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STRATEGIES FOR IMPROVING THE PROFITABILITY OF PIG FARMS IN CROSS RIVER STATE, NIGERIA

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Abstract

The study ascertained strategies for improving the profitability of pig farms in Cross River State, Nigeria. One research question and one hypothesis guided the study. The study adopted survey research design. The population for the study was 744 participants made up of 456 and 288 registered pig farmers and agricultural extension officers respectively in the study area. The sample for the study comprised 260 participants made up of 150 registered pig farmers and 110 agricultural extension agents. The sample size for the registered farmers and extension agents was determined using the Taro Yamane formula. The random sampling technique was used to select the pig farmers and extension agents that participated in the study. The instrument for data collection was a structured questionnaire developed by the researcher. A structured questionnaire was the instrument used for data collection. To test for reliability of the structured questionnaire, the Cronbach Alpha method was employed to test the internal consistency of the instrument. The reliability test yielded coefficients of 0.80. It was found out that there was no significant difference in the mean responses of agricultural extension personnel and pig farmers on the strategies for improving the profitability of pig farms. Based on these findings, it is concluded that the profitability of pig farms could be improved through the adoption of strategies such as effective use of available resources, use of innovative technologies, implementation of relevant policies, joining relevant organizations, effective extension services, establishment of pig breeding centres, and creating marketing linkages, among others. It was recommended among others that the ministry of agriculture at the state and federal level, animal product based nongovernmental organizations, and other stakeholders should provide funds for farmers to implement the strategies identified to enhance improvement in pig farms in the study area.

Introduction

Farm animals have long played important roles in the nutrition and economy of mankind. One of such animals in Nigeria is pig. Pigs are domestic Swine, mammals of the Suidae family. According to Irekhore (2012), a pig is any of the animals in the Genus Sus, within the Suidae family of even toed ungulates. They are mammals with stocky bodies, small eyes, large ears, and

flat snouts (Carlson, 2020). The word pig, hog and swine are all generic terms used synonymously without regard to gender, size or breed. The domestic pig (*Sus scrofa domesticus)* or *S. domesticus* have coats that are coarse and bristly. They are snout-bodied, short-legged, omnivorous mammals, with thick skin usually sparely coated with short bristles. There are four hoofed toes on each foot, with the two larger central toes bearing most of the weight but the outer two also being used in soft ground. Pigs were domesticated approximately 5,000 to 7,000 years ago and have become very important as a source of high-quality protein, playing crucial roles in the socio-economic life and wellbeing of farmers.

Pig is one of the most widely consumed animals accounting for about 36% of meat production in Nigeria (Food and Agriculture Organization FAO, 2018). Pork can be eaten both freshly cooked and preserved While the pancreas is used in the production of insulin. Some materials that are produced using parts from a pig include antifreeze, fertilizers and adhesive, water fitter, insulation, rubber, certain plastics, floor waxes, crayons, and chalk adhesive (United State Department of Agriculture USDA, 2016). Similarly, pig manure is widely used as fertilizer, for crop production globally.

Fat from pig abdomen (lard) is used in shaving creams, soaps, make-up, baked goods, and other foods. The skin of a pig can be used to produce footballs and clothing items for human consumption. Pig production provides a veritable source of income for farmers and the national economy. Irekhore (2012) observed that pig production contributes about 10% of the total annual revenue derived from animal production. Compared to other livestock, pigs possess qualities which endear them to farmers.

The outstanding qualities which grant Pig production potential advantages over other livestock and make them suitable for profit-based business venture in Nigeria are numerous. The National Agricultural Advising Services NAAS (2021) identified these advantages to include high feed conversion efficiency, utilization of a wide variety of feed stuffs into valuable nutritious meat, high prolificacy, little investment on buildings and equipment; and quick returns since the marketable weight of fatteners can be achieved within a period of 5 – 8 months. NAAS (2021) pointed out that there is good demand from domestic as well as export market for pigs' products such as pork, bacon, ham, sausages, lard among others. To harness the benefits from pig production, farmers rear different types of pig breeds.

