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Assessment of reproductive and growth performances of pig breeds in the peri-urban area of Douala (Equatorial Zone)

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Abstract

The aim of this study was to evaluate the reproductive and growth performances of pig breeds in Douala, Cameroon. The reproductive performance of gilts and multiparous sows (38 per group) from 8 selected farms were monitored and controlled. Thereafter, piglets were controlled from birth to weaning age. The age at first service (AFS), fertility index (FI), fecundity, age at first farrowing (AFF), weight at first farrowing (WtFF) and litter size (LS) of gilts were 179.97 ± 25.40 days; 1.76 ± 0.77 ; 100 ± 0.00 ; 350.47 ± 40.58 days; 107.26 ± 31.85 kg and 7.18 ± 1.93 piglets, respectively. In sows, the FI, fecundity, LS and farrowing interval (FarI) were 1.13 ± 0.34 ; 100 ± 0.00 ; 9.03 ± 2.14 piglets and 179.63 ± 25.14 days, respectively. FI and LS were better in sows compared to gilts ($P = 0.000$). The sex ratio was 0.63. Local breed animals reared in semi-modern farms and fed mixed feed showed the lowest WtFF. In piglets, the average birth weight (kg), the average weaning weight (kg), age at weaning (days) and survival rate (%) until weaning were 1.32 ± 0.20 , 10.60 ± 1.41 , 56.86 ± 8.24 and 48.43, respectively. These results indicated that reproductive performance is strongly influenced by breed, feed and farm type.

Keywords: Douala, Feed, Fertility, Growth, Pig breed.

Introduction

Cameroon has about 19,400,000 inhabitants and pork is consumed by nearly 70% of the population (INS, 2011). The pig population is estimated at 1.7 million and the industry provides about 30,000 tons of pork per year. Pork production was estimated at about 48,960 tons in 2010 and is expected to peak 86,190 tons in 2015 (MINEPIA, 2011). The current production estimated (2.02 kg/person/year) is low when compared to the demand of 5 kg pork/person/year (MINEPIA, 2011). The low productivity is attributed mainly to the production system and the poor exploitation of production potential. To reduce importation of pork, the government of Cameroon has funded projects to promote the improvement of livestock productivity such as the Pig Industry Development Program (PSDB), Projects to improve Agricultural Competitiveness (PACA), and many others. Despite these efforts, pig production in Cameroon is still insufficient and is characterized by a traditional farming systems consisting of small pig production units. The farming conditions are often poor and farmers usually choose farming options with minimum investment and professional interventions while hoping to maximize profitability (Nyabusore, 1982). Under these conditions, little is known of the pig's performance and how they vary from one farm to another.

These small farms play an important role in the socio-economic lives of the local people. Pigs are

a valuable source of capital, are used to meet the daily family needs, and are an important source of animal protein (Thorne, 1992). Despite the interest in increasing pork production there is lack of literature on pig productivity in Cameroon (Mopate-Logtene and Kabore-Zoungana, 2010).

This study was conducted to assess the reproductive and growth performance of pig breeds in the peri-urban area of Douala (Equatorial Zone). Specifically we determined the reproductive performance of gilts/sows, the growth performance of their piglets, and evaluated the effect of rearing factors on these performances.

Materials and Methods

Area of the study

The study was conducted in peri-urban area of Douala; the Littoral region of Cameroon situated between $4^{\circ} 3' 1''$ North and $9^{\circ} 42' 0''$ East. The farms were located in Wouri Department, near several markets of Douala. According to the agro-ecological classification of Cameroon, Douala is characterized with a constant temperature of about 26°C and the rainy season starts from March and ends in October. Very heavy rains resulting in flooding usually occurs between June and October.

Design of study

A total of 76 pigs were randomly selected from eight farms from within the framework of PACA (Table 1).

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Table 1. Structure of the research population.

Breed	Gilts	Sows	Total
Large-white	19	20	39
Duroc	4	8	12
Landrace	13	8	21
Local	2	2	4
Total	38	38	76

All of these farms were sponsored by the World Bank in partnership with the Ministries of Agriculture and Rural Development (MINADER) and Livestock, Fisheries and Animal Husbandry (MINEPIA). PACA projects were funded by the World Bank and launched in the North West Region of Cameroon in 2010. These projects had the main objective to “increase the competitiveness of beneficiary producer organizations that are working in the maize, rice, plantains, pigs and poultry sectors”. These projects were given a budget of 62 million Euros to spend over a period of five years, with aims to increase livestock production by 20% (MINEPIA, 2011).

