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INCIDENCE OF AFRICAN SWINE FEVER (ASF) DISEASE AND ITS ASSOCIATED IMPLICATIONS ON PIG PRODUCTION IN LAGOS STATE, NIGERIA

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Abstract

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Recent outbreak of African Swine Fever (ASF) disease of pig had threatened pig production in Nigeria in the midst of hitherto growing importance in urban and peri-urban pig farming. Using data collected from a survey of 247 pig farms selected by multi-stage sampling technique in Lagos State where the disease had been reported, this study revealed that the disease ravaged about 88% of the farms with mortality rate estimated as 79.2% of the initial stock size with animals killed across different age categories. Estimated monetary value of the loss was estimated as ₦485, 853.91. The incidence of the disease has resulted in total close down of about 83% of the pig farms who have not restocked their farm after the epidemic. The cultural practices of the farmers centered round sharing of labourers, implements and means of transportation for inputs and animals while foundation stock are sourced from neigbouring farms. All these were perceived as significant contributors to the spread of the disease in the area. There is thus the need for adequate sensitization of farmers on integrated methods for preventing the reoccurrence of the disease.

Key words: pig production, African swine fever, pig farmers, livestock disease, Nigeria

Introduction

Pig production has become increasingly important and, owing to the changing dietary patterns and growing demand for animal protein, subsistence Peri-urban production systems have turned to short-cycle species, namely poultry and pigs, to meet the increasing market demand (Adesehinwa et al., 2003a). This trend has given rise to many Peri-urban commercial pig-producing units, rearing improved and often pure exotic breeds. Recent outbreaks have caused significant losses and have threatened entire pig populations in some countries (EMPRESS 2002). In Nigeria, the inherent potential in pig farming has manifested

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in the rapid increase in number of pig farms witnessed recently (Adesehinwa et al., 2003b) until the reported menace of African Swine Fever (ASF) that ravaged pig farms and consequently resulted in loss of farmers' investments especially in some parts of Southwest Agro-ecological zone of Nigeria (Majiyagbe et al., 2004; Otesile et al., 2005; Olugasa and Ijagbone 2007).

The prevalence of the disease has been confirmed in 5 out of the six core states (Olusaga and Ijagbone, 2007) of Southwestern Nigeria. Considering this high level of virulence, the outbreak of the disease portends a great threat of serious economic importance wherever it is reported. In addition, the domination of the Nigerian agricultural sector by the crop subsector, and the livestock sub-sector by smallholder farmers, known with numerous inabilities, underscores the enormity of the impending challenges in allowing the disease to thrive for so long. Forestalling such, however, requires multi-dimensional approaches which is better based on thorough understanding of not only the ethno-veterinary environment surrounding the prevalence of the disease but also the identification of the socio-economic factors that could be held as contributory to the spread of the disease among local farmers. Such effort should also consider quantifying the economic loss attributable to the disease incidence among the local farms.

In this respect, this study targets examining the spread of the disease and identifying the contributing factors in addition to quantifying the purported economic loss suffered by pig farms in Lagos State where the disease was recently reported to be endemic.

Methodology

Data for this survey were generated from a farm survey of pig farms conducted in Lagos State. The survey involved a total of 300 pig farmers selected by multi-stage sampling technique. However, a total of 247 questionnaires, certified as containing enough information, were used for the analysis. The first stage involved the stratification of the State into the three existing Agricultural Development Program (ADP) zones (West, East and Far Eastern), while the second stage involves random selection of farmers from the list of pig farmers obtained from the Zonal ADP offices. Sample size for each ADP zone was determined by probability proportional to size given by:

$$S_{State} = \frac{P_i}{P_t}.N$$

Where: S_{zone} = Sample size for zone I; P_i = Population of pig farms in the zone

P_t = Total population of pig farms in the State; N = the predetermined total sample size for the Study (300)

Data for this study were collected through personal interview conducted with the aid of structured questionnaire designed to elicit information covering farm and farmer-specific demographic characteristics, sources of information on husbandry and diseases management practices of the farmers, incidence of ASF disease, stock size before and after the disease, number of animals lost to the disease and the cost implication etc. Data were analyzed using descriptive statistics like frequency distribution, mean and percentages.