There are several types of pigs breeds popularly raised in Nigeria. Each type varies in appearance, size, and biological characteristics. According to Akinbobola (2021), the popular breeds include, large white (Yorkshire), landrace, Duroc and Poland China. The large white is white in colour with black pigments, possess moderately long head with slight dished face and a broad snout, with fine neck, long and evenly full to shoulders with deep and broad chest, and have long, level, wide back. According to Turner (2021), the large white is known for its good carcass quality, high prolificacy, and efficient feed conversion ability. The Landrace is medium to large and has outstanding abilities when it comes to raising large litters and farrowing ability (Turner, 2021). The Landrace is known for its smoothness and lean carcass, high prolificacy, sturdy nature and mature early.

The Duroc breed has an excellent weight gain rate, high feed conversion capacity early maturity, ability to farrow large litter and good mothering ability. The Poland China breed is black in colour with white patches on the face. It is prolific with excellent meat and good carcass quality, excellent feed conversion capacity, and early maturity (Brown, 2020). The large white (Yorkshire) breed is used in this study because of its starling qualities such as good carcass quality, high prolificacy, and efficient feed conversion, and its relative popularity among Nigerian livestock farmers. The pigs are reared using different enterprises.

Pig is fast replacing goat and sheep as major livestock reared at both subsistence and commercial levels after poultry in Cross River State, particularly Northern Cross River. Pig production is fast becoming a promising business venture in Cross River State. This is due to many associated advantages of the pig production industry in the area: favourable climatic environment, general acceptability of pig products, and ready market for the product and consumers' preference for pig meat, the prolific nature of pigs, fast feed conversion ability, and the growing demand for pork meat during major festivals such as Christmas and new yam celebrations have endeared pigs to farmers. Further, pigs tend to be more resistant to most of the disease pathogens associated with humid climate. The farmers in the area rear pigs utilizing a variety of production resources and market pigs at different stages of growth, with the aim of making some profit. However, farmers generally market their pigs at finisher phase when the pigs have attained a size adjudged by the farmer as mature. This phase could range from eight weeks to as much thirty weeks of rearing. In an interaction with the pig farmers in the study area, the researchers found that farmers sell the pigs at all age or stages of maturity, with some keeping the pigs in their farm for longer periods after maturity with the hope of selling at higher prices, not knowing the stage/phase that is more profitable in production, thus incurring more cost of production and loss instead of profit. The most suitable maturity stage to market the pigs for highest profitability is not known in the area.

Besides, a number of common constraints which have been identified in different regions of Nigeria include inadequate extension education, high cost of feed, diseases and parasite infestation, poor farm management, high cost of veterinary services, insufficient credit facilities and subsidies, and infant mortality and cannibalism (Uddin & Osasogi, 2016). Others include difficulty in securing institutional loans, cost of feed and feed ingredients, disease outbreak, and pilfering. Inadequate finance can restrict farmers from expanding their scale of production. Oguniyi and Omoteso (2014).and Bamiyi (2013) identified that the major constraint of the animal farm industry especially in developing countries like Nigeria is capital. These constraints vary depending on the geographical, climatic and policy environment under which the pig farmers operate, thus the need to investigate constraints specific to pig farmers in Cross River State and find out strategies for overcoming the constraints.

Statement of the Problem

Farmers venture into pig production with the aim of rearing piglets or mature pigs both for the market and supply of high-quality protein sources for the family. To achieve this, farmers adopt different pig production systems and enterprises, deploying different factors of production such as land, labour, capital, and management at varying levels of cost. Pig production enterprises

adopted include farrow to finisher enterprises, farrow to wean enterprises, pig breeding enterprises, and pig finisher enterprise. In each of these enterprises, the farmer can sell pigs at any phase, and still make some profit. In the pig finisher enterprises for instance, the farmers purchase the weaned piglets and raise them to table size before disposing them through marketing. The pigs attain table size from about ten weeks and continue to grow thereafter as they remain on the farm till the age of about 20 – 25 weeks after weaning.

Within the rearing period, the farmer can sell the pigs either as live pigs or pork with the view to generate income to cover cost of investment with profit. In Cross River State, pig farmers sell their pigs at almost any stages of production (grower stage to the finishing stage) all to make profit. However, it is not certain which phase yields the highest returns on investment. Most farmers believe that the longer the pigs stay in the farm after the initial maturity, the higher the weight gain and the higher the price when disposed. Similarly, the longer the pigs stay in the farm, the more the resources spent on feeds and other variable costs, thus increasing cost of production. For the pig farmer to make profit, the income from the sale of the pig and its products must be higher than the cost of rearing.

