GROWTH PARAMETERS OF PIGS AT DIFFERENT PRODUCTION PHASES FOR FARMER'S PROFITABILITY IN CROSS RIVER, NIGERIA

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Abstract

The study determined the growth parameters of pigs at different production phases for farmer's profitability in Cross River, Nigeria. A research question and one hypothesis guided the study. The hypothesis was tested at $p< 0.05$ level of significance. The study adopted experimental design. A population of 22 piglets of Large White (Yorkshire) breed was used. The piglets were 15 to 21-days of age. The sample was 18 healthy piglets. The instrument for data collection was a template for recording the information such as cost of piglets, cost of feeds, daily feed consumed among others and a structured questionnaire. The instrument was validated by three (3) experts, one (1) from the Department of Agricultural Education, and two (2) from the Department of Animal Science, all from University of Nigeria, Nsukka. Data was collected by directly recording inputs, outputs, costs, and revenue for each production phase. Weigh back technique was used to collect data on feed intake. The data was analyzed using Mean, Analysis of Variance (ANOVA), t-test, and Stochastic Frontier Regression statistic .Finding indicated that pigs sold at phase 3 had the highest profitability when compared to others while the pig sold at production phase 1 had the least profitability; pigs sold at the phase 3 had the highest feed intake followed by the feed intake in phase 2; the highest average body weight was obtained in phase 3 at the twentieth week of production ; and the least average weight was obtained in the first week on phase; and the highest weight gain was obtained at phase 2 and 3 while the lowest weight gain was obtained at phase 1. It was recommended among others that farmers should be educated on the two phase (phase 3) to provide more feeds for the highest feed intake which will translate to the highest average body weight.

Keywords: Growth Parameters, Pig Production, Production Phases, Profitability,

Introduction

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). There are several types of pigs breeds popularly raised in Nigeria. According to Akinbobola (2021), the popular breeds include, large white (Yorkshire), landrace, Duroc and Poland China. Each type varies in appearance, size, and biological characteristics.

One of the farm animals in Nigeria that have played important roles in the nutrition and economy of the populace is pig. It 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. 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 the production of shaving cream, 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. The pancreas is used in the production of insulin. 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) added that there is good demand from domestic as well as export market for pigs' products such as pork, bacon, ham, sausages, and lard among others. To harness the benefits from pig production, farmers rear different types of pig breeds.

. Generally, there are different pig production enterprises which a farmer may choose from. These include breeding enterprise, farrow only, farrow-to-finish operations, and finisher enterprise. Pig production enterprises can be categorized into farrow to finish, farrow to wean, wean to finish, feeder pig production, seed stock production, and pure-bred production. Pig production phase refers to the stage at which pigs are reared and sold by the farmers. This essentially depends on the pig production enterprise(s) a farmer chooses(s) to embark on. Segunle (2012) identified the grower and finisher phases. While some farmers sell their stock at grower phase (up to a market weight of 18 to 20kg), others sell at the finisher phase (30kg and above). The finisher phase of pig production enterprise is the stage at which the pigs have reached maturity (market/table size), aged between 14 – 25 weeks and attain a weight of between 60-100kg (Agada, 2019). The cost of production as well as the unit price per pig at different phases vary depending on the efficiency in the utilization of production resources.

Growth refers to an irreversible increase in the size. Weight, length, and girth of living organisms, it is a characteristic feature of all plants and animals. Black (2018) and Christo and Madukwe (2011) defined growth as the quantitative increase in the size, mass, volume of an animal. Growth can

be assessed or measured using several indices known as parameters. Growth parameters refer to specific measures or indicators that are used to assess and quantify the growth of an organism. (National Research Council NRC, 2012). According to NRC (2012), the measurement of growth parameters provides an insight into the performance and the productivity of a livestock enterprise. NRC (2012} identifies the common parameters for assessing growth to include weight gain which could be daily, weekly, average daily or average weekly weight gain, feed conversion ratio (FCR), body weight, feed intake which could be daily, weekly, average daily, or average weekly body weight, fed intake, and mortality rate.