Data collection on farm characteristics

Questionnaires were used to collect information on farm structure and management, as well as socio-economic characteristics of breeders. Three farming systems were identified: traditional (n=1; 12.5%), semi-modern (n=5; 62.5%) and modern (n=2; 25%). The traditional pig's farm (type 1) was located at about 300 m from homes and in most cases the walls and floors were constructed with planks. The farm was not protected from visitors and the hygiene practices were not standard. The farming conditions were often poor. Most of the work was performed by family members using inappropriate equipment as there were minimal investments and professional interventions. The semi-modern farms (type 2) were based on solid concrete floors but the walls (1.2 m high) were made up of temporary materials (bricks or wood) and located about 500 m from homes with limited access to visitors. The semi-modern pig sties were used for raising sows, lactating dams, the fatteners and boars. The health care provided to the pigs was both prophylactic (vaccination against swine erysipelas) and curative. Labourers may be recruited but their labor time was not factored in, though wearing boots was a common practice on most farms. The modern farms (type 3) in the context of this study were well constructed buildings located more than 500 m from homes for biosecurity reasons. The floors were concreted and sloped gently to facilitate cleaning by washing with water. The buildings were partitioned to enable grouping of pigs per age whenever necessary. There were footbaths at each entrance and exit of the main

building. Health care consisted of prophylactic and curative therapies against common pathologies such as swine erysipelas, salmonellosis, African swine fever, transmissible gastro-enteritis, vesicular stomatitis, and metabolic diseases associated with calcium, iron and vitamin deficiencies. Veterinarians were contracted to provide health services. Staffs were dressed with blue blouse and wore boots, gloves and masks.

Feeding

The animals were fed twice a day according to a predetermined schedule or standardized farming code provided by the supervisory ministry, MINEPIA (2011) and water was available *ad libitum*. Some of the farmer composed their own feed while others bought feed supplied by the Feed Mills Corporation of Cameroon (SPC). The nutritive value of the farmer composed feed was: 45 to 60% energy, 25 to 35% protein, 2 to 4% Calcium/Phosphorus and 1.5 to 2% mineral and vitamins complex (MVC). The feed of SPC consisted of 65 to 75% energy, 12 to 25% protein, 2-3% Calcium/Phosphorus and 1.5 to 2% MVC. The pigs received the same amount of feed and feed content depending of their age and weight. The raw materials were composed of maize, maize bran, waste from grinding mills, soya bean cake, cotton seed cake and groundnut cake, fish meal and bone meal.

Evaluation of the reproductive performance of gilts and sows

The pigs were bred by natural mating and the heats were detected with using breeding boars. The fertility index (FI: total number of mating for a conception), fecundity (% live piglets born per bred gilt or sow within 6 hours), age at first service (AFS), farrowing interval (FarI), litter size (LS), weight at first farrowing (WtFF), age at first farrowing (AFF) and the sex ratio (male/live piglets) were determined. Weight of adult pigs was estimated using a barometric tape (Zoometer) on the thoracic circumference while piglets were weighed on a weighing balance type TTZ-200.

Piglet growth performance assessment

The piglets were weighed at birth (BWt) and at weaning (WWt). The age at weaning (AW) was recorded and the survival rate determined. Clinical signs of some diseases were recorded until weaning.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences software (SPSS-20). Analysis of Variance and Turkey HSD tests were used to compare different groups. Differences were significant at $P < 0.05$.

Results

Reproductive performance

Of the 76 gilts and sows monitored, a total of 607 live piglets were farrowed with a sex ratio of 0.63. Table 2 shows the overall of reproductive performance in gilts and sows. The FI and LS in sows were better than those of gilts ($P = 0.000$).

Effects of breed, the type of farm and feed on reproductive performance in gilts and sows

Since the number of farms involved in the project was low; in particular the fact that the “traditional system” was represented by a single farm (with only 3 sows/gilts), results and discussion have been limited the comparison to two types of farms (modern vs. semi-modern)

Tables 3 and 4 show the respective effects of some husbandry factors on reproductive performance of gilts and sows. The WtFF was heavily influenced by breed, farm type and the feeding. Local pig breeds reared in semi-modern farms and fed mixed feed had the lowest weight at WtFF. Gilts in modern or type 3 farms and fed on complete diet exhibited better LS while the Landrace sows have the best LS.