Unfortunately, farmers most often focus on the profit which is an absolute number and think less or are unaware of the profitability of the farm business which is a broader concept that assesses how effective a farm business generates profit relative to the resources invested; and indicate overall success and sustainability of the pig farm enterprises. Most farmers do not really know the best age or stage of maturity to market their pigs for highest profitability. Consequently, pig farmers most often incur greater cost of production relative to the profit when they eventually dispose the pigs. This situation reduces the pig farmers' income and earnings, increases the cost of production, raises the rate of poverty, threatens the survival of the farms, and pose a threat to national food security, thus the need to ascertain strategies for improving the profitability of pig farms in Cross River State, Nigeria.

Purpose of the Study

The purpose of the study was to ascertain strategies for improving the profitability of pig farms in Cross River State, Nigeria.

Research Questions

This study answered this research question:
What are the strategies for improving the profitability of pig farms in the study area?

Research Hypothesis

This null hypothesis guided the study:
There is no significant difference in the mean rating of the opinions of pig farmers and agricultural extension personnel on the strategies for improving the profitability of pig farms in Cross River State, Nigeria.

Review of related literature

Pig production is profitable and economically viable. Improving the profitability of pig farming business is imperative. Ezeibe (2010) recommended that the profitability of pig farms can be enhanced if feed cost is reduced through the process of substituting feed with locally available by-products like banana, maize residues, sugar cane residues, cassava, fish waste, over ripe fruits etc. Such diet may be supplemented with small quantities of protein concentrates. The author also recommended that there should be an enlightenment campaign to make people aware of the nutritional and economic advantage of eating pork., while better marketing channels should be utilized like local established supermarkets with facilities, transportation, and personnel for marketing pork. The formation of cooperative societies especially in the rural areas and inter State trading and reduction of the mortality rate for piglets using farrowing crates so as to minimize accidental death of the piglets could also enhance profitability.

Commenting on the management practices that can improve profit margins in pig production enterprise, Abrams (2020) argue that although swine producers have improved genetics and methods of production, the producers still have a product that must be marketed within a short time span. Therefore, pig producers have little control or influence on the price received for market pigs. Because producers cannot control the market price, the way to improve potential profit is to reduce production cost. Some suggestions to reduce production cost as suggested by researcher borders on record keeping, health of the stock, marketing, and feed cost. On record, the author noted that a good set of production records is necessary to determine the areas where production cost can be reduced. It is critical to improving profit margins that the least productive sows are culled. Reducing sow numbers according to Abrams (2020) can help reduce overcrowded facilities, eliminate sows that don't pay their own way, and reduce labor requirements so management efficiency may be improved.

Agola(2012) pointed out that disease prevention costs less than the treatment of disease problems. Vaccination programs should be kept in place unless your veterinarian recommends making a change. Marketing pigs at lighter weights will reduce overall feed consumption, improve feed conversion, and reduce overcrowding (Agola, 2020). Agola (2020) suggested that when pigs are sold, they should be sorted for market in uniform weights and quality. A set of scales can be beneficial to determine what pigs are ready for market. Taking time to weigh each pig may prevent dockage at the market due to lightweight pigs being on the load. On feed cost, Abrams (2020) observed that when feed cost is high and cash hog prices are low, the swine producer normally looks for feed products that will reduce dietary costs. The author cautioned that while there is merit in using by-products and purchasing lower cost grains, caution should be taken to ensure the diets will be consumed in an amount to meet the nutrient requirements of pigs. The first place to start in reducing feed costs is to make sure feed is not being wasted, feeder adjustment should be checked daily to ensure feed wastage doesn't occur, and care should also be taken not to restrict feed availability to the pigs.

On the place of reproductive efficiency in improving the profitability of pig farming, Davis (2020) and Abrams (2020), recommended that spending more time in the farrowing house with the sow and litter can often increase the number of pigs weaned per litter which will reduce