The feed intake is the amount of feed consumed by an organism over a specific period usually measured in kilogram per day or week. According to Lammers, et al. (2010), measuring feed intake is essential for ensuring that the animal receives adequate nutrition for optimal growth and productivity. Kim, et al. (2012) feed intake as the amount of feed consumed by an animal within given period. Feed intake in an animal is a function of several factors which according to Tholen et al. (2018) include genetic factors, age, type of diet, feed presentation and physical form of the feed. Adejumo et al. (2020) identified health status and disease challenges while Awoyomi et al. (2019) identified social factors within an animal group.

Genetic factors are considered as supreme among the factors that influence feed intake in animals including pigs. According to Tholen, et al. (2018), different breeds of animals and genetic lines within and between animal groups have varying appetites and feed efficiency potentials. Dyck, et al. (2013) noted that the feed intake of animals and their overall productivity can be improved through genetic improvement. The effect of genetic factors become more pronounced as the animals begin to age. According to Lekule and Kyvsgaard (2013), as the animal age, their nutritional requirements increase leading to higher feed intake to promote active growth until full maturity. For pigs, Lekule and Kyvsgaard (2013) piglets in their early stages of growth have smaller stomach capacities and limited appetite, but this begins to increase and the ability to consume larger quantities of feed increases. The authors recommended that the pig farmers should monitor and adjust the quantity of fed supplied to ages of the piglets.

The type of diet in terms of the nutrient composition and quality of the diet determine the appetite of the animals and consequently the feed intake level. Patience et al. (2015) noted that nutrient deficiency and imbalances can affect the palatability and acceptability of feeds to the animals, and thus influence the feed intake positively or negatively. The authors advocated for the need for farmers to provide nutrient rich feeds to meet the specific requirements of the class of animals reared. Stolba and Woo-gush (2019) observed that the way and manner the feed is presented and the physical form of the feed influences feed intake. According to Tugnoli, et al. (2012), feed particle size, texture, and moisture content can affect palatability and digestibility thus influence feed intake. Nofiani et al. (2019) noted

that that environmental factors can influence the feed intake of animals especially pigs. According to the authors, comfortable housing conditions, adequate space allowance and good air quality can enhance feed intake while unfavorable conditions such as extreme temperature, poor ventilation, overstocking and other unfavorable environmental conditions reduce feed intake. Other factors that may influence feed intake are identified to include health status and disease challenges (Adejumo, et al. (2020), feeding management practices (McGlone et al., 2011), and social factors (Awoyomi et al (2019). Adequate feed intake results in favourable weight and growth rate of the animal.

Body weight provides an insight into the size and general developmental status of the animal. According to Huang et al. (2020), measurement of the body weight is essential in monitoring growth progress, identify potential health issues, and adjust nutrient supply. In pigs, Dyck, et al. (2013) and Adejomo et al. (2020) noted that body weight serves as an indicator of growth, health, and vary depending on factors such as age, breed, sex, and management practices. Other factors that could influence growth have been identified by several authors to include nutrient status of the animal (Campbell & Taverner, 2014); management practices (Aduku et al. 2020); environmental conditions such as temperature, relative humidity, and quality of the air (Awoyomi et al., 2019; Food and Agricultural Organization, 2021; and Devine et al., 2018).

Average weekly body weight is another parameter used to measure growth. According to (Aduku et al. 2020), average weekly body weight is calculated the total weight gain by the number of weeks within the measurement period. Effective management of the average weekly weight gain provides information about the efficiency of feed utilization and the overall health of the animal (Campbell & Taverner, 2014). A knowledge of the average weekly weight gain provides an indicator of the profitability of the farm business (Huang et al., 2020). Average weekly weight gain is a function of the feed conversion ratio.

Feed conversion ratio (FCR) in pigs provides an insight into the efficiency of fed utilization by the pigs. According to Adeola and Cowieson (2011), FCR expresses the quantity of fee consumed by an animal relative to the weight gain attained. According to Dyck, et al. (2013), FCR is an indicator of the economic viability and sustainability of the farm business; and when optimized, results to cost savings and improved profitability among others. The need therefore to assess body weight gain, weekly body weight, average body weight and feed conversion ratio.

