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SHORT COMMUNICATION

Performance characteristics of sows fed enriched diet from weaning to service in a commercial flock

Orheruata, A. M., A. T. Spaine, and S. O. Nwokoro

Department of Animal Science, University of Benin, Benin City, Nigeria.
Email: maorheruata@yahoo.co.uk or micorhe@uniben.edu Tel: +234 8023438773

Abstract

Field data from 40 sows together with obtained data from 1999 to 2005 were analysed to determine the performance of sows fed enriched diet from weaning to service in a commercial flock. The data were on litter size at birth (LTZBT), litter size at weaning (LTZWN), weaning age (WNAGE), farrowing interval (FRINT), parity (PRTY) and reproductive life (PRODLF). Mean value of 9.44(no), 6.03(no), 31.87d, 153.58d and 3.65yr were obtained for LTZBT, LTZWN, WNAGE, FRINT and PRODLF respectively. The influence of parity on sow's performance was analysed while mortality and sows efficiency of production were determined. Antagonistic relationship existed between production and reproduction traits. Mortality amongst piglets increased with weaning age. Over 80% of sows had FRINT of less than 157days, farrowed litters greater than 7 and over 55% weaned litter size of over 8. Parity had no influence on sow's performance. Sows efficiency of production indices showed that sows had 2 farrowing/year, a farrowing rate of 84% and small litter index of less than 17%. The findings of this study have indicated that better performance of sows can be achieved by giving enriched diet (flushing) from weaning to service rather than the practice of flushing only few days to service.

Key words: Sow performance, enriched diet, weaning, service, commercial flock

Introduction

The performance of the exotic and well-adapted pigs commonly used for commercial production seems to be decreasing (Lukefahr and Cheeke, 1991). Since the economy of pig production depends on sow productivity (Aherne and Kirkwood, 1985), enhancing their productivity will be beneficial to the farmer. The reason for the decreasing production of sows is definitely not genetic but due to problems relating to levels of feeding, management and as well as the harsh effect of heat stress. Increasing sows productivity will have to focus on prolificacy. Litter size is one of the factors determining prolificacy and the ability to increase litter size will generally increase output of meat in swine production. Although, See (2000) had postulated that sow productivity depends heavily on the management of the breeding female population genetics, nutrition and environment, nutrition is an important factor affecting productivity (Radestits *et al.*, 1994). Modern pig nutrition and management increasingly has to realize that feeding pigs in a cost efficient way is not a simple function of the nutrient specification of the diet, but rather on feeding for performance. The manipulation of the pig diet to cause the pigs to enjoy good health, higher immunity and enhanced performance will boost cost efficiency of production in the pig industry.

Reproductive responses to changes in nutritional status are reported (Smith and Somade, 1994) to fall within two categories which are acute responses that occur within a few days, such as increased ovulation rate associated with "flushing" and chronic responses that occur in the last two weeks of pregnancy associated with "steaming up". Flushing has been reported to bring a low ovulation rate back to normal levels, increase the number of eggs shed resulting to large litter size (Jindal *et al.*, 1996). Flushing diets have been recommended before and immediately after mating (Foxcroft *et al.*, 1996). However, in order to allow the sow attain necessary body conditions before service and also to shed more ova, flushing could be much earlier. Feeding sheep high protein supplement 6-10 days before estrous has also been reported (Oldham and Lindsay, 1984) to enhance ovulation rate. It is therefore the objective of this study to determine the performance of sows flushed from weaning to service in a commercial flock.

Materials and Methods

Site of the study

The study was a fieldwork carried out in a commercial farm in Benin City between April and September 2005. Data kept by the farm from 1999 to 2005 before the fieldwork started were also used.

Housing and Management of the Animals

The pigs were housed in group-pens in houses built with concrete and windows at the upper portions for proper ventilation. Each pen has a tap drinker and concrete feeder. The floors are cemented roughly and the roof made from asbestors to ensure sufficient cooling of the house. The breeding herd consisted of large-white and landrace breeds which were mated on their weight when they were 120 to 140kg at about 8 to 9 months of age. Only healthy pigs without defects, with about 12 – 14 prominent teats were selected.

The sows were fed breeder feed morning (08.00hrs) and afternoon (14.00hrs). Composition of the feed per ton include maize (240kg), soya bean meal (250kg), palm kernel meal (200kg), dried cassava chips (100kg), wheat bran (150kg), bone meal (30kg), limestone (20kg), lysine (1kg), methionine (1kg), Biotonic (2kg), vitamins (1kg), mycofix (1kg), salt (2.5kg) and minerals (1.5kg). Water was provided *ad libitum*.

Daily management practices carried out include feeding, cleaning of pens and the feeders. Left over feed were discarded and replaced with fresh feed. The animals were exposed to routine veterinary care and detection of animals on heat or animals that returned on heat. !.5kg of fish meal was added to the feed for sows at weaning to service to serve as flush diet.