Growth performance and health profile of the piglets

Of all farrowed piglets, the average BWt (kg), the average WWt (kg), AW (days) and survival rate until

weaning were 1.32 ± 0.20 , 10.60 ± 1.41 , 56.86 ± 8.24 and 48.43, respectively. These performances were influenced by breed, farm type and source of feed (Table 5). Of the 51.57% of piglets that died, 11.14% were from sudden death, and 88.86% were suffering from various diseases including: neonatal diarrhea (95%), Salmonella (15%), constipation (57%), infections respiratory (5%), gastrointestinal parasites (100%), sarcoptic mange (20.56%) and abscesses (12.12%).

Discussion

The AFS was in the range (137 to 281 days) described by Rozeboom *et al.* (1996), but less than that reported by Ayssiwede (2005) in Benin and Mopate-Logtene *et al.* (2009) in Central African Republic and the CDDR/SAILD (1996). This variation may be due to the heterogeneous type of farm and feeding systems considered in this study. The AFS of animals raised in modern farms was younger compared to those raised on semi-modern farms. Since animals raised on type 3 farms were fed on complete diet, it is most probably that complete and well balanced diets were responsible for gilts reaching puberty earlier than those fed the mixed feed and raised on type 2 farms (Ayssiwede, 2005). However, other environmental factors of semi-modern farms such as inadequate ventilation and facilities to control high ambient temperatures could result in drop in reproductive and growth performances (Quiniou *et al.*, 2000). Precocity could also be due to the grouping effects from the random combination with fattening animals as was observed more in the modern than semi-modern farms (Dovonou, 2002).

Table 2. Overall reproductive performance of gilts and sows (means±SEM).

Parameters	Gilts	Sows	P-value
AFS (days)	179.97±25.40		
FI	1.76±0.77 ^a	1.13±0.34 ^b	0.000
Fecundity (%)	100.00±0.00	100.00±0.00	
AFF (days)	350.47±40.58		
WtFF (kg)	107.26±31.85		
LS (piglets)	7.18±1.93 ^a	9.03±2.14 ^b	0.000
FarI (days)		179.63±25.14	

^{a,b}Means within the same row with different indices are significantly different at $P < 0.05$.

Table 3. Effect of breed, type of farm and feed on reproductive performance in gilts.

Parameters	AFS (days)	FI	Fecundity (%)	AFF (days)	WtFF (Kg)	LS (piglets)
Breed						
Large-white (n=19)	183.68±5.13 ^a	1.67±0.29 ^a	100.00±0.00	342.05±8.94 ^a	96.47±6.23 ^a	7.28±0.41 ^a
Duroc (n=4)	184.50±13.13 ^a	3.00±0.00 ^a	100.00±0.00	365.75±7.75 ^a	108.25±7.56 ^a	6.50±1.26 ^a
Landrace (n=13)	177.75±8.54 ^a	1.70±0.17 ^a	100.00±0.00	354.54±13.60 ^a	128.46±8.75 ^b	7.46±0.58 ^a
Local (n=2)	149.00±10.00 ^a	2.00±0.00 ^a	100.00±0.00	373.50±15.50 ^a	70.00±20.00 ^a	6.00±1.00 ^a
P- value	0.32	0.43		0.56	0.01	0.69
Type of farms						
Semi-modern (n=18)	189.76±6.24 ^a	1.44±0.24 ^a	100.00±0.00	342.83±8.73 ^a	91.33±3.42 ^a	6.33±0.36 ^a
Modern (n=19)	169.16±4.61 ^b	1.91±0.21 ^a	100.00±0.00	355.68±10.05 ^a	121.16±8.58 ^b	7.89±0.46 ^b
P- value	0.01	0.10		0.41	0.01	0.03
Feed						
Mixed (n=19)	191.39±6.10 ^a	1.60±0.27 ^a	100.00±0.00	345.26±8.61 ^a	93.37±3.82 ^a	6.47±0.37 ^a
Complete (n=19)	169.16±4.61 ^b	1.91±0.21 ^a	100.00±0.00	355.68±10.05 ^a	121.16±8.58 ^b	7.89±0.46 ^b
P- value	0.01	0.37		0.44	0.00	0.02

^{a,b}Means within the same column with different indices are significantly different at $P < 0.05$. n=number.