Profitability indicates the overall success and sustainability of a business (Agada, 2012). Profitability provides a knowledge of the economic state of the business and helps entrepreneurs to be efficient in their management decisions and not to be wasteful in their spending, their time and money thus yielding a positive economics of production. Economics of production refers to utilizing the minimum quantity of resources by the pig farmer to obtain maximum benefit. It entails wisely allocating the various inputs such as feeds, medication; utilities and litter among others which the pig farmer

spends money on to avoid wastage of those resources to be profitable. Most often, pig farmers encounter several constraints which threaten the profitability of the business.

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. Also, the longer the pigs stay on the farm, the more the resources spent on feeds and other variable cost, thus increasing cost of production. For the pig farmer to make a profit, the income from the sale of the pig and its products must be higher than the cost of rearing.

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 its resources and investments; 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. Pig farmers most often incur greater cost of production relative to the profit when they eventually dispose the pigs. This reduces their profit and profitability as well as the sustainability of such farms leading to premature death and fold up of most pig production enterprises. 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 determine the profitability of pigs sold at different phases of production.

Purpose of the study

The study determined growth parameters of pigs at different production phases for farmer's profitability in Cross River.

Research Questions

This study answered this research question, what are the growth parameters of pigs at different production phases?

Research hypothesis

This null hypothesis guided the study. There is no significant difference in the mean growth parameters of pig sold at different production phases.

Methodology

The study adopted experimental research designs. The study was carried out in Cross River State. Nigeria. The population for the study was 22 piglets of Large White (Yorkshire). The piglets were between 15 to 21-days of age. At this age, the piglets had reached weaning stage and are able to feed on other feed materials. The pigs were raised and finally sold out in three phases of 10, 14, and 18 weeks of rearing. The sample for the study comprised 18 healthy piglets. The 18 piglets were selected

through purposive sampling. The instrument for data collection was made up of templates. The templates were used for recording the information such as cost of piglets, cost of feeds, and daily feed consumption rate among others. The template comprised of summary sheet for the phases of production, daily feed consumption record, purchase record, sales record, 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.

Experimental procedure

In the first two weeks of the arrival of the piglets to the farm, all the piglets were raised together. They received the same type and quantity of feeds. All the pigs were vaccinated on arrival at the farm. At the end of the first two weeks, the piglets were randomly allocated to three groups A, B and C with each group having six piglets. All the treatment groups received the same treatment throughout the period of the experiment. It was also assumed that the conditions in each of the pens, the health of the piglets, the feed quantity and quality were all the same.

At the end of the first twelve weeks of rearing, two piglets were randomly selected from each group. One was sold live, and the amount realized recorded while the other slaughtered, meat processed, sold and amount realized recorded. This marked the first phase of production. At the end of sixteen week of rearing (phase 2), two pigs were randomly selected from each group, one was sold live and the other slaughtered, the meat sold, and the amount realized recorded. At the end of twenty week of rearing (phase 3), the remaining two pigs in each of the three groups were picked, one each was sold live while the remaining one from each group was slaughtered, the meat sold, and the amount realized was recorded. At each of the phases, data on the feed intake of the pigs, average body weight, and daily weight gain among others as well as the cost of inputs such as piglets, vaccines, labor, and facilities were recorded.

Measures were taken to control the extraneous variables in the study. Where a pig could not be sold at the end of a particular phase of production due to non-availability of buyers, the weight of the pigs was taken and the prevailing market price for the size of pig was taken as the selling price. For the slaughtered pig, the carcass weight was taken and the prevailing market price per kilogram weight of the meat was taken as the selling price. Also, to control for the age of the piglets, a range of 15 – 21 days old piglets were purchased as taken to be of the same age. This allowed for uniformity in the treatment procedures.

Methods of data collection

Data in the study was collected by recording inputs, outputs, costs, and revenue for each production phase. Weigh back technique was used as a method of data collection regarding the feeding. The weigh back technique is a method in which the pigs were served a specified quantity of feed every

morning. In the morning of the following day, the remaining quantity of feed was weighed again. The quantity of feed consumed was determined by subtracting the quantity of feed left from the quantity of feed served.