the amount of sow and boar feed charged to each pig. The authors pointed out that short term objectives to improve reproductive efficiency should concentrate on getting more production from the breeding herd currently in production. This includes improving conception and farrowing rate and weaning more pigs per sow per year. According to Charles (2019), profitable pig farming in Nigeria relies on a combination of interconnected aspects such as housing, breeding and reproduction, nutrition, disease prevention & control and management, which are incorporated into intensive system of pig keeping achieving a desirable and sustainable production. Charles (2019) opined that a blend of technical know how to make the right decisions at the right time, capital to provide improved building, feed and drugs, marketing viability to ensure that the animals have to be brought to the market when they have reached the desired weight and with optimum strategy for buying and selling of inputs (drugs, feed, farm facilities and equipment) and output (pork) with dependable sales outlet are key to sustainable income flow from pig farming. Charles (2019) added that more profit can be made in the following ways: ensuring improved housing to provide convenience to pigs to facilitate better growth; employing good breeding practice by avoiding in breeding and ensuring selection of best animals in the herd for breeding; provision of good and well balance feed to your stock to ensure availability of nutrients for fast growth; ensuring a good disease control measure, to reduce cost through reduced medication (drugs) and to facilitate the animal's utilization of nutrients for growth; and pushing to expand production, so as to enjoy more flexibility with economics of scale for production at lesser cost.

Duniya, Akpoko, Oyakhilomen and Nandi (2013) recommended that pig farmers should always endeavor to select and keep improved, exotic breeds of pigs such as Large White in their farms due to their high production performance. Duniya, Akpoko, Oyakhilomen and Nandi (2013) recommended the following to enhance the production and profitability of pig farms: better use of available resources, given the current state of technology and through policies that would encourage pig farming; pig farmers should belong to pig farmers' association around them so as to have access to relevant information about new technologies or practices and the accessibility of credit facilities; policies that would encourage in depth research by research institutions to proffer solutions to prevalent diseases in pig production; an effective extension service should be established to bridge the gap between pig farmers and the research institutions, and also to create awareness about improved technologies in pig production; the government should consider the possibility of establishing pig breeding center, pork processing units and creating market linkage which can motivate pig producers.

Though Pig production in the study area was profitable, but increase in the scale of production is advocated so that the high cost of feed will be distributed among large number of pigs which will cut down the cost; the farmers should learn how to formulate their feeds and utilize local feed stuffs; and the farmers whose efficiency level is very low, are expected to seek advice from the prospective ones on how to improve and attain greater level of efficiency in their production.

The adoption of new high-tech technology is recommended as another pertinent measure to increase efficiency and productivity in piggery industry. According to Boyns, (2012), the key

to enabling pig producers and other farmers to increase efficiency and production to meet the expected future growth in global demand for pig products is the adoption and the use the latest high-tech tools that are being developed by researchers in pig husbandry. Boyns (2012) noted that there is an urgent need to refocus on the benefits high-tech developments offer consumers, and farmers. Farmers should venture beyond the farm gate and collaborate more closely with the technology supply chain. AgriSales Incorporated (2021) noted that with these advances in technology, pig farming has huge potential in the 21st century to increase quality and efficiency.

AgriSales Incorporated (2021) enumerated some high-tech technologies to include:

i. Automated individual feedings - In automated individual feeding technology, pigs are fed the right amount of food at the right times, takes the animals' weight and factors it into the equation. It then monitors the weight over time, while managing the pigs in large pen. The result is optimal production performance.
ii. Temperature and environment control - There are specific temperatures required for farming pigs to grow happily and health. These advances in climate control also have systems that create mist while regulating temperatures. This creates a comfortable environment for all the pigs.
iii. Artificial intelligence and robot - This technology uses algorithms to create human-like decision making. These systems are equipped with facial recognition features to identify each individual pig. They then keep track of each pig's eating habits, water intake, movement, and more. Robots are another great help because they can do a lot of heavy work and labor without ever getting tired. Some robots help check the sows for heat, while others are made to ensure that the housing is always kept clean.
iv. Sensors placed on the pig - Sensors are booming in the pig industry. Farmers will now be able to keep track of their pigs' health in real-time, pigs' heat cycles, plus their food and water intake. Fix sensors will record the temperatures, dust levels, humidity levels in the pen.

According to Osborne (2019), modern pig farming technology has transformed pig farms across the country and around the world. The author stressed that the successful pig farm today is one where farmers use technology to their advantage. In doing so, farm operations are improved for both workers and animals. The result is an increase in production, efficiency, and profitability for the farm. Pig farmers adopting modern pig farming technologies provide the best possible environment for raising, feeding, housing, and caring for pigs throughout all stages of their lives (Osborne, 2019). The author maintained that introducing new pig farming technologies can improve the success of any pig farming operation. A technologically advanced pig farm is a productive and profitable pig farm. Osborne (2019) observed that financial rewards for incorporating pig farming technology not only increases the efficiency of pig production, but helps farmers manage their operation more effectively.

