₦1,652.74 ≈ $8.22 (P < 0.05). Lastly, when controlling for years of production experience and variable costs, every additional pig in the herd resulted in a return on investment of ₦ 1,502.14 ($7.47; P < 0.01). Pig production experience, herd size, variable cost items, cost of stock, and access to credit significantly influenced pig production in the study area. The study therefore recommended subsidizing input costs, the need for extension officers or experts to educate less experienced farmers in pig production, and the provision of effective extension services targeted at raising the technical knowledge of pig farmers to improve productivity and profitability.
Munzhelele et al. (2016) conducted a study to evaluate the current government agricultural interventions in terms of technical and economic feasibility and to ascertain whether the small-scale pig value chain alleviates poverty in Mpumalanga. Data were obtained from 220 randomly selected small-holder pig farmers using a semi-structured questionnaire. The results showed that 58% farrowed ≤ 10 piglets/born/sow/litter, 44.2% practiced no weaning method, and many fed swill and leftovers alone (41.6%). The pair-wise association revealed that feeding commercial feeds was associated with pigs in relatively good to very good body condition. Pigs in poor body condition were positively correlated with the feeding of swill alone. The economic models for the 10-sow unit showed that pig farming is unprofitable when the current management and feeding systems used in the commercial industry are employed. However, only through a combination of cooperative systems, economies of scale, reduced preweaning mortality, and structured government inputs can pig production be profitable at this scale.
In Sierra Leone, little or no study has been done on the profitability of pig farming and its determinants in Muyamba district, the only study to the best of our knowledge is that of Abdulai Mahmood Conteh and Brima Gogra (2019) on the Indigenous pig farming in rural areas of Sierra Leone: Practices, constraints and impact on livelihood. This study examines the local pig farmer and their pig farming activity to evaluate the activity and determine whether it is profitable. The research adds a special touch by comparing pig farming activities in three selected chiefdoms in Sierra Leone.

3. **Methodology**

3.1 Area of the Study

Three chiefdoms in Moyamba District, in Sierra Leone's southwest region, were selected for this study. This district is the largest in the southern province, with 6,902 square kilometers. It shares borders with the Atlantic Ocean to the west, Bonthe District to the east and south, and the Tonkolili and Port Loko Districts to the north. Its 318,588 inhabitants are spread throughout 14 chiefdoms, with Moyamba serving as its capital (Sierra Leone, 2015). The dry season, from November to April, and the rainy season, from May to October, are the two seasons Moyamba District, like the rest of Sierra Leone, experiences. The predominant livelihood activity is mixed farming and agricultural production, and the socioeconomic features of the several districts are nearly identical. Moreover, raising livestock is another widespread practice. In certain villages, people engage in fishing and mining.
With the Mende accounting for 60% of the population, the district's ethnic makeup is essentially homogeneous; the remaining groups include Sherbro, Temne, and Loko. More than 92% of the district's population lives in rural areas. A family's average size is 5.7. According to the district's 2014 estimated population, 50% of the active workforce is between the ages of 15 and 64, and 45% of the population is under the age of 14 (18% of those under the age of five and 27% of those under the age of 15) (Statistics Sierra Leone, 2015).

3.2 Population, Sample Technique, and Size

The target population was farmers owning pig farms situated within Muyamba District (Kori, Fakunya, and Kamajel chiefdoms), as this enabled the researcher to obtain data from experienced field personnel during the research period. Given that no data on the total number of pig farmers in the study area are available, the few farmers whose contacts could be obtained in the selected areas of Muyamba District were contacted, and through them, other pig farmers were identified within their localities. Hence, the research adopted a snowball sampling technique after dividing the district into the various chiefdoms and selecting the three chiefdoms where most pig farms are located.

The identified pig farmers were contacted, and only those who agreed to participate in the research responded to the questionnaires. Also, given that the study aimed at doing a comparative profitability analysis of pig farming in the three selected chiefdoms (i.e., Kori, Fakunya, and Kamajel chiefdoms), the questionnaires were administered in such a way as to have equal numbers from all three chiefdoms, 50 pig farmers per selected chiefdom, making a total of 150 respondents. Hence, we also used purposive and snowball sampling to collect data from the farmers.

3.3 Estimation Technique and Model Specification

The socio-economic characteristics of respondents, production practices, and the experiences and constraints they faced were analyzed using descriptive statistics, while gross margin analysis was used to assess the costs and benefits of pig farming in Muyamba District. Linear regression analysis was used to establish relationships among variables and identify factors that explain differences in pig farming profitability among farmers in the district. We use ordinary least squares (OLS) regression analysis to estimate our model because it provides the best linear unbiased and efficient estimates (BLUE) and is easy to interpret, given that the dependent variable is continuous.