Data on the feed intake of the pigs, average body weight, and daily weight gain among others were measured and recorded. The data on the feed intake was obtained by subtracting the leftover feed every morning from the feed supplied the previous day, while average body weight was obtained by dividing the total weight of the pigs in the group by the number of pigs measured. The daily weight gain was obtained by subtracting the previous day's weight from the current day's weight. The cost of inputs such as piglets, vaccines, labour, and facilities were recorded in each phase of production. At 12 weeks, 16 weeks, and 20 weeks, one pig was randomly selected from each of the groups, sold and the amount recorded. Also, one pig from each of the groups was slaughtered, the meat processed, sold and the amount recorded. In all the phases, the faeces of the pigs were collected on daily bases, sold and the money realized was included as part of income for each of the phase. At the end of this procedure, the different phases were calculated and evaluated to determine which phase was more profitable.

Methods of Data Analysis

The Stochastic Frontier Regression Analysis was used to test hypothesis of the study.

Results

Research Question: What are the growth parameters of pig at different production phases?

Data for answering research question 1 are presented in Table 1-3

Table 1: Average Feed Intake of Pigs at Different Production Phases

Weeks	Phase 1(kg)	Phase 2 (kg)	Phase 3 (kg)
1	1.32	1.32	1.32
2	1.40	1.40	1.40
3	1.40	1.40	1.40
4	1.48	1.48	1.48
5	1.48	1.48	1.48
6	1.56	1.56	1.56
7	1.56	1.56	1.56
8	1.63	1.63	1.63
9	1.63	1.63	1.63
10	1.71	1.71	1.71
11	1.71	1.71	1.71
12	1.71	1.71	1.71
End of Phase 1 = 18.59			
13		2.80	2.80
14		2.80	2.80
15		2.92	2.92
16		2.92	2.92
End of phase 2		**30.03**	
17			6.07

18	6.07
19	6.30
20	6.30
End of phase 3	**54.77**

In Table 1 the results on the feed intake of pigs sold at different production phases is presented. The result indicated that the highest average feed intake was recorded in phase 3 (54.77 kg) which was followed by the feed intake in phase 2 (30.03 kg). The least feed intake was observed in phase 1 (18.59kg). Generally, it was observed that feed intake of the pigs increases as the duration progresses.

Table 2: Average Weight of Pigs at Different Production *Phases*

Weeks	**Phase 1(kg)**	**Phase 2 (kg)**	**Phase 3 (kg)**
1	8.0	8.0	8.0
2	8.5	8.5	8.5
3	9.0	9.0	9.0
4	10.5	10.5	10.5
5	11.5	11.5	11.5
6	12.5	12.5	12.5
7	15.5	15.5	15.5
8	21.0	21.0	21.0
9	27.5	27.5	27.5
10	30.5	30.5	30.5
11	38.0	38.0	38.0
12	40.0	40.0	40.0
End of Phase 1 = 19.38			
13		45.0	45.0
14		48.5	48.5
15		55.0	55.0
16		65.0	65.0
End of phase 2		**27.87**	
17			72.2
18			80.0
19			85.0
20			95.0
End of phase 3			**38.91**

In Table 1 the results on the weight of pigs at different production phases are presented. The result indicated that the average weight of pig in phases increased as the duration of rearing increased. The highest weight was obtained at the fourth week of phase 3 (95 kg) and twentieth week of rearing while the least weight was obtained at the first week on phase 1 (8 kg) and first week of rearing. Similarly, the average weights of pigs at phase 2 were greater than the average weights of pigs in phase 1 while the average weights of pigs in phase 3 were greater than the average weights in phase 2.

Table 3: Average weight gain of pigs at different production phases

Weeks	Phase 1kg	Phase 2 (kg)	Phase 3 (kg)
1	-	-	-
2	0.50	0.50	0.50
3	0.50	0.50	0.50
4	1.50	1.50	1.50
5	1.00	1.00	1.00
6	1.00	1.00	1.00
7	3.00	3.00	3.00
8	5.50	5.50	5.50
9	6.50	6.50	6.50
10	3.00	3.00	3.00
11	7.50	7.50	7.50
12	2.00	2.00	2.00
End of Phase 1			
13		5.00	5.00
14		2.50	2.50
15		6.50	6.50
16		10.00	10.00
End of phase 2			
17			6.70
18			7.80
19			5.00
20			10.00
End of phase 3			

Table 3 presents the average weight gain of pigs at different production phases. From the result, it can be deduced that the weight gain did not follow a definite trend. There was an increase and decrease in weight gain over a given period. However, the highest weight gain was obtained at phase 2 and 3 (10) while the lowest weight gain was obtained at phase 1 (0.50).