A related study on strategies for improving the profitability of pig farms was conducted by Ezeibe (2010). This study was carried out to analyze the production performance and profitability of pig farms in Enugu State. Eight research questions and five hypotheses were formulated based on the specific purpose of the study. Survey design was adopted for the study.

The study covered the registered pig farms in the study area. The population for the study was 519 respondents comprising 162 registered rural pig farmers, 135 registered urban pig farmers and 222 agricultural extension agents in Enugu State. The entire population was used as sample. The instrument for data collection was validated and its reliability determined. Data were collected using structured questionnaire supported with pig performance recording sheets, and available farm records. The data collected were analyzed using percentage and frequency count, mean and standard deviation were used to answer the research questions while Analysis of Variance (ANOVA), Duncan's test and t-test statistic were used in testing the hypotheses at 0.05 level of significance. It was found out that the most popular breed of pig in the study area was Large White. Other breeds of pig occasionally kept by farmers include Duroc Jersey, West African Dwarf pig, Land Race and Hampshire. It was also found out among others that that farmers adopted most of the pig production technologies except such technologies that require high level skills like castration, artificial insemination and telemarketing or video merchandising. The study revealed some productivity constraints and strategies for improving physical productivity and profitability of pig farms. They recommended among others that pig farmers should always endeavor to select and keep improved, exotic breeds of pigs such as Large White in their farms due to their high production performance and that stakeholders in pig production should join hands in reducing the productivity constraints of pig farms by providing human and material resources to increase productivity.

Methodology

The study adopted survey research design. The population for the study was 744 participants made up of 456 and 288 registered pig farmers and agricultural extension officers respectively in the study area. this population is most appropriate for the study because the pig farmers have been in the business and are used to the challenges that could influence the profitability of pig farms while the extension agents have worked closely with the farmers and have become conversant with their challenges. both are thus were assumed to have possess adequate experience to recommend strategies for improving the profitability of pig farms in Cross River State, Nigeria. The sample for the study comprised 260 participants made up of 150 registered pig farmers and 110 agricultural extension agents. The sample size for the registered farmers and extension agents was determined using the Taro Yamane formula. The random sampling technique was used to select the pig farmers and extension agents that participated in the study. The instrument for data collection was a structured questionnaire developed by the researcher. The instrument was rated on a four-point response option of Strongly agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with values of 4, 3, 2, and 1 respectively. The instrument was validated by three experts, one from the Department of Agricultural Education, Faculty of Vocational and Technical Education, and two from the Department of Animal Science, Faculty of Agriculture, University of Nigeria, Nsukka. The experts examined the instruments to ascertain the extent to which the instruments can contribute to achieving the objectives of the study. The experts offered suggestions that were used to improve the quality of the instruments towards meeting the objectives of the study. The research instrument had 38 items before validation but reduced to 35 after correcting the validated items.

To test for reliability of the structured questionnaire, the Cronbach Alpha method was employed to test the internal consistency of the instrument. To achieve this, the instrument was administered to 13 registered farmers and 12 agricultural extension agents in Ikom local government area of Cross River State which was not a part of the study but had similar agricultural practice with the Northern Cross River. Further, Ikom shares boundary with the study area and practice the same pattern of rearing pigs. The reliability test result yielded coefficients of 0.80. The structured questionnaire was administered through direct contact with the help of the research assistants. The instruments were retrieved immediately after completion by the respondents. The research assistants helped farmers who could not read and write to interpret the items and check the response options of their choice. All the 280 copies of the structured questionnaire administered were retrieved and used for analysis, giving a 100% rate of return. The data aimed at answering research questions were analyzed using Mean. The hypothesis was tested using t-test statistic To take decisions on the research questions, the real limit of numbers was used. Any item with a mean rating of 3.50 – 4.00 was taken as strongly agree, 2.50 – 3.49 was taken as agree, while mean rating between 1.50 – 2.49 was taken as disagree. Mean rating less than 1.50 was taken as strongly disagree. A null hypothesis was upheld when the calculated value of p is equal or greater than the 0.05 level of significance ($p \geq 0.05$) and rejected if otherwise.