Table 4. Effect of breed, type of farm and feed on reproductive performance in sows.

Parameters	FI	Fecundity (%)	LS	FarI (days)
Breed				
Large-white (n=20)	1.15±0.08 ^a	100.00±0.00	9.55±0.31 ^a	184.63±4.85 ^a
Duroc (n=8)	1.12±0.12 ^a	100.00±0.00	6.86±0.96 ^b	166.37±8.81 ^a
Landrace (n=8)	1.12±0.12 ^a	100.00±0.00	10.13±0.67 ^a	172.37±10.23 ^a
Local (n=2)	1.00±0.00 ^a	100.00±0.00	7.00±2.00 ^c	202.67±14.38 ^a
P-value	0.95		0.00	0.10
Type of farms				
Semi-modern (n=21)	1.14±0.08 ^a	100.00±0.00	9.00±0.53 ^a	171.75±4.11 ^a
Modern (n=15)	1.13±0.09 ^a	100.00±0.00	8.93±0.51 ^a	186.47±7.80 ^a
P-value	0.86		0.81	0.19
Feed				
Mixed (n=23)	1.13±0.07 ^a	100.00±0.00	9.09±0.49 ^a	173.18±4.01 ^a
Complete (n=15)	1.13±0.09 ^a	100.00±0.00	8.93±0.51 ^a	186.47±7.80 ^a
P-value	0.98		0.83	0.11

^{a,b,c}Means within the same column with different indices are significantly different at $P < 0.05$. n=number.

Table 5. Effect of breed, type of farm and feed on growth performance in piglets.

Parameters	BWt (kg)	WWt (kg)	AW (days)	Mortality rate (%)
Breed				
Large-white (n=145)	1.35±0.02 ^a	10.76±0.92 ^a	57.34±0.69 ^a	46.96 ^a
Duroc (n=46)	1.37±0.03 ^a	11.01±0.21 ^b	58.30±0.97 ^a	18.53 ^b
Landrace (n=91)	1.26±0.01 ^b	10.43±0.17 ^a	56.12±0.91 ^{a,b}	30.03 ^c
Local (n=12)	1.18±0.03 ^b	8.52±0.18 ^c	51.25±2.23 ^b	4.47 ^d
P-value	0.000	0.000	0.041	0.000
Type of farms				
Semi-modern (n=162)	1.27±0.01 ^a	10.22±0.10 ^a	55.47±0.77 ^a	51.76 ^a
Modern (n=118)	1.38±0.02 ^b	11.15±0.14 ^b	60.07±0.21 ^b	37.70 ^b
P-value	0.000	0.000	0.000	0.000
Feed				
Mixed (n=175)	1.27±0.01 ^a	10.24±0.09 ^a	54.80±0.75 ^a	60.70 ^a
Complete (n=119)	1.38±0.02 ^b	11.15±0.14 ^b	60.07±0.21 ^b	39.30 ^b
P-value	0.000	0.000	0.000	0.000

^{a,b,c,d}Means within the same column with different indices are significantly different at $P < 0.05$. n=number.

Of the 38 gilts in this study, only 42.9% were successfully bred during their first heats. FI was better in sows compared to gilts. Multi-parity being an important fertility factor, FI tended to 1 with older sows (Labroue *et al.*, 2000). It is recommended that gilts should be serviced during their 2nd and 3rd heat to avoid the risk of dystocia and increase birth weight of piglets and hence their viability (FAO, 2009). The average AFF of gilts was within the range (348 to 487 days) reported by Aloeyi (1997) and Missohou *et al.* (2001) in Togo and Senegal, respectively; was slightly less

than that described by Aumaitre *et al.* (1966) and Legault *et al.* (1996) in France but higher than that of local pigs in Benin (Ayssiwede, 2005) and in Central African Republic (Mopate-Logtene *et al.*, 2009). This variation might have been due to breed and breeding environment. Reproductive performance is influenced by weight gain regardless of the farming system in place. The performance of the local pigs in Cameroon was low compared to some hybrids and exotic breeds (Keambou *et al.*, 2010). The average WtFF is comparable to that reported by Rozeboom *et al.* (1996), but much higher than

