

## Evaluation of African Swine Fever and its Effects on Pig Farmer's Profitability in the Buea Municipality, South West Region of Cameroon

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### Abstract

Agricultural productivity should be a central term in the Africa's primary sector, the sector must be strong enough to create and foster both wealth and wellbeing, most particularly for its direct actors. In Cameroon, like in the rest of the continent, the agricultural sector remains a great contributor of economic growth and Livestock production plays a crucial role in it. Pig production is an integral part but its sustainability remains questionable as the sector faces several constraints such as low capital, poor technology, outdated farming methods, and most particularly the prevalence of a deadly diseases known as the African Swine Fever (ASF) affecting more than 80% of smallholder pig farmers in Cameroon. The present study evaluated the effects of the ASF disease on the profitability of pig farmers in Cameroon. The study used primary data obtained through a well-structured questionnaire from 60 pig farmers to evaluate its prevalence, the awareness and perception of pig farmers, the level of hygiene, sanitation and biosecurity measures that catalyze the spread of the disease, increasing mortality and cost thereby affecting profitability. The Multiple linear Regression was used to analyse factors contributing to profit lost. Results show that at significance level of 0.05, the incidence of ASF (0.017) reduces profit, while the application of sanitary, hygiene and biosecurity measures (0.001) and if pigs were previously vaccinated against Swine Erysipelas (0.007) increase profit. It is therefore recommended to intensify biosecurity measures to reduce occurrence, more veterinary campaigns should be held, and research should be intensified to increase availability of commercial vaccine against ASF.

**Keywords:** ASF Vaccines, Cameroon, Pig, Production, Profit Evaluation

### Résumé

La productivité agricole reste un terme central dans le secteur primaire Africain, le secteur doit être suffisamment étoffé pour créer et favoriser à la fois la richesse et le bien-être, plus particulièrement pour les acteurs directs. Au Cameroun, comme dans le reste du continent, le secteur agricole reste un grand contributeur de la croissance économique et la production animale y joue un rôle crucial. La production porcine en fait partie intégrante mais sa durabilité reste discutable car le secteur est confronté à plusieurs contraintes telles que le faible capital, des technologies inadaptées, les méthodes d'élevage obsolètes et plus particulièrement la prévalence d'une maladie mortelle connue sous le nom de Peste Porcine Africaine (PPA), pénalisant plus de 80% des petits éleveurs de porcs au Cameroun.

La présente étude évalue les effets de la maladie PPA sur la rentabilité des éleveurs de porcs au Cameroun. L'étude a utilisé des données primaires obtenues grâce à un questionnaire bien structuré auprès de 60 éleveurs de porcs pour évaluer la prévalence, la sensibilité et la perception des éleveurs de porcs, le niveau des mesures d'hygiène, d'assainissement et de biosécurité qui catalysent la propagation de la maladie, augmentant la mortalité et les coûts, affectant ainsi la rentabilité. La régression linéaire multiple a été utilisée pour analyser les facteurs contribuant à la perte de profit. Les résultats montrent qu'au niveau de signification de 0,05, l'incidence de la PPA (0,017) réduit le profit, tandis que l'application de mesures sanitaires, d'hygiène et de biosécurité (0,001) et si les porcs ont été préalablement vaccinés contre l'Erysipèle Porcin (0,007) augmentent le profit. Il est donc recommandé d'intensifier les mesures de biosécurité pour réduire l'incidence, de mener davantage de campagnes de sensibilisation vétérinaires et d'intensifier la recherche sur un vaccin commercial contre la PPA pour une prévention efficace.

**Mots-clés:** Cameroun, Coûts de production, Évaluation des bénéfices, Production porcine, Vaccins PPA

## Introduction

Agriculture is a cardinal sector in Africa's economies. Every day, it feeds hundreds of millions of its inhabitants and beyond. It ought to be a foundational pillar for sustained economic growth. Cameroon, the triangular Central Africa region's country, being a low-income country with a population of 28,156,350 (Ngu *et al.*, 2020), as of 2022 had about 24% of its population living below the international poverty line, heavily depending on the agricultural sector. This sector employs about 30% of the rural population with one third involved in livestock production and 23.3% involved in pig farming (Kouam *et al.*, 2021). Overall, the pig production of Africa in 2020, topped 44 million heads with Nigeria and South Africa leading the production. As of 2020, Cameroon produced 1,960,026 heads (FAOSTAT, 2020).