Hypothesis: There is no significant difference in the mean growth parameters of pig sold at different production phases.

Table 4: ANOVA analysis of the feed intake of pigs reared at different production phases

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	64.547	2	32.273	2071.994	.000
Within Groups	.265	17	.016		
Total	64.811	19			

The results on Table 4 shows that the p-value of 0.00 is less than the 0.05 level of significance. This shows that there is a statistically significant difference (p=0.00<0.05) in the feed intake of pigs reared at different production phases. The null hypothesis is therefore rejected.

Table 5: Post-hoc test of the feed intake of pigs reared at different production phases

(I) Phases	(J) Phases	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Phase 1	Phase 2	-1.31083*	.07206	.000	-1.4629	-1.1588
	Phase3	-4.63583*	.07206	.000	-4.7879	-4.4838
Phase 2	Phase 1	1.31083*	.07206	.000	1.1588	1.4629
	Phase3	-3.32500*	.08825	.000	-3.5112	-3.1388
Phase3	Phase 1	4.63583*	.07206	.000	4.4838	4.7879
	Phase 2	3.32500*	.08825	.000	3.1388	3.5112

*. The mean difference is significant at 0.05 level.

Table 5 shows the post-hoc test of the significant difference in the feed intake of pigs sold at different phases of production. The LSD test of the feed intake of pigs sold at different production phases shows that the statistically significant difference was between phase 3 and phase 1 which had the greatest mean difference of 4.64.

Table 6: ANOVA analysis of the average weight of pigs reared at different production phases

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	13209.698	2	6604.849	55.356	.000
Within Groups	2028.380	17	119.316		
Total	15238.078	19			

The results in Table 6 shows ANOVA analysis of the average weight of pigs reared at different production phases. The result indicated that the p-value of 0.00 is less than 0.05 level of significance. This implies that there is a statistically significant difference (p=0.00<0.05) in the average weight of pigs reared at different production phases. The null hypothesis is therefore not upheld.

Table 7: Post-hoc test of the average weight of pigs sold at different production phases

(I) Phases	(J) Phases	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound

Phase 1	Phase 2	-34.00000*	6.30652	.000	-47.3056	-20.6944
	Phase 3	-63.67500*	6.30652	.000	-76.9806	-50.3694
Phase 2	Phase 1	34.00000*	6.30652	.000	20.6944	47.3056
	Phase 3	-29.67500*	7.72387	.001	-45.9710	-13.3790
Phase 3	Phase 1	63.67500*	6.30652	.000	50.3694	76.9806
	Phase 2	29.67500*	7.72387	.001	13.3790	45.9710

*. The mean difference is significant at the 0.05 level.

Table 7 presents the Post-hoc test of the average weight of pigs sold at different production phases. The results shows the post-hoc test of the significant difference in the average weight of pigs sold at different phases of production. The LSD test of the average weight of pigs sold at different production phases shows that the difference was between phase 3 and phase 1 which has the highest mean difference of 63.68.

Table 8: ANOVA analysis of the average weight gain of pigs reared at different production phases

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	81.383	2	40.692	6.131	.010
Within Groups	112.834	17	6.637		
Total	194.218	19			

The result of ANOVA analysis of the average weight gain of pigs reared at different production phases is presented in Table 8.The result shows that the p-value of 0.01 is less than 0.05 level of significance which implies that there is a statistically significant difference ($p=0.01<0.05$) in the average weight gain of pigs reared at different production phases. The hypothesis of no significant difference is therefore not accepted.