the 62.3 kg and well below 158.1 kg obtained from local and improved breeds respectively (CDDR/SAILD, 1996). In this study, the Local breeds have the lowest WtFF. This corroborates with the results of Rozeboom *et al.* (1996) who reported higher WtFF in exotic breeds than local breeds. Animals raised on modern farms and fed complete feed had the best WtFF due to the positive effect of feeding on the breeding conditions of animals. Messi (1982) stated that though the final weight of the animal depends on several factors such as breed, birth weight, management system and fattening period. Diet therefore plays an important role in the reproductive performance and growth of animals irrespective of breed, and thus the profitability of farm operations (Ayssiwede, 2005).

The LS of gilts is similar to that reported in Benin (Ayssiwede, 2005) and in Pala, Garoua and Bangui (Mopate-Logtene *et al.*, 2009), but lower than the values found in Nigeria (Smith, 1982), Senegal (Lokossou, 1982; Missohou *et al.*, 2001) and Europe (Eastwood *et al.*, 2011). LS increased with age and parity as average LS was significantly higher in sows than gilts. The development of the female reproductive organs usually attains full potential after several parities. Landrace pigs were very prolific (CDDR/SAILD, 1996) in Cameroon. According to Labroue *et al.* (2000), LS initially increases with parity and then decreases until 7th and 8th farrowing (Youssao *et al.*, 2009). The age factor is followed by breed and farm type. Exotic breeds and hybrids are more prolific than local breeds (Keambou *et al.*, 2010). Similarly, poor breeding conditions cause a decrease in the numerical and weight productivity in pigs (Youssao *et al.*, 2008). However, other authors suggest that body conditions of gilt did not influence the LS during the first three parities (Rozeboom *et al.*, 1996).

The FarI observed in this study is comparable to the 176 days reported in Togo (Aloeyi, 1997); higher than the 160 days in France (Eastwood *et al.*, 2011) but lower than the 188 and 246 days reported in Benin (Ayssiwede, 2005) and Madagascar (Razafimanantsoa, 1988), respectively. That the Cameroonian pigs were farrowing twice a year is a good indicator of the breeding potential that can be exploited in planning improvement program to increase pig population in Cameroon.

There were more male than female piglets per litter as has been previously reported (Solignac *et al.*, 1989). However, Lougnon and Picard (1982) were of the opinion that this sex ratio is influenced by LS. In this study LS greater than 7 were dominated by males. Local breeds littered more male piglets, but whatever the breed, the number of male piglets littered was above 50% of the new born (Solignac *et al.*, 1989). Though breeding system and livestock production

techniques may influence the proportion of male births (Ayssiwede, 2005).

The average BWt of the pigs were similar to those reported by Canope and Raynaud (1980) in Guadeloupe; lower than those of several authors (Razafimanantsoa, 1988; Missohou *et al.*, 2001; Ayssiwede, 2005) but greater than the weight reported by Smith (1982) and Abdallah (1997) in Nigeria and the Central African Republic, respectively. These variations may be due to several factors including breed and the management systems of the various farms studied.

In a similar way, the WWt and AW were different from those reported in other studies in tropical countries (Bastianelli, 2002; Ayssiwede, 2005). The exotic breeds, despite the tropical rearing conditions, had better WWt than Local breeds. This study demonstrated that there is a positive correlation between growth and breeding conditions.

The mortality rate observed was higher than 15.9% reported by Solignac *et al.* (1989) in France but lower than the 67.5% obtained by Ayssiwede (2005) in Benin farms. Higher mortality rates amongst the exotic breeds could be linked to their poor adaptability to tropical conditions and inappropriate handling of dams during farrowing due to inexperience of farmers. In addition, overcrowding in the type 2 and 3 farms might have helped in the spread of certain diseases, resulting in high mortalities and fewer weaned piglets. Also diets that are not tailored to the breed's need may be a source of increase morbidity and mortality (Sambou, 2010).

Conclusion

The reproductive and growth performances of pigs in the peri-urban area of Douala were strongly influenced by breed, type of farm and source of feed. Simple changes in the management and breeding technique could possibly improve on these performances.

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