Results and Discussion

Socio-economic Characteristics of Pig Farmers

Several studies (Enete, 2005; Olagunju and Adeyemo, 2007) have underscored the significant influence of farmer's socioeconomic characteristics impact on managerial capabilities of smallholder farmers in developing agriculture. The bulk of these studies emphasized the influence of attributes like age, sex, level of education, access to alternative income and basic infrastructures have on farmers' decision to adopt new innovations and consequently their managerial capabilities.

The distribution of pig farming population on the basis of both farm and farmer-specific attributes is shown on Table 1. The study revealed that pig farming in the study area is dominated by male farmers constituting about 62% of the population of pig farmers. Majority of the farmers, are married (73.3%) with

Table 1
Socio-economic characteristics of pig farmers

Characteristics	Number of Respondents	Percentage of Respondents
Sex		
Male	154	62.3
Female	93	37.7
Age (Years)		
20 – 29	7	2.8
30-39	39	15.8
40-49	81	32.8
50-59	68	27.5
60 and Above	52	21.1
Average	48.9	
Marital Status		
Single	66	26.7
Married	181	73.3
Educational Qualification		
None	10	4.1
Adult Education	13	5.3
Primary School	22	8.9
Secondary School	67	27.9
Post Secondary	135	54.7
Major Occupation		
Farming	190	76.9
Paid Employment	19	7.7
Artisan	7	2.8
Trading	11	4.5
Others	20	8.1
Alternative Source of Income		
Yes	210	85
No	37	15
Years in Livestock Production		
Less than 5 years	102	41.3
5-10 years	95	38.5
11-15 years	27	10.9
15-20 years	9	3.6
Above 20 Years	14	5.7
Years in Pig Farming		
Less than 5 years	132	53.4
5-10 years	71	28.7
11-15 years	29	11.7
15-20 years	7	2.8
Above 20 Years	8	3.2

Source: Computed from Field Survey, 2007.

formal education (90.7) notably post secondary education (54.7%). Farming is the major occupation of a larger percentage (76.9%) of the farmers although 85 percent diversified into other occupation for additional income. The dominance of male in pig farming has been attributed to the laborious nature of management operations in pig farming. In addition, the average age of the farmers is 48.9 years with majority of the farmers (78.9%) been within the productive age of 20-59 years thereby suggesting availability of physical strength and mental alertness required for vigor-demanding management practices. The high level of literacy is in turn expected to enhance the managerial capabilities of the farmers as strong correlation has been established between education and innovativeness among smallholder farmers.

Although, majority of the farmers had farming has their major occupation, portraying possible high premium been placed on pig farming in allocation of production resources, including time and entrepreneurship. The marked access to sources of alternative income can however be taking as a copping strategies for different form of risks considering the fact that livestock industries generally are risk prevalent notably from virulent diseases. Having spent less than five years in the industry, majority of the farmers are not only relatively new in pig farming (53.4%) but also in livestock farming (41.3%) generally. This category of farmers probably represents those who joined the enterprise in the wake of the recent increased importance of the enterprise in the livestock industry. While the large percentage of new entrants is reflective of possible dearth of experience as regards areas requiring technical skill endowment, it is rather an indication of flexibility in re-orientation into new productivity enhancing technologies or managerial practices as fresher minds are known to be more receptive to new innovations. This is also expected to be aided by high level of education among the pig farmers (Table 1).

Sources of Land Holding and Number of Farm Location

One of the age-long attributes of smallholder agriculture in Sub Sahara Africa is the dominance of communal land tenure and consequently land acquisition through inheritance. Under such systems, land are said to be highly fragmented and at most instances inimical to increased investment in expansion of holdings or land improvement technologies, especially in crop production. The distribution of pig farmers by sources of land holdings (Table 2) however shows that pig farmers acquire farm land commonly through outright purchase (59.2%), and to a lesser extent, by rentage (23.9%). However, about 9% and 10% obtained their farm land for pig production through inheritance and

Table 2
Sources of land holding and number of farm location

Method of Land Acquisition	No. of Farmers	Percentage
Inheritance	22	8.9
Rentage	25	57.1
Pledging	59	10.1
Purchase	141	57.1
No. of Farm Locations		
One	68	27.6
Two	81	32.8
Three	97	39.3
Seven	1	0.4

Source: Computed from Field Survey 2007.

pledging respectively. Also, majority of the farmers have pig farms in two (32.8%) or three (39.3%) locations. The number of farm locations is still minimal for effective management by the farmers.