Table 9: Post-hoc test of the average weight gain of pigs reared at different production phases

(I) Phases	(J) Phases	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Phase 1	Phase 2	-3.33333*	1.48743	.039	-6.4715	-.1951
	Phase 3	-4.70833*	1.48743	.006	-7.8465	-1.5701
Phase 2	Phase 1	3.33333*	1.48743	.039	.1951	6.4715
	Phase 3	-1.37500	1.82172	.461	-5.2185	2.4685
Phase 3	Phase 1	4.70833*	1.48743	.006	1.5701	7.8465
	Phase 2	1.37500	1.82172	.461	-2.4685	5.2185

*. The mean difference is significant at the 0.05 level.

Table 9 presents the post-hoc analysis of the significant difference in the average weight gain of pigs sold at different phases of production. The LSD test of the average weight gain indicated that the difference in weight gain was found between phase 3 and phase 1 which had the highest mean difference 4.71.

Findings of the study

The findings on the growth parameters of pigs sold in different production phases showed that the highest feed intake was recorded in phase 3 which was followed by the feed intake in phase 2; the highest average body weight was obtained in phase 3 at the twentieth week of production while the least average weight was obtained in the first week of phase 1; and the highest weight gain was obtained at phase 2 and 3 while the lowest weight gain was obtained at phase 1. There is a statistically significant difference in the feed intake of pigs reared at different production phases, the average weight of pigs reared at different production phases, and the average weight gain of pigs reared at different production phases.

Discussion of Findings

The findings on the growth parameters of pigs sold in different production phases showed that the highest feed intake was recorded in phase 3 which was followed by the feed intake in phase 2; the highest average body weight was obtained in phase 3 at the twentieth week of production while the least average weight was obtained in the first week in phase 1; and the highest weight gain was obtained at phase 2 and 3 while the lowest weight gain was obtained at phase 1. The finding that the feed intake was highest in phase 3 is in order because feed intake in pigs follows a pattern of increasing consumption as they grow, with the highest intake typically occurring in Phase 3 (finishing phase) of production. According to a study published by the National Research Council (2012), feed intake increases as pigs grow, with the greatest intake occurring during the finishing phase (Phase 3). Further, Whittemore & Fawcett (2016) found that feed intake was highest in Phase 3, followed by Phase 2 (growing phase). This pattern of feed intake can be attributed to the pigs' increasing energy requirements as they grow and mature. During Phase 3, pigs are typically in the finishing stage, where they require more energy to support rapid growth and weight gain.

The highest average body weight was obtained in phase 3 at the twentieth week of production while the least average weight was obtained in the first week in phase 1. Research has consistently shown that the highest body weight in pigs is obtained in Phase 3 (finishing phase) of production, while the lowest body weight is obtained in Phase 1 (starter phase). Close and Cole (2000) found that the highest body weight was achieved in Phase 3, with an average weight of 120 kg, compared to Phase 1,

where the average weight was 20 kg. in the same manner, Kyriazakis and Emmans (2015) reported that the body weight of pigs increased significantly from Phase 1 to Phase 3, with the highest weight gain occurring during Phase 3. This trend of body weight gain can be attributed to the increasing feed intake and nutrient requirements of pigs as they grow and mature. During Phase 3, pigs are typically in the finishing stage, where they require more energy and nutrients to support rapid growth and weight gain.

Implication 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, food security, and the agricultural education curriculum, and agricultural education students among others. For the profitability and sustainability of pig farms: the findings of the study if implemented, would make pig farms to become more profitable and sustainable. Famers will make more profit when they sell their pigs either live or slaughtered at the appropriate phase of production. This will minimize the waste of feeds and other production resources, maximize profit, and encourage the farmers to stay in business; reduce the rate of attrition of pig farms and promote their sustainability.

Conclusion

1. Pig production is a highly profitable enterprise and contribute to reducing poverty and promote food security. Pigs sold at phase 3 had the highest profitability when compared to others while the pig sold at production phase 1 had the least profitability. Based on these findings of this study, it could be concluded that pig production is most profitable and pig farmers will make more profit when they sale their pigs at the third phase of production.

Recommendations

Based on the findings and the conclusion of the study, it is recommended that:

1. The Ministry of Agriculture through the agricultural extension agents should advice pig farmers to sell their pigs at the appropriate phase for highest profitability.
2. Farmers should be educated on the two phase (phase 3) to provide more feeds for the highest feed intake which will translate to the highest average body weight.

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