Model Specification:

The regression analysis model is described as follows:

$\text{Profit} = \beta_0 + \beta_1\text{Age} + \beta_2\text{YR} + \beta_3\text{HZ} + \beta_4\text{Edu} + \beta_5\text{HdZ} + \text{VC}\beta_6 + \beta_7\text{Cs} + \beta_8\text{ACr} + \mu$ Where:

Profit is the dependent variable = total profit in Leones

The independent variables, which are thus listed:

Age= Age of the farmers (in years)

YR= Years of production experience (in years)

HZ= Household size (Number)

Edu = Years of education (in years)

HdZ = Herd size (Number)

VC = Variable cost ((feed, labor, drugs and vaccines, and cost of transportation) (in SLE))

Cs = Cost of stock (in SLE)

ACr = Access to credit (if yes=1, otherwise, 0)

Also, the benefit-cost analysis was used to determine the profitability of pig farming in Muyamba as follows;

Total cost (TC) = Total Variable Cost (TVC) + Total Fixed Cost (TFC)

Total revenue (TR) = Output (Q) × per Unit price (P)

Profit /Net revenue = total revenue – total cost

Gross margin = Total revenue – total variable cost

Gross income/net profit = Gross margin (GM) – Total fixed cost (TFC)

Benefit = Total Revenue/Total Cost

The Benefit-Cost (BCR) Ratio was used to assess the profitability of pig farming. A BCR result greater than one is an indication of the financial profitability of the pig farm.

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4. Results and Discussions

4.1 Determination of Profitability of Pig Farming in Muyamba District.

Table 1 below shows the profit situation of pig farmers in the Muyamba District, including Kori (BIII), Fakunya (BII), and Kamajel (BI).

Table 1: Determination of Benefit/Cost Ratio for Muyamba District

	Revenue and Cost Situation (SLE)			
Description	**BIII Kori**	**BII Fakunya**	**BI Kamajel**	**Total**
Weaned piglets	26,550	4,544.57	19,701.79	50,797.04
Fattened piglets	15,664.48	7,531.01	17,532.17	40,727.67
Culled sows	9,972.09	129.84	0	10,101.93
Empty feed bags sold	618.27	1,122.89	128.81	1,869.97
Bags of manure sold	2,925.15	530.28	1,113.20	4,568.63
Total Returns (TR)	**55,730.66**	**13,858.60**	**38,475.97**	**108,065.24**
Cost of feed	11,009.18	2,601.57	3,841.33	17,452.08
Cost of Piglets/breeding stock	2,576.12	,934.49	4,458.00	9,968.62
Cost of labor	2,493.02	311.63	173.14	2,977.78
Cost of drugs/Vet. Services	664.80	457.05	443.20	1,565.06
Cost of clipping and castration	0	129.85	0	128.85
Cost of breeding/mating	872.57	415.50	467.44	1,755.50
Cost of transportation	527.69	286.69	394.73	1,209.12
Total Variable Cost (TVC)	**18,143.37**	**7,136.79**	**9,777.84**	**35,058.00**
Depreciation on buildings	1,506.73	254.55	561.77	2,323.05
Depreciation on equipment	70.38	144.22	111.83	326.22
Repairs and maintenance	1,196.65	277.09	344.52	1,818.26
Salary	0	0	0	2,083.33
Total Fixed Cost (TFC)	**2,773.76**	**675.89**	**1,018.12**	**4,467.76**
Profitability of Pig Farming				
Total Revenue (TR)	55,730.66	13,858.60	38,475.97	**108,065.24**
Total Cost (TC)	**20,917.14**	**7812.65**	**10,882.52**	**39,612.31**
Net Revenue (NR)	**34,813.52**	**6,045.95**	**27,593.45**	**68,452.93**
Gross Margin (GM)	**37,587.28**	**6,721.81**	**28,698.14**	**73,007.22**
Benefit Cost Ratio (BCR)	**2.66**	**1.77**	**3.54**	**2.73**

Source: Field Work 2025. Note: 1USD = 23.31 SLE

Looking at the table of costs and benefits incurred and derived from pig farming above by an average pig farmer in Muyamba District in the three selected chiefdoms, as presented in the table above, we observe that pig farming is profitable in the three localities of the Muyamba District, as findings record a positive

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net revenue in all three selected chiefdoms in Muyamba District. It is also seen that, though the three chiefdoms realize a positive net revenue, their profitability levels differ, with Kori chiefdom recording the highest profit of 37,587.28 SLE, Fakunya with 27,593.45 SLE, and Kamajel with the least net revenue of 6,721.81 SLE**.** Overall, pig farming is profitable in Muyamba district, with a benefit-cost ratio of 2.73, indicating that benefits exceed costs.