Stock Composition and Sources of Foundation Stock

Breeding for resistance is an age-long technological advancement in livestock disease management. Stocking of resistant breeds has thus become a veritable recommendation for livestock farmers, especially for virulent (viral) diseases like ASF. However, breeding for resistance to ASF has been attempted by cross breeding domestic pig resistant species, but according to FAO (2005), it has been with limited success. Consequently, stocking of different breeds by farmers could not be taken as a direct measure by farmers to control the disease; rather, stock composition with respect to breed and age is an important yardstick in determining the access of farmers to information on breed variability with regards to productivity among the livestock farmers.

With an average stock size of 149 pigs, farmers in Lagos State stock predominantly Large White (33.0%) and Crosses (34.8%) on their farms. Other exotic breeds, including Duroc, Landrace and Hampshire constituted 13.5%, 12.5% and 6.2% of the average stock size respectively (Table 3). Also, adult animals constitute about 30% (boar 8.5%, sow 21.9%) while growers and kid constitute 46.1% and 39.38% of the total stock respectively. Invariably, younger stock constitutes the larger percentage of the stock size as at the time of the survey and this has the implication of reducing the possible value of losses due to ASF as opposed to keeping a lager percentage of the breeding and adult stock.

In addition to stocking the appropriate breeds that are considered resistant to certain diseases, stock procurement from reputable sources is another managerial practice targeted at disease control. In the live-

Table 3
Initial stock composition and source of stock

Stock Composition		
Stock	Mean	% of Total stock
Large White	49	33
Landrace	19	12.5
Hampshire	9	6.2
Duroc	20	13.5
Crosses	52	34.8
Total	149	100
Adult Boar	11	7.4
Adult Sow	28	18.8
Growers	49	32.9
Weaners	27	18.1
Piglet	34	22.8
Sources of Stock	Number of respondents	
Fellow Farmers	198	80.2
Research Institutes	2	0.8
ADPs		
Registered Private Farms	-	

Source: Computed from Field Survey, 2007

stock industry, it is often recommended that farmers should source breeding stock from farms certified by reputable agencies while farmers are often discouraged from getting stock from fellow farmers who might not have the necessary capabilities for disease management or proper documentation on the history of the stock of breeds.

Contrary to this famous recommendation, pig farmers in the study area procured their breeding stock from fellow farmers (80.2%) thereby appearing to be the most prominent and available sources of stocks. A marginal percentage (0.8%) of the farmers got their stock from Research Institutes while some other farmers got theirs from other sources like State Agricultural Development Programmes (ADPs) and Registered Farms (Table 3). This shows that farmers commonly recycle animals among each other and this is quite capable of allowing easy transfer of infectious diseases like ASF, especially among smallholder farmers. These farmers are known to be limited in capabilities for disease identification and management, as well as in the midst of close to absence of incentives for proper disclosure of incidence of virulent diseases to relevant disease surveillance agencies. The practice of sourcing foundation stock from fellow farmers has also been reported among pig farmers in Kaduna State (Ajala et al., 2007), where sourcing from pig markets and neighbouring farms formed the common practice.

Sources of Information on Pig Production and African swine fever Disease

The importance of effective and efficient research and extension system in agricultural development cannot be overemphasized. An efficient system guarantees effective linkage of farmers to extension information regarding management, service delivery, market and disease management. Early and accurate warning of new outbreaks of epidemic livestock diseases, and particularly the spread of such diseases to new areas, is an essential prerequisite for the effective containment and control of these diseases (EMPRESS 2002).