Pig production provides for several by-products including pork, sausages, smoked ham, bone collagen, cosmetic products, brushes, and many more. It is highly demanded for because of its high animal protein and remains the second most produced meat in the world behind poultry (FAOSTAT, 2020). In Cameroon, like in other parts of Africa, pig farming is largely a smallholder's activity with few commercial farmers. However, there are huge potentials of scaling-up as it represents a great contributor of youth and women entrepreneurship mostly in rural settings. Pig farming value-chain is full of opportunities for butchers, assemblers, transporters and brokers, middlemen and input suppliers (Ebanja *et al.*, 2021; Brown *et al.*, 2022). It usually enables poor rural families to constitute a saving/emergency/financial scheme with possibility of home consumption, income generation, and paying medical bills, school fees and debt funding (Amuko *et al.*, 2023).

Pigs are commonly used in cultural events and activities such as marriages, funerals, celebrations, and festivities. Cameroon national production barely satisfies demand and data about exports of pigs from Cameroon are quite limited. There are major price fluctuations depending on year periods; they increase during Christmas, new year, after ASF occurrence; they drastically decrease during the ASF outbreak, when the demand decreases and at the beginning of planting season. There exist some diseases which increases cost of production, raise mortality rates and decreases profitability of farmers and other actors of the value chain involved. Many diseases such as exudative dermatitis, coccidiosis, respiratory diseases, mastitis, porcine parvovirus, Swine Erysipelas and African Swine

Fever (ASF) greatly affect pig production. The ASF remains one of the deadliest pig diseases which can cause up to 100% losses; its invasion in a farm is very harmful and has been very recurrent in Cameroon settings and this has over the years, discouraged and driven out of business a good number of pig farmers. It is caused by the African Swine Fever Virus (ASFV), first diagnosed in Kenya in 1910 and was reported as a disease which causes 100% mortality in pigs once it invades the farm. It was later detected in South Africa, Malawi, and Angola and currently is present in about 32 African countries (FAO, 2019).

So far, according to Food and Agricultural Organization (FAO), no main cure for this disease has been discovered, and commercial vaccines are not yet available. The only means to control the disease involves use of sanitary measures, the intensification of veterinary campaign for sensitisation, the availability of information when there is outbreak and the killing of animals when a farm is infected. The ASFV was introduced in Cameroon in 1982 and it took just two months for the disease to spread through the major pig producing regions in Cameroon, killing about 60% of the country's pigs. Since then, the disease has been occurring, infecting, and killing many pigs. The last occurrence of this fatal disease was on 10 July, 2022 killing about 6,254 pigs. Routes of transmission of the virus can be through contact of infected and uninfected pigs via body fluids blood, urine, saliva, nasal fluids, and rectal fluids (Veterinary Records, 2021). About 70% of pig farmers are involved in the traditional system of production with local and hybrid breeds of pigs with minimal input. The country is endemic to the virus with huge economic losses. Generally, Capsid proteins are used in the genotyping of viruses since they appear to be variable in length, size genetic and constitution. Sequencing of the gene, coupled with Polymerase Chain Reaction (PCR), provides results within 48 hours.

Profitability refers to ability to generate earnings or income as compared to its expenses and other relevant costs incurred during a specific period. Factors affecting profit include: production units, production cost per unit, direct costs, value per unit and fixed costs. More pigs mean more profit but also higher risk in the case of ASF invasion. The production theory, the profitability theory, the productivity theory, the cost and return theory and the business interest theory are examined in the study.