Data collection and Analysis

Data used for this study were obtained from 40 gilts/sows that farrowed between April and September 2005 and from the records kept by the farm since 1999 to the date the study started. Information on sows identification and farrowings were extracted. Farrowing interval

(FRINT) was computed as difference between subsequent farrowing. Weaning age (WNAGE), litter size at birth (LTZBT) and weaning (LTZWN) and productive life (PRODLF) were noted. PRODLF was calculated as age from first parity to the last parity of the sows before culling. Records of sows with incomplete information were removed. The data obtained were arranged and subjected to statistical analysis using the GLM procedure of SAS (2000). Fixed effects of farrowing interval, weaning age and parity of sow on performance were considered using the following model.

$$Y_{ijkl} = u + f_i + w_j + p_k + e_{ijkl}$$

Where

Y_{ijkl} = observed performance of the l^{th} sow with i^{th} farrowing interval, j^{th} weaning age at the k^{th} parity; μ = overall mean of all observations: f_i = effect of i^{th} farrowing interval; w_j = effect of j^{th} weaning age; p_k = effect of the k^{th} parity and e_{ijkl} = random error of observation.

Results

Sows performance

The mean values for the traits studied are presented in Table 1. FRINT that had the least coefficient of variation also exhibited the highest standard deviation among individual values. Generally traits varied less except for PRODLF with coefficient of variation of over 30%.

Percentage distribution of sows farrowing interval showed that over 80% of the sows had FRINT of less than 157days (Figure 1). The distribution of litter size at birth and weaning also depicted good performance as over 80% of the sows farrowed litter size greater than 7 while over 55% of sows that farrowed weaned litter size of 8 and above. The influence of parity on sows litter size at birth as depicted in Figure 3 showed that the sows performance was not significantly influenced as performance was almost similar from parity 1 to 14 except at parity 3, 6 and 12 with litter size of over 10. Litter size at weaning was between 6 and 8 except at parity 3, 5, 12 and 13 where litter size at weaning was above 8. Sows with higher litter size at birth also weaned higher litter size.

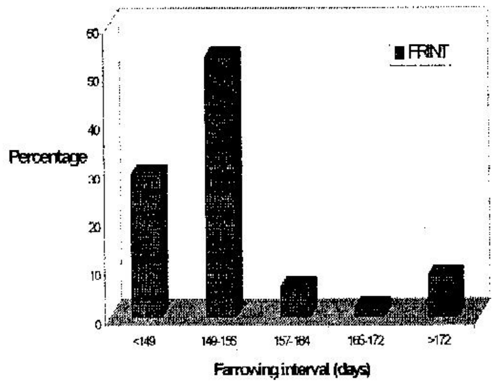

Figure 1. Percentage distribution of farrowing interval of sows fed enriched diet from weaning to service

Table 1. Mean performance of sows fed enriched diet from weaning to service in a commercial setting.

Variables	N	Mean	Std. Dev	SE	CV (%)
LTZBT (no)	277	9.44	2.42	0.14	25.67
LTZWN (no)	276	8.03	2.03	0.12	25.31
WNAGE (days)	276	31.87	4.51	0.27	14.14
FRINT (days)	237	153.58	11.65	0.75	7.58
PODLF (yr)	40	3.65	1.45	0.23	39.66

Table 2. Correlation coefficient values between the traits studied.

Variables	PRTY	LTZBT	LTZWN	WNAGE	FRINT	PRODLF
PRTY		-0.09	-0.11*	0.09	-0.04	0.46**
LTZBT			0.74**	0.09	-0.08	0.21**
LTZWN				0.09	-0.12*	0.26**
WNAGE					-0.11	0.05
FRINT						0.09
PRODLF						

The correlation coefficients among the traits ranged from –0.12 to 0.74 (Table 2). Reproductive traits had negative relationship with production traits while longevity (PRODLF) had positive and highly significant relationship with production traits. Highest correlation coefficient (0.74) was obtained among production traits.

Mortality

The mortality observed at different weaning age is presented in Table 3. Percentage mortality increased as the weaning age also increased with sows weaning their litter at above 40 days of age recording mortality of over 10 percent. Mortality within individual sow litters varied from 2.23 to 17.94 percent.

Table 3. Computed mortality of piglets farrowed by sows fed enriched diet from weaning to service as influenced by weaning age.

Weaning age (days)	Computed mortality (%)
Less than or equal 21	7.83
22 – 28	6.13
29 – 40	8.58
Above 40	12.77

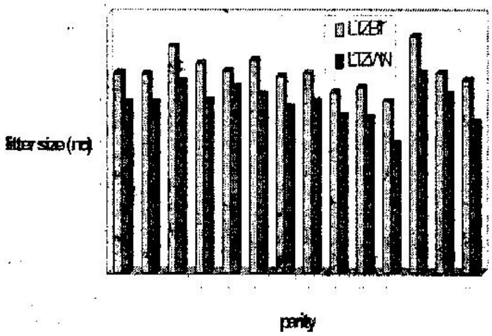

Figure 3 Histogram of average litter size at birth and weaning of sows fed enriched diet from weaning to service as influenced by parity.

Sow efficiency of production

The sow efficiency of production indices computed from results obtained in this study is presented in Table 4. The result showed that sows had 2 farrowings/year with a farrowing rate of 84% and small litter index of roughly 17%.