Pig farmers in the study area access information on production practices and disease management commonly through newspaper and personal contact with extension agents with a total rank score of 509 and 506 respectively (Table 4). Other sources of information in order of importance include agricultural shows (282), fellow farmers (259), radio broadcast

Table 4
Channels of information on pig production and incidence of ASF disease

Information Channels	Rank Score	Percentage of Maximum Score
Radio Broadcast	217	21.9
Television Broadcast	179	18.1
Extension Bulletin	179	18.1
Newspaper	509	51.5
Personal Contact with Extension Agent	506	51.2
Fellow Farmer	259	26.2
Research Institute	159	16
Agricultural Shows	282	28.5
Internet	177	17.9
Access to Warning Information on ASF Incidence		
Yes	63	28.5
No	158	71.5

Source: Computed from Field Survey, 2007

(217), television broadcast (179), Extension bulletin (179), internet (177) and research institute (177). This result has shown the impact of education on the farmers' ability to access information prominently through sources that requires ability to read and write (newspaper) but without undermining the importance of the traditional extension outlet through extension agents and fellow farmers. It was also evident from the study that farmers also made use of internet facility, thereby deriving benefits that information technology (ICT) could offer for agricultural development.

The result of the study also show that the pig farmers had poor access to warning information on incidence of ASF in the study area, with about 71% of the farmers alluding to non-availability of access to warning information on the disease. EMPRESS (2002) observed that due to weakness in early warning systems, outbreak of serious epidemic livestock disease in new areas eluded the attention of central veterinary authorities for several weeks or month, thereby allowing the diseases to spread unchecked. The consequences have been unnecessary production losses, as well as difficult and more expensive control and disease eradication measures or outright impossibility of both.

Incidence of ASF Disease in Pig Farms and Associated loses

The scope of spread of ASF disease, its virulence and associated economic losses are presented in Table 5. The study showed that ASF disease was recorded in about 88% of the pig farms, with about 90% of the stock size infected with the disease. Eventually, about 79% of the animals were lost to the disease with an

Table 5
Incidence of ASF disease and associated losses

Incidence of disease	Frequency of Respondents	Percent
Yes	213	88.4
No	28	11.6
Total	241	100
Age category	Stock size lost to ASF	Loss Value (N)
Boar	9 (81.8)	73.690.47
Sow	18 (64.3)	18.061.05
Grower	39 (79.6)	138.832.21
Weaner	20 (74.1)	53.199.67
Piglet	32 (94.1)	40.070.51
Total	118	485.853.91
	Mean	% of Stock Size
Total Stock Size	149	-
Number of Animal infected	134	89.9
Number of dead	118	79.2
Correlation Analysis		
Initial Stock size x size infected	0.998*	
Infected stock size x No. of dead animals	0.739*	

Figure in Parenthesis are percentages of initial stock size

* Significant at P≤0.01

Source: Computed from Field Survey, 2007

estimated average value of ₦485, 853.91. Gross mortality was highest among piglets (94.1%), followed by adult boar (81.8%), grower (79.6%), Weaners (74.1% and sow (64.3%). Babalobi et al. (2007) reported a gross mortality rate of 91%, with age group mortality ranging from 75.9% (growers), 83.1% (Weaners), 91.2% (finishers) and 99.8% (piglets) thereby underscoring the virulence of the disease across age groups. In addition, the correlation coefficient between initial size of stock and stock size infected (0.998) on one hand, the stock size infected and number of dead animals (0.739) on the other, are both significant at $P \leq 0.01$. The estimates also suggest a strong association between stock size and incidence/mortality due to the disease.

Although, the animals lost to the disease in terms

Table 6
Contributing factors to incidence of disease

Factor	Incidence of Disease	Chi-Square- Value	Significant P	Remark
Sex:				
Male	112 (45.3)	3.903	0.06	NS
Female	79 (32.0)			
Other sources of income				
Yes	61 (28.6)	3.33	0.068	NS
No	97 (45.4)			
Sharing of labourers				
Yes	174 (70.2)	23.182	0	S
No	18 (7.3)			
Sharing of implement				
Yes	178 (71.8)	23.825	0	S
No	14 (5.6)			
Visit of Farmers				
Yes	171 (69.0)	21.745	0	S
No	21 (8.5)			
Visit of customers				
Yes	10 (4.0)	25.216	0	S
No	182 (73.4)			
Contact with extension agent				
Yes	165 (68.5)	0.425	0.329	NS
No	21 (8.7)			
Transport of product together				
Yes	169 (68.1)	7.326	0.008	S
No	23 (9.3)			
Transport of input together				
Yes	169 (68.1)	26.912	0	S
No	23 (9.3)			

S = Significant. NS = Not Significant ($P \leq 0.05$)