Several studies have been carried out on the effect of ASF on pig farmer's profitability. Ralph (2021) analyzed consequences of ASF on rural economies and smallholder swine producers in Haiti. Results showed an expanding swine industry. Thomas and Najibullah (2020) assessed the scale of direct production costs associated with the ASF epidemic in the People's Republic of China and neighboring countries in which the disease had been confirmed by October 2019. A deterministic approach was used. They concluded that costs will likely rise as result of the disease's economic impacts. Ngu *et al.* (2020) carried out research on the epidemiology of ASF in piggeries in the Centre, South and Southwest Regions of Cameroon. An overall prevalence of 15.2% was obtained using the ELISA method and 23.8% using the RT-PCR. These results are similar to those of Kouam *et al.* (2022) which demonstrated the persistence of the virus and its circulation in the Southern part of Cameroon. There is therefore occurrence of ASF in the population of domestic pigs in Cameroon though at a lower prevalence compared to in other countries of the sub-region, such as the Democratic Republic of Congo. Ebanja *et al.* (2021) carried out analysis on ASF considering the prevalence and farm characteristics, in the Northwest, West, Littoral and Southwest Regions of Cameroon. The PCR results showed that the southwest region had the highest number of ASF carrier animals. Within the southwest region, the Miselleleh village had the highest rate of positive samples with 19 out of 48. The occurrence of the ASFV in Cameroon in 1982 caused massive losses.

Causes of the wild spread of this disease were attributed to factors like low levels of education, poor sanitation and hygiene, limited extension services, limited training courses on pig farming and poor coping strategies during outbreaks. The occurrence can lead to negative impacts such as loss of income, loss of jobs for all those involved in the pig/pork chain, declining investment prospects, price fluctuations leading to difficulties in determining price trends, poverty, and hardship due to decrease of profitability. The main objective of this study therefore was to evaluate the effects of ASF on pig farmer's profitability in the Buea Municipality. The research hypothesized that ASF does not significantly affect profitability of pig farming in the Buea Municipality.

## Materials and Methods

**The Study Area.** The present study was carried out in the Buea Municipality. Buea is the capital city of the South-west Region of Cameroon. The city is in Fako Division, on the eastern slopes of Mount Cameroon, and has a population of about 300,000 people. Both qualitative and quantitative techniques were used to analyze the data. Regression analyses were used along with the SPSS to determine the impact of ASF on pig farmer's profitability in terms of measurement of variables, for *Profitability* the correspondents expressed their experiences on their profit levels before, during and after the occurrence of ASF. *African Swine Fever*: was measured from farmer's perception/awareness and pig/pork price fluctuation. Other variables examined included *Level of Education* (number of school years), *Sanitation and Hygiene* (number of fence cleaning session per day, disinfect), *Extension Services* (number of visit per year), *training on pig farming* (number of capacity building session per year on animal farming), *coping strategies* (farm management methods used to prevent and minimize the disease damages) were the five variables associated with high incident and spread of ASF.

**The Empirical Model.** The model specification is:  $Y = \alpha + \sum (\beta_i X_i) + \epsilon_t$ .....(1)

It is simplified further as:  $Y = a + \beta_1 A + \beta_2 B + \epsilon$  .....(2)

Where  $a$  is not equal to zero, and  $\alpha$  = the intercept of equation, coefficients of ASF components. Components of ASF are: A = levels of education, B = Sanitation and hygiene, C= Extension service, D = Training on pig farming, E =Copping strategies,  $\epsilon_t$  = error term

**Data.** For primary data: a structured questionnaire was used to collect data about past and current prevalence of ASF in the study area bringing out information on farmers' awareness and perceptions regarding this disease and how prices fluctuate because of its occurrence. At the time of this study the exact population of pig farmers and pork dealers in Buea were not known. A sample of 60 pig farmers was interviewed using random sampling. These farmers were interviewed face to face using a questionnaire.

## Results and Discussion

**Descriptive Statistics.** Of the respondents, 68.3% of pig farmers were males with the majority aged 21-30 years old. This may be due to high demand for labour in pig production. Adults are also seen to be fully engaged in this activity due to its high need of experience and man power. About 38.3% were university graduates favoured by the presence of numerous tertiary education institutions, the State University (of Buea) and most particularly the existence of the Faculty of Agriculture and Veterinary Medicine (Animal Sciences) with training in pig farming. Almost 36.7% of respondents were married. Many farms were of medium size with more than 10 pigs.