4.2 Determinants of profitability of pig farming in Muyamba District

Table 2: Regression Results

Variable label	*Parameter*	*Coefficients*	*P-value*
Intercept	β_0	-0.047655	0.008366
Age of the farmers(X_1)	β_1	0.022515*	0.013227
Years of experience(X_2)	β_2	0.049068*	0.036291
Household size(X_3)	β_3	0.063352**	0.013428
Years of education(X_4)	β_4	0.114211**	0.026412
Herd size(X_5)	β_5	0.138673*	0.019131
Variable cost(X_6)	β_6	-0.042116*	0.011521
Cost of stock(X_7)	β_7	0.013351**	0.002101
Access to credit(X_8)	β_8	0.024811**	0.004163
R^2		0.963357	
Adj R^2		0.886159	
F		0.001675	

Note: (*) and (**) are 5% and 1% levels of significance, respectively. Source: Field Work 2025.

From Table 2, a multiple regression analysis shows that the dependent variables explain 88.6159% of the variance in the independent variable, with an adjusted R-square of 0.886159. The F-significance of *0.001675*, which is well below 0.05, indicates that the variables are jointly significant.

The results revealed that the Age of the farmers is positively associated with revenue from pig farming, with a coefficient of 0.022515, indicating that an increase in the Age of the farmers will lead to a significant increase in revenue from pig farming. Years of production experience were positively associated with revenue from pig farming, with a coefficient of 0.049068, suggesting that greater experience is associated with higher revenue. Household size was positively associated with a coefficient of 0.063352, suggesting that an increase in household size is likely to lead to a significant increase in revenue from pig farming. Also, Years of education were positively associated with revenue from pig farming, with a coefficient of 0.114211, indicating that an increase in years of education will lead to a significant increase in revenue from pig farming. Herd size was positive with a coefficient value of *0.138673,* implying that an increase in Herd size will lead to a significant increase in revenue from pig farming.

Meanwhile, Variable cost was negative with a coefficient value of *-0.042116,* implying that an increase in Variable cost will lead to a significant decrease in revenue from pig farming, and Access to credit was positive with a coefficient value of *0.024811,* implying that an increase in Access to credit will lead to a significant increase in revenue from pig farming.

4.3 Discussion

The findings indicated that farmers' ages were positively associated, with a coefficient of 0.022515, suggesting that higher farmers' ages are associated with a notable increase in pig farming profits. These results diverge from those of Kouam M. K. et al. (2020) on the analysis of the profitability and efficiency of improved and local smallholder dairy production: a case of the Lilongwe milk shed area, which found that older farmers typically exhibit higher levels of profit inefficiency in local smallholder dairying. Kavoi

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et al. (2010) also found similar results in Kenya's marginal zones, using a stochastic frontier model to measure the economic efficiency of smallholder dairy cattle. Meanwhile, Production Experience is positive, meaning that a considerable increase in Years of Production Experience is likely to result in a higher revenue from pig farming. Similar findings were reported by Abiodun E. O. et al. (2017), who found that farmers' revenue was positively affected by the production experience coefficients (1.85), indicating that a one-unit increase in each of these factors increases returns by the coefficient amount.

Furthermore, herd size was positive, meaning that a larger herd will likely result in a 13.8673% increase in both output and income from pig farming. This finding is consistent with that of Duniya et al. (2013), who measured the profitability of pig production in the Kaduna State, Nigeria, local government areas of Zangon Kataf and Jema'a.

Above all, variable costs were negative, suggesting a large, likely decline in pig farming revenue due to higher variable costs. This outcome confirms the findings of Osondu et al. (2014), who found that farmers' income decreases as input prices rise. However, with a coefficient value of 0.024811, Access to Credit was positive, suggesting that a rise in this factor will result in a notable rise in pig farming revenue. Despite this result contradicting that of Osondu et al. (2014), institutional financing should be made accessible to smaller-holding farmers to increase their output and income. According to Jabbar and Akter (2008), expanding the enterprise will result from giving pig farmers more access to loans.

5. Conclusion

Pig farming is a profitable and encouraging business activity in these three selected chiefdoms in Muyamba District, though the profitability varies across the chiefdoms, with Kori chiefdom being the most profitable. Thus, Pig farmers should form strong associations that will carry their individual voices into a unified voice, channeling their financial, technical, marketing, and other needs to the right places so they can be heard and their concerns addressed promptly. An association of pig farmers can: hire veterinary services more easily than an individual farmer, lobby for funds to help members more easily than an individual farmer, and organize a marketing channel more conveniently and economically than an individual farmer.

6. Limitations and Directions for Further Study

This study was limited only to three chiefdoms in one district in Sierra Leone. It would be interesting if a similar study were carried out in at least 4 districts. It would also be a valuable contribution to the literature if a study were conducted on the effects of financial inclusion and pig farmers' empowerment on the productivity and profitability of pig farming.

Conflict of Interest: The authors declare no conflict of interest.

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