Table 7
Preventive/control method adopted by farmers and effectiveness

	Effectiveness			Total
	Not Effective	Effective	Very Effective	
Antibiotic/ Drugs	114	1	3	118 (47.8%)
Disinfectant	138	17	6	161 (65.2)
Herbs	0	1	0	01 (0.4%)
Veterinary Attention	3	0	0	03 (1.2)
Sanitation	2	5	7	14 (5.7%)
Culling of infected animal	0	1	3	04 (1.6)
Restriction of visits	0	5	0	05 (2.0)
Prevention of farm gate slaughtering	0	0	1	1 (0.4)
Burying of dead animals	0	1	0	01 (0.4)

Source: Computed from Field Survey, 2007

of growers, weaners and piglets were individually more in numbers than sows, however, the gross monetary values of the losses were more for stocked sows (₦180,061.05) followed by growers (₦138,832.21) which were more in number than sows. The higher value is reflective of the high premium commanded by sows as breeding stock compared to growers and piglets.

Within the confines of a production and health management systems adopted by farmers, constant interaction occurs between livestock and the environment and this goes a long way in determining the potential for spread of infectious diseases. Also, some farmer specific attributes, especially those that have been established to have influence of managerial capabilities and operational efficiency of the farmers are also likely to have influence on potential for spread of infectious diseases among farms.

This study showed that farm specific attributes notably, sex, access to alternative income and contact with extension agent has no significant relationship with incidence of ASF disease among pig farms in the study area (Table 6). However, significant relationship exists between incidence of the disease and the various ways with which pig farms interact with the production environment, like, sharing of labourers, implements, means of transport for inputs and products, visits of fellow farmers and customers to the farms. Consequently, such factors could be held as contributory to the spread of the disease in the area.

It was also discovered that because of the small size and proximity of most of the pig farms to each other, the farmers do share the same set of labourers and consequently implements for specific operations. Rather than being on permanent appointment, the labourers work on part time basis and this affords them the opportunity of moving from one farm/shed to the other on daily basis thereby increasing the risk of spread of the disease, especially in areas where pig farms are highly concentrated. Although, restriction of frequent movement into farms has been a widely advocated health management guideline for ages, a case whereby farms share labourers, implements and means of transport for input and animals undoubtedly undermines the importance of such restriction even when enforced. Although, the use of disinfectants (62.5%) and antibiotics were the two prominent methods of disease prevention among the farmers (Table 7), a greater percentage of the farmers alluded to the ineffectiveness of the methods in ASF prevention. Other preventive methods adopted by the farmers include use of sanitation (5.7%), restriction of visits (2.0%), culling of infected animals (1.6%), veterinary consultation (1.2%), prevention of farm gate slaughtering (0.4%), burying of dead animals (0.4%) and use of local herbs (0.4%).

Conclusion

This study has shown the prevalence of ASF among 88% of pig farms in Lagos State and this has resulted in the loss of about 79% of the stocked population of animals with an estimated average revenue loss of ₦485, 000 per farm. Contributing factors were predominantly hygiene related, as majority of the farmers either share implements, labourers or transport products and inputs in the same vehicle especially in the absence of adequate access to warning information about the incidence or spread of the disease. Also, a situation whereby foundations stock were predominantly sourced from neighbouring farms made control of spread of the diseases difficult and there was also an evidence of dearth of certified source for foundation stock.

Apart from the loss of investment, about 83% of the farmers have not restocked after the attack of the disease, thereby implying possible loss of income to the labourers working on such farms, although majority of the farmers (85.0) have alternative source of income. The virulence of the disease was evident in the mortality rate recorded, while most preventive/ control methods applied by the farmers proved ineffective in curtailing the spread of the disease. There was thus the need for intensive sensitization on integrated approach for preventing the occurrence/ reoccurrrence and spread of disease among pig farms. Such, should include adequate surveillance and warning mechanism to alert farmers of the threat of infectious diseases before the spread gets out of hand.

Lack of adequate compensation for infected farms has been a major limiting factor on disease reporting among farmers. Creating avenue for such would no doubt go a long way to effectively involve the farmers in the surveillance program, especially, when they are assured of getting adequate compensation for animals lost to control mechanism when incidences are reported.

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