Only 13.3% of pig farmers had worked for above 10 years and assumed they had high experience in pig farming, while 40% had worked in farms for between 6-10 years. Majority lacked better experience to handle and manage the disease leading to loss. Almost 95% could not clearly identify the symptoms of the ASFV. This leads to increased mortality and profit lost. About 80% of farmers had experienced the disease, 46.7% of the respondents had no idea about the transmission routes, 35% had some idea while only 15% could clearly identify the disease. Around 38.3% sold their pigs during disease outbreak, 16.7% killed the pigs, 25% kept the pigs, and 15% either sold, kept or killed depending on the situation at hand. The immediate response by farmers determined profit made from each option. Only 20% farms had more than 5 veterinary visits per year. Conventional preventive methods, used by 55% of respondent were: vaccination against swine Erysipelas and use of chemicals; non-conventional methods included the use of herbs, double fencing, sanitation and smoking the fence. The virulence of the disease was measured by how fast it took to wipe out the entire farm. The research found that 26.7% of farmers estimated less than two weeks to wipe out the entire herd. It was indicated that the spread of this disease was catalyzed by straying animals as 65% of respondents reported stray animals (fowls, rats, pigs from other farms, goats, etc.). Studies also revealed that consumption of semi cooked infested pork provides a high probability of contamination (Akber *et al.*, 2019; Adedeji *et al.*, 2022). About 58.3% of surveyed farmers consumed infected pork and almost 43.3% used foot baths for disinfection. Approximately 48.3% indicated that the disease did not discourage them from expanding the business.

**Inferential Results.** A multiple linear regression approach was used to model ASF incidence on profitability of pig farms in Buea. Profitability was measured in terms of amount of profits lost (in FCFA) as results of the outbreak. Results are shown in Table 1.

Table 1. Significant inferential results for the effect of ASF on profitability of pig farming

| Profit lost                         | Coef.      | Std. Err. | T     | P>t (0.05) |
|-------------------------------------|------------|-----------|-------|------------|
| Incidence of ASF                    | 19777.24   | 7763.03   | 2.55  | 0.017**    |
| Age                                 | 8455.31    | 5790.07   | 1.46  | 0.156      |
| Immediate Response to ASF           | 1649.65    | 2978.52   | 0.55  | 0.584      |
| Ability to Identify Symptoms        | 595.80     | 12507.10  | 0.05  | 0.962      |
| Availability of vet                 | 4688.10    | 11944.09  | -0.39 | 0.698      |
| Use of Swine Erysipelas Vaccine     | -3592.71   | 12323.12  | 2.92  | 0.007**    |
| Application of biosecurity Measures | -2898.16   | 7691.09   | 3.77  | 0.001**    |
| _cons                               | 9313.94    | 14081.70  | -0.66 | 0.514      |
| R-squared                           | 0.79 (79%) |           |       |            |
| Adj R-squared                       | 0.71 (71%) |           |       |            |

**Hypothesis Test (Interpretation of coefficients and p-values).** The coefficient of the constant term is positive (584.677), providing annual profits of 9313.94FCFA (US\$15.21) per pig. Results further show that education level of farmers, years of experience in pig farming, farm size, use of vaccines and application of biosecurity measures all have negative impacts on the profit lost. The use of swine Erysipelas vaccines and application of biosecurity measures are significant determinants with P-values of 0.007 and 0.001, respectively. We therefore reject the null hypothesis that there is no significant relationship between use of other (diseases) vaccines and application of

biosecurity and loss. In addition, incidence of ASF was positively related to loss. This implies that farmers that experience an ASF incidence also experienced a loss of 19777.24 FCFA (US\$ 32.30) per year, and per pig. The independent variables jointly explain more than 71.1%% changes in profit or loss with 28.9% accountable for by the stochastic error term.

## Conclusion

Pig production is gradually gaining attention of Buea inhabitants. However, some constraints such as lack of capital, limited skills and the prevalence of diseases such as the ASF have greatly slowed down the sector's rapid development. This study is relevant as it evaluates the prevalence of the disease thereby informing farmers on how to enhance prevention and mitigation strategies to reduce cost and mortality. The information helps farmers and policy makers to prepare before the disease occurs. The study recommends that farmers should attend more training sessions on pig farming, and more youths should be sent to agricultural schools to develop skills to enhance disease control. Moreover, decisions makers should conduct biological research and provide commercial vaccines against ASF, apart from intensifying veterinary campaigns.

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