Results and Discussion

Research Question: What are the strategies for improving the profitability of pig farms.

Table 1: Mean Analysis of the Strategies for Improving the Profitability of Pig Farms

***N_1* = 150; N_2 = 110**

S/N	Items	$\overline{X}_G$	SDG	Dec
1	Effective use of available resources	3.21	0.83	A
2	Use of innovative technologies in pig production and marketing	3.07	0.83	A
3	Implementation of relevant policies	2.89	0.95	A
4	Encourage pig farmers to join and take active part in relevant associations around them so as to have access to relevant information about new technologies	3.10	0.92	A
5	Establish an effective extension service to bridge the gap between pig farmers and research institutes	3.10	0.89	A
6	Establishment of pig breeding centres	3.06	0.81	A
7	Create marketing linkages which can motivate pig producers	2.98	0.93	A
8	Support innovative community-based pig production systems	3.14	0.86	A
9	Encourage other private sector investment in pig production	3.14	0.78	A
10	Train farmers on how to formulate feed utilizing local feed stuffs	3.09	1.69	A
11	Establish model farms for farmers to learn	3.07	0.91	A
12	Farmers with no efficiency level should be encouraged to seek advice from the prospective ones	3.08	0.88	A
13	Adopt new high-tech pig production technology	3.22	2.20	A

14	Create awareness about improved technologies in pig production among pig farmers	3.42	0.69	A
15	Provide incentives to pig farmers	3.01	0.96	A

Key: X_G = Grand Mean; SD_G = Grand Standard deviation; A = Agree

Table 1 presents he results of the mean rating and standard deviation analysis of the responses of pig farmers and agricultural extension personnel on the strategies for improving the profitability of pig farms. The results show that all the items had the mean ratings within the number limits of 2.50 and 3.49 which imply that effective use of available resources, use of innovative technologies, implementation of relevant policies, joining relevant organizations, effective extension services, establishment of pig breeding centres, creating marketing linkages, and innovative community-based pig production system are the strategies for improving profitability of pig farms. Other strategies identified include private sector investment, train farmers on how to formulate feed, establishment of model farms, seeking advice from prospective farmers, adopting new high-tech production technologies, awareness about new technologies and incentives to farmers.

Hypothesis: There is no significant difference in the mean ratings of the pig farmers and agricultural extension personnel on the strategies for improving the profitability of pig farms

Table 2*:* t-test Analysis of the Mean Ratings of the Agricultural Extension Personnel and Pig Farmers of the Strategies for Improving the Profitability of Pig Farms

		Farmers		**Extension Agents**			
S/N	**Items**	$\overline{X}_1$	**SD1**	$\overline{X}_2$	**SD2**	**p-value**	**Rem**
1	Effective use of available resources	3.23	0.75	3.18	0.9	0.59	NS
2	Use of innovative technologies in pig production and marketing	3.23	0.78	2.9	0.88	0.00	S
3	Implementation of relevant policies	2.97	0.87	2.81	1.02	0.21	NS
4	Encourage pig farmers to join and take active part in relevant associations around them to have access to relevant information about new technologies	3.25	0.82	2.94	1.02	0.01	S
5	Establish an effective extension service to bridge the gap between pig farmers and research institutes	3.19	0.81	3.01	0.97	0.12	NS
6	Establishment of pig breeding centres	3.17	0.79	2.94	0.82	0.03	S
7	Create marketing linkages which can motivate pig producers	3.14	0.86	2.81	0.99	0.01	S
8	Support innovative community-based pig production systems	3.2	0.75	3.08	0.96	0.24	NS
9	Encourage other private sector investment in pig production	3.21	0.76	3.06	0.8	0.16	NS
10	Train farmers on how to formulate feed utilizing local feed stuffs	3.34	2.26	2.83	1.11	0.05	NS
11	Establish model farms for farmers to learn	3.31	0.78	2.83	1.03	0.00	S
12	Farmers with no efficiency level should be encouraged to seek advice from the prospective ones	3.25	0.75	2.9	1.00	0.00	S
13	Adopt new high-tech pig production technology	3.04	0.83	3.4	3.57	0.18	NS
14	Create awareness about improved technologies in pig production among pig farmers	3.52	0.58	3.31	0.8	0.02	S
15	Provide incentives to pig farmers	3.19	0.83	2.83	1.08	0.00	S