Table 4. Computed sows efficiency of production indices of sows fed enriched diet from weaning to service in a commercial setting.

Variables	Mean value
Litter size at birth (no)	9.44
Litter size at weaning (no)	8.03
Farrowing interval (days)	153.58
Farrowing rate (%)	84.15
No of farrowing/year	2
No of piglet/sow/year	18.88
Pre-weaning mortality	14.94
No of weaners/sow/year	16.06
Small litter index (%)	16.97

Small litter index = percentage of litters with <8 piglets

Discussion

The average LTZBT of 9.44 obtained in this study is very close to 9.5 – 12 reported by Ptaszynska (2002) as the reference standard for decision boundaries in pig production and in agreement with 8.0 – 12 reported by Olomu (1995) as average for the exotic breeds of pigs in a well managed system in the humid tropics. This value however is slightly higher than values reported by other workers in similar environment (Adebambo, 1995; Orheruata *et al.*, 1997; Akinfala, 2005). Such higher performance of sows could be attributed to the enriched diet that may have provoked high ovulation rate thus leading to higher percentage of fertilised eggs cumulating to higher litter size at birth. Similar finding was reported for rabbits (Iyeghe-Erakpotobor, 2005). LTZWN obtained was similar to value reported by Ptaszynska (2002). The litter size at weaning suggested low mortality. The mortality of 14.94% obtained in this study is quite low compared to the acceptable 20%. Sows generally weaned their litter at 31.87 days that falls within the range of 28 to 42 days reported in the literature (PigCHAMP, 1999).

In this flock over 80% of the sows had FRINT of less than 157 days (Fig. 1). Such FRINT ensured regular farrowing of twice annually and thus good reproductive efficiency.

The productive life of sows based on farm production records indicating when they were culled from the breeding flock showed that the sows had PRODLF that range from 1 to 6 years with average of 3.65 years. This value agrees with the observation of Hafez (1974) who reported that the maximum rate of production is reached around 3 to 4 years in sows. The sows in this flock could be said to have effectively utilized their productive life. This may not have been achieved if the sows were not well nourished.

The results of the correlation coefficient estimations suggest antagonistic relationship between reproductive trait and production of sows. Sows with longer reproduction interval had smaller litter size. Such antagonistic relationship between reproduction and production had also been reported in cattle (Orheruata *et al.*, 2004).

Differences in the rate a gilt reach puberty as well as pregnancy failure in gilts and sows followed by re-mating results in considerable variation to the specific parity category of sows (French et al., 1979). In this study such variation thus had influence on PRODLF as can be inferred from the highly significant relationship that existed between PRTY and PRODLF in Table 2. Similar relationship also existed between PRTY and LTZWN but in the negative direction. Litter size had been reported to increase up to parity 6 then stabilize before decreasing at parity 8 (Xue et al., 1986). Therefore, if in a flock majority of the sows cannot have up to parity 8 the productivity of such flock will be affected.

Mortality observed with respect to weaning age was generally low. Mortality was high below and above average weaning age of 3 to 4 weeks. This observation agreed with the results obtained by Orheruata, *et al.* (1997). The result therefore suggests that piglets should be weaned at 3 to 4 weeks for optimum survival. The obtained mortality recorded in this flock depicted good management and the enriched diet could have ensured good body condition of the sows and thus were able to produce enough milk for the piglets. The enriched diet may have conferred on the sows better physiological status prior to service and during pregnancy by providing enough nutrients for them are their fetuses. Consequently, the piglets were able to go through the pre-weaning stage in a healthy condition and hence the reduced mortality.

Litter size as influenced by parity depicted in Figure 3 showed a slight increase from parity 1 to 3 and a drop in parity 4. There was no definite pattern of increase and drop in litter size from parity 4 to 14. However, litter size was similar from parity 4 to 11 before increasing. This trend did not follow the usual trend of increase and continuous decrease from parity 3 as reported by Belstra and See (2004) and Ajayi *et al.* (2005). The maintenance of high and almost similar litter size of the sows used in this study up to parity 11 could be attributed to the enriched diet the sows were exposed to from weaning to service which may have provided enough nutrients that sustained high ovulation rate and there was no adsorption of the shed ova due to nutritional stress. Ashworth (1991) has reported that changes in maternal nutritional status have effect both on the endometrial secretory protein profile and composition of allantoic fluid from which the developing foetus derives its nutrients. With the enriched diet the sows were able to maintain high ovulation rate and thus high litter size through out their reproductive life.

The indices obtained for some of the sow efficiency of production were high when compared against the values reported for "decision boundary" by Ptaszynska (2002) for reproductive parameters are below such values thus indicating satisfactory sow efficiency of production. If in a selection exercise sows with small litter index are culled from this flock, the performance will further be increased. Such relative high sow efficiency of production can be attributed to the enriched diet from weaning to service as it may have conferred better body condition on the sows and provided adequate nourishment for the sows and piglets. The sows were able to have regular reproductive cycles of 2 per year and consequently, this is a higher output when compared with flocks having longer farrowing interval.

The findings of this study have indicated that better performance of sows can be achieved by giving enriched diet (flushing) from weaning to service rather than the practice of flushing only few days to service.

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