Abstract W400

Length of productive life and lifetime production of Landrace, Yorkshire and crossbred sows raised under Thai tropical conditions

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SUMMARY

Length of productive life (**LPL**) and lifetime production of sows are important for commercial swine business. These traits need to be considered for the improvement of sow productivity and efficiency. The aim of this study was to characterize factors affecting **LPL** and lifetime piglets born alive (**LB**), lifetime piglets death loss (**LL**), lifetime weaned piglets (**LW**), and lifetime non-productive sow days (**LN**) in Landrace (L), Yorkshire (Y) and F1 crossbreds between L and Y (C) sows evaluated in a Thai commercial farm. Data included records of 1,239 L, 397 Y and 153 C sows born between 2001 and 2010. The **LPL** was defined as the number of days between sow age at first farrowing and sow age at weaning of her last farrowing. The **LB**, **LL**, **LW**, and **LN** were the sum of all individual measurements of each trait during this period. The model included year-season and breed group (L, Y, and C) as subclass fixed effects, age at first farrowing (9 to 17 mo) as a fixed covariate, and residual as a random effect. Least squares means (LSM) were estimated for all breed groups. Year-season effects were important for all traits (P < 0.01). Sows that began to farrow at older ages had significantly shorter **LPL** (-17.4 ± 7.1 d/mo; P = 0.01), lower **LB** (-1.2 ± 0.5 piglets/mo; P = 0.03), and lower **LW** (-1.2 ± 0.5; piglets/mo; P = 0.009) than sows that started farrowing at younger ages. Breed group effects were significant (P < 0.05) for **LL**, **LW** and **LN**, but not for **LPL** and **LB**. Yorkshire sows had the highest **LL** (8.5 ± 0.4 piglets) and **LW** (47.6 ± 1.3 piglets), L sows had the lowest **LL** (7.4 ± 1.0 piglets), **LW** (43.6 ± 0.7 piglets), and **LN** (30.3 ± 0.6 d), and C sows had the highest **LN** (33.5 ± 1.7 d) of all breed groups. Thus, Y sows were the most productive over their lifetime (highest **LW**) of all breed groups in this commercial herd. This study needs to be repeated with a large number of herds in Thailand to verify if results here apply to the whole swine population in this tropical country.

INTRODUCTION

Thailand is a tropical country in southeast Asia where pork consumption has been steadily increasing in recent years resulting in substantially higher competition among commercial swine producers. Currently, Thailand has a population of 9,681,774 pigs, of which 6,092,239 (63%) were used for fattening, 2,877,592 (30%) for breeding, and 11,943 (7%) were native pigs. Under strong economic competition, the efficiency of pig production becomes a key factor to the survival of swine commercial operations. Length of sow productive life (**LPL**; the number of days between sow age at first farrowing and sow age at weaning of her last farrowing) and lifetime production traits (i.e., **LB**, **LL**, **LW** and **LN;** the sum of all individual measurements of each trait during the lifetime of a sow) are important for profitability. Highly productive sows that have high **LPL** would have lower costs of production and higher margins of profitability increasing the economic efficiency of the commercial farm. Thus, ***the objective of this study were to characterize factor affecting length of productive life and lifetime production traits of sows raised under tropical conditions in Thailand.***

MATERIALS AND METHODS

Data, Animals and Traits. The dataset consisted of pedigree and phenotypic records from 1,239 Landrace (L), 397 Yorkshire (Y) and 153 crossbreds between L and Y (C) sows born in 2001 to 2010 in a commercial swine farm in Thailand. All sows had completed their productive life and had been removed from the farm. Traits were Length of productive life (**LPL**), lifetime piglets born alive (**LB**), lifetime piglet death loss (**LL**), lifetime piglets weaned (**LW**), and lifetime non-productive sow days (**LN**). The **LPL** was defined as the number of days between sow age at first farrowing and sow age at weaning of her last farrowing. The **LB**, **LL**, **LW**, and **LN** were the sum of all individual measurements of each trait during this period.

Climate, Nutrition and Management. Seasons were winter (November to February; 3.8°C to 37.7°C and 49.0% to 83.0%RH), summer (March to June; 13.8°C to 42.4°C; 44.0% to 84.0%RH), and rainy (July to October; 14.0°C to 39.0°C; 74.0% to 90.0%RH). All gilts and sows were managed in an open-house system with foggers (gilts and non-lactating sows) or dippers (nursing sows) that were activated when the ambient temperature rose above 33°C. Non-lactating sows and gilts received 2.5 kg of concentrate twice a day (16% crude protein and 3,200 to 3,500 kcal/kg). Nursing sows were fed 5 to 6 kg of concentrate (17 to 18% crude protein and 4,060 kcal/kg) 4 times a day.

Replacement gilts were chosen based on their growth and reproduction, and information of their ancestors for piglet production. Estrus of gilts and weaned sows was detected by boar exposure every day. Gilts were inseminated for the first time at 8 to 9 months of age or 140 kg of body weight. Gilts and sows were inseminated twice with the same boar (12 h after detection of estrus and 12 h after the first insemination). Pregnant sows were kept in a breeder cage until approximately 7 days before parturition, and then taken to a farrowing barn with dippers. Piglets were weaned at roughly 7 kg (26 to 30 d of age).

Data Analysis: The model included year-season and breed group (L, Y, and C) as subclass fixed effects, age at first farrowing (9 to 17 mo) as a fixed covariate, and residual as a random effect. Least squares means (LSM) were estimated for all year-season and breed group subclasses. The year-season LSM for each trait (**LPL**, **LB**, **LL**, **LW** and **LN**) were averaged across seasons within years, and then used to estimate phenotypic trends as the regression of yearly LSM on year. Breed group (L, Y, and C) LSM for all traits were compared using t-tests. Significant differences were considered at α = 0.05. Differences between the LