

FINANCIAL LOSSES IN SOME FARMS DUE TO AFRICAN SWINE FEVER DISEASE IN SOUTH-EASTERN NIGERIA

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ABSTRACT

African Swine Fever (ASF) is a highly contagious viral disease that affects domestic and wild pigs, causing significant socio-economic losses in affected regions. In Nigeria, outbreaks have led to severe disruptions in pig production systems, especially among smallholder farmers who dominate the industry. This study assesses the economic impact of ASF in South-eastern, Nigeria, by evaluating direct losses such as pig mortality and culling, as well as indirect costs including market disruptions, job losses, and increased biosecurity expenses. The mean cost benefit ratio of 15 farms studied in this work that suffered ASF disease was 0.30, which implies that the farmers were running the farms at a loss, which indicates that, for every ₦1 invested, a farmer was losing 70 kobo, whereas the mean cost benefit ratio of 15 farms that did not suffer ASF disease was 1.53, implying that for every ₦1.00 invested in the business the farmer was gaining ₦0.53 in return, thus, the business was profitable. The study revealed that the economic impact of ASF in the study area, farm with ASF outbreak had production loss ₦142,402.10/pig. Control and prevention of ASF disease will reduce economic losses in pig production by helping farmers to realize substantial financial returns from high production cost inputs, which undoubtedly will contribute towards an increase in food production.

Keywords: African swine fever (ASF), financial losses, pig farming, disease outbreak, pig farms, South-East

INTRODUCTION

African Swine Fever (ASF) is a transboundary viral disease of pigs characterized by high mortality, lack of effective treatment and absence of vaccines making it one of the most formidable challenges to global swine production and profound economic consequences (Penrith *et al.*, 2013 and Costard *et al.*, 2013). The disease has emerged as one of the most devastating threats to pig production worldwide, especially in countries with weak veterinary infrastructure and informal livestock markets.

In Nigeria, pig farming represents a vital source of livelihood and income, particularly among smallholder and medium-scale producers. However, the emergence and recurrence of ASF outbreaks in various states of the country have led to mass culling, trade bans, and the collapse of pig value chains (Odemuyiwa *et al.*, 2007).

The economic implications of ASF are multifaceted. At the farm level, producers incur direct losses due to high mortality rates, compulsory culling of infected or at-risk herds and increased cost of disease control and enhanced biosecurity measures. Indirect impacts may include long-term production losses, reduced market access, price volatility and disruptions in the supply chain (Beltran-Akrudo *et al.*, 2017).

Some studies have focused on the pathology and virology of ASF, but relatively few have provided empirical data on its economic impact at the state level (Costard *et al.*, 2009). This study aims to bridge this knowledge gap by analysing the economic losses experienced by pig farmers in Nigeria. It also explores farmer coping strategies and evaluates existing control policies for their effectiveness.

The specific objective of the study was to determine the socio-economic impact of ASF in eastern Nigeria.

MATERIAL AND METHODS

STUDY AREA AND STUDY DESIGN

The study areas were in three States in South-eastern Nigeria, namely Abia, Imo and Enugu. Abia State lies at approximately latitude 5°29'N and 7°33'E, Imo State at 5°29'N and 7°20'E, and Enugu State at 6°27'10"N and 7°30'40"E of the equator (Adiele *et al.*, 2005).

Records for this study were obtained through on-farm data collection from pig farms in South-Eastern Nigeria. Information on production costs, pig mortality, culling, revenue, and biosecurity expenses was collected using structured questionnaires, farm records, and interviews with pig farmers. Additional data on ASF occurrence were obtained from farmers' reports and veterinary records.

Farms were categorized into those affected by ASF outbreaks and those not affected for comparative economic analysis. Farms were classified into ASF-affected (n = 15) and non-affected (n = 15) groups for comparative economic analysis.

REVENUE CALCULATIONS

The revenue calculations were made based on the following:
Inputs made by farmers that suffered ASF disease (Table I)
Outputs made by farmers that suffered ASF disease (Table I)
Inputs made by farmers without ASF disease (Table II)
Outputs made by farmers without ASF disease (Table II)

THE FINANCIAL OUTPUTS MADE BY 15 FARMS

The cost benefit analyses were calculated for farms that suffered ASF and for farms that did not suffer from ASF disease.

COST BENEFIT RATIO ANALYSIS OR RATE OF RETURN ON INVESTMENT (%)

Cost benefit ratio (CBR) or Rate of return on Investment (RRI) gives the basis for the profitability, that is, what will one naira invested into the business give (return on investment).

So, in order to conclude whether the enterprise is profitable or not, there is the need to compute the profitability index. Profitability index is the gross revenue divided by total costs. However, a ratio of 1 is normally an indicator that the venture is at break-even position. The following profitability measures were calculated:

Rate of returns on investment or cost benefit ratio (%)

$$\text{CBR} = \text{GM}/\text{TVC} \dots \dots \dots \text{(i)}$$

GM = Total Revenue (TR) - Total Variable Cost

$$(\text{TR} - \text{TV}) \dots \dots \dots \text{(ii)}$$

Where;

GM = Gross margin,

TVC = Total variable cost.

The ratio should be greater than 1 for the investment to be profitable.

DATA ANALYSIS

Data collected were entered into Excel spreadsheet for input and output computation to determine the financial losses due to ASF. Data computations were carried out to calculate individual farm input and output among the variables such as: farm size, mortality or number dead, and medication/labour cost.

RESULTS

Total input and output loss of 15 farms with ASF disease outbreak = ₦128,462,919.14 (Table I).

Total financial input of the 15 farms without ASF disease = ₦76,683,232.00 (Table II).

Total financial output of the 15 farms without ASF disease = ₦141,776,553.18 (Table II).

The mean cost benefit ratio of 15 farms that suffered ASF disease was 0.30, which implies that the farmers were running the farms at a loss, meaning that, for every ₦1 invested, a farmer was losing 70 kobo (Table IV), while the mean cost benefit ratio of 15 farms that did not suffer ASF disease was 1.53, implying that for every ₦1.00 invested in the business, the farmer was getting ₦0.53 in return, thus, the business was profitable (Table III).

TABLE I: ASF DISEASE INFECTED FARMS SHOWING INPUT COST AND OUTPUT LOSS

Farm	Flock size	No dead (%)	TOTAL VARIABLE COST (₦)			TOTAL REVENUE (₦)			Overall loss/pig (₦)
			Purchase price	Feeding	Medication	Manure	Pork sales	Total (input, output) (₦)	
1	100	94 (94.0)	2000000	1737820	18432.50	395280	525000	4676532.5	49750.35
2	50	35 (70.0)	1000000	861454.4	273536	703927.8	1312500	10489768.5	299708
3	120	110 (91.7)	2280000	1837866	256000	603900	875000	5852766	53206.96
4	80	60 (75)	1520000	489187.26	217560	162449.1	1750000	4139196.36	52319
5	40	35 (87.5)	1000000	4113160	68864	54900	2187500	7424424	212126.4
6	20	15 (75.0)	540000	711225	115200	281637	780000	2428062	161870.8
7	60	55 (91.67)	1620000	761454.4	273536	703927.8	1312500	4671.419	84935
8	150	100 (66.67)	3250000	1437866	256000	603900	5850000	11397766	113978
9	180	120 (66.67)	6700000	1737866	400000	503090	7020000	16360956	136341
10	200	180 (90.0)	7820000	1937866	600000	403000	7800000	18560000	103111
11	205	200 (97.6)	8240000	2037866	700000	700000	7995000	19672000	95961
12	10	5 (50.0)	370000	400000	54000	90390	390000	1304390	260872
13	115	100 (86.96)	2185000	6437866	512000	603900	4850000	14588766	145888
14	40	25 (62.50)	1000000	4113160	68864	54900	2187500	7424424	296977
15	80	60 (75.0)	1520000	489187.26	217560	162449.1	1750000	4139196.36	68987
Sum	1,450.0	1,199.00	41,045,000.00	29,103,844.32	4,031,552.50	6,027,650.80	46,585,000.00	128462919.14	2,136031.51
Mean	96.7	79.93	2,736,333.33	1,940,256.29	2,69,770.17	401,843.39	401,843.39	8,564194.61	142402.10
S.E.M	16.47	15.04	679061.06	440093.97	53003.81	64401.82	64401.82	1632947.72	22447.70

TABLE II: INPUT AND OUTPUT CALCULATION OF 15 FARMS WITHOUT ASF DISEASE OUTBREAK

Farm	Flock size	INPUT COST IN NAIRA (₦)			OUTPUT COST (₦)		
		Purchase price	Feeding	Medication	Total variable cost (₦)	Total revenue (₦)	Gross margin (₦)
1	100	1888600	3085000	176113	5149713	11249712.5	6100000
2	50	1988600	2156000	431216	4575816	8895816	5320000
3	120	2216000	2800000	413680	5429680	11329680	5900000
4	80	1976667	627250	55562	2659477	6120000	3460523.2
5	40	980000	4700754	50,000	5730754	8890754	6260000
6	20	450000	943340	100000	1493340	3278340	1785000
7	60	176727	830678	173536	1180941	6300941	5120000
8	150	2350000	2156799	170000	4676799	8626799	4950000
9	180	4400000	2356799	50000	6806799	12146799	7340000
10	200	6320000	1653184	518000	8491184	11271184	8780000
11	205	6539024	2400000	360000	9299024	19294024	10995000
12	10	370000	400000	54000	824000	2541799	1717799
13	115	190000	9606799	400000	10156799	13941799	10785000
14	40	1488600	6331056	330000	8149656	11709656	8560000
15	80	1300000	652250	107000	2059250	6179249.68	5120000
Sum	1,450.00	32,634,218.00	40,699,909.00	3,389,107.00	76,683,232.00	141,776,553.18	92,193,322.2
Mean	96.67	2,175,614.53	2,713,327.27	225,940.47	5,112,215.47	9,451,770.21	4,339,554.81
S.E.M	16.47	526,427.88	644,764.35	42,574.79	785,980.92	1,109,186.97	65,093,322.20

TABLE III: COST BENEFIT REVENUE OF 15 FARMS THAT DID NOT EXPERIENCE ASF OUTBREAK

Farm	Total variable cost (₦)	Total revenue (₦)	Gross margin (₦)	Cost benefit ratio
1	5149713	11249712.5	6100000	1.184532
2	4575816	9895816	5320000	1.162634
3	5429680	11329680	5900000	1.08662
4	2659477	6120000	3460523.2	1.301205
5	5730754	11990754	6260000	1.092352
6	1493340	3278340	1785000	1.195307
7	1180941	6300941	5120000	4.335526
8	4676799	9626799	4950000	1.058416
9	6806799	14146799	7340000	1.078334
10	8491184	17271184	8780000	1.034014
11	9299024	20294024	10995000	1.182382
12	824000	2541799	1717799	2.084708
13	10156799	20941799	10785000	1.06185
14	8149656	16709656	8560000	1.050351
15	2059250	7179249.68	5120000	2.486343
Total				1.530

TABLE IV: COST BENEFIT REVENUE OF 15 FARMS THAT EXPERIENCED ASF OUTBREAK

Farm	Total input (₦)	Total output (₦)	Profit from normal farm (₦)	Cost benefit ratio
1	3756253	920280	-2835973	-0.755
2	2134990	2016428	-118563	-0.05553
3	4373866	1478900	-2894966	-0.66188
4	2226747	1912449	-314298	-0.14115
5	5182024	2242400	-2939624	-0.56727
6	1366425	1061637	-304788	-0.22306
7	2654990	2016428	-638563	-0.24051
8	4943866	6453900	1510034	0.305436
9	8837866	7523090	-1314776	-0.14877
10	10357866	8203000	-2154866	-0.20804
11	10977866	8695000	-2282866	-0.20795
12	824000	480390	-343610	-0.417
13	9134866	5453900	-3680966	-0.40296
14	5182024	2242400	-2939624	-0.56727
15	2226747	1912449	-314298	-0.14115
Total				- 0.30

DISCUSSION

The mean cost benefit ratio of 15 farms studied in this work that suffered ASF disease was 0.30, which implies that the farmers were running the farms at a loss, which indicates that, for every ₦1 invested, a farmer was losing 70 kobo, whereas the mean cost benefit ratio of 15 farms that did not suffer ASF disease was 1.53 implying that for every ₦1.00 invested in the business, the farmer was getting ₦0.53 in return, thus, the business was profitable.

The result is also inconsistent with the findings published in the International Journal by Ibitoye *et al.* (2016), who reported the result on return on investment of 0.84, which implied that for every naira invested in pig enterprise, ₦0.80 was received as profit by the producers, which further confirmed the profitability of pig production in the area. The financial implication of this is that farmers that had ASF were running at a loss. The decision whether to keep or cull ASF- infected pigs was straightforward.

Farmers that obtained a loan to start pig production would be unable to pay the bank interest.

The impact of ASF on pig farming cannot be overstated. Not only does it lead to the loss of valuable livestock, but it also inflicts severe emotional and financial hardships on the farmers. The outbreaks of ASF deteriorate livelihoods of smallholder farmers and people that are involved in the pig industry. According to Carrquiry *et al.*, (2020) the worldwide annual losses due to ASF were in the range of \$15 billion and a little over \$50 billion in cumulative multi-year losses. The disease remains a major concern to the swine industry due to the unpredictability of outbreaks and the fact that there is no vaccine.

A number of socio-economic impacts were raised by the farmers. This data were quantified and it includes; loss of income as most of the farmers depends on the pig keeping and related activities. Also, unemployment, mental disturbance, and poor livelihoods were reported. Medical and education expenses couldn't be met as parents failed to pay school fees and medical bills.

Additionally, some farmers had loans from banks, due to ASF outbreaks, they failed to pay the loans that were taken to start businesses, and also failed to pay the farm labourers by most of the farmers. ASF is posing a threat to the country's economy and also to food security, especially animal protein.

CONCLUSION

Disease reporting and accurate record keeping quantifying the economic losses due to ASF in Nigeria is still a major challenge. Farmers with ASF affected flocks were running at a financial loss.

RECOMMENDATIONS

1. General proper record keeping (financial input, output) by pig farmers is very important.
2. Regular extension of pig farmers' enlightenment campaign on selected pig diseases like ASF be encouraged.
3. Proper control programme on ASF.

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