Key: X_1 = Mean of Farmers; SD_1 = Standard Deviation of Farmers; X_2 = Mean of Extension Agents; SD_2 = Standard Deviation; S – Significant; NS = Not Significant

Results on Table 2 show that items 2, 4, 6, 7, 11, 12, 14 and 15 have p-values of ranging from 0.00 – 0.03 which are less than the 0.05 level of significance. This implies that there is statistically significant difference ($p<0.05$) in the mean responses of extension personnel and pig farmers on the strategies for improving the profitability of pig farms for those items. The null hypothesis for those items was therefore not accepted. Furthermore, items 1, 3, 5, 8, 9, 10 and 13 had the p-values ranging from 0.05-0.59 which are equal to or greater than the 0.05 level of significance. This implied that there was no statistically significant difference ($p\geq0.05$) in the mean responses of extension personnel and pig farmers on the strategies for improving the profitability of pig farms for those items. The null hypothesis was therefore accepted for those items.

Findings of the Study

It was found that the strategies for improving the profitability of pig farms include effective use of available resources, use of innovative technologies, implementation of relevant policies, joining relevant organizations, effective extension services, establishment of pig breeding centres, and creating marketing linkages, among others. Generally, there was no significant difference in the mean responses of extension personnel and pig farmers on the strategies for improving the profitability of pig farms on some items.

Discussion of Findings

The findings on the strategies for improving the profitability of pig farms revealed that effective use of available resources, use of innovative technologies, implementation of relevant policies, joining relevant organizations, effective extension services, establishment of pig breeding centres, and creating marketing linkages, among others. These findings align with those of Abrams (2020), and Agola (2020) who in their different studies recommended the strategies such as reduction in the cost of feeds through the process of substituting feed with locally available by-products like banana, maize residues, sugar cane residues, cassava, fish waste, over ripe fruits among others, access to improved genetics and methods of production, and effective disease prevention to reduce the costs treatment of disease. Also recommended by the authors are the need for formulation and implementation of relevant policies, membership of relevant organizations, provision of effective extension services, and establishment of pig breeding centres.

The finding of the study is corroborated by Ezeibe (2010) who carried out a study on strategies for improving the profitability of pig farms in Enugu State, Nigeria. It was also found out among others that that farmers adopted most of the pig production technologies except such technologies that require high level skills like castration, artificial insemination and telemarketing or video merchandising. The study revealed some productivity constraints and strategies for improving physical productivity and profitability of pig farms. It recommended among others that pig farmers should always endeavor to select and keep improved, exotic breeds of pigs such as Large White in their farms due to their high production performance and that stakeholders in pig

production should join hands in reducing the productivity constraints of pig farms by providing human and material resources to increase productivity.

Implications of the Findings

The findings from this study have far reaching implications for profitability and sustainability of pig farms, wellbeing of pig farmers, poverty reduction, and food security among others.

The findings of this study if implemented will lead to a more vibrant and profitable pig production sub sector, enhances the income of rural pig farmers, and reduce poverty. When farmers earn more from their farm businesses, they contribute not only to their rural economies, but to the national economic development. Food security exists when food is available, accessible, and utilized by the people on a sustainable basis. The findings of this study if implemented will ensure an increase in the production of pigs and pig products and their ready availability on a sustained and affordable basis. An increase in the production of pigs because of the implementation of the strategies identified in this study will raise the intake of animal protein and reduce the prevalence of malnutrition related diseases, especially among rural dwellers. The findings of the study will have implications for the agricultural extension agents through enriching the contents and their knowledge, thus position them to better advice their clients. This will enhance the productivity of their services.

Conclusion

Pig production is a highly profitable enterprise and contribute to reducing poverty and promote food security. Based on the findings of this study, it is concluded that pig production is most profitable. The profitability of pig farms could be improved through the adoption of strategies such as effective use of available resources, use of innovative technologies, implementation of relevant policies, joining relevant organizations, effective extension services, establishment of pig breeding centres, and creating marketing linkages, among others.

Recommendation

Based on the findings and the conclusion of the study, it is recommended that: the ministry of agriculture at the state and federal level, animal product based nongovernmental organizations, and other stakeholders should provide funds for farmers to implement the strategies identified in this study. These inputs, equipment, and facilities should be provided at a subsidized rates to pig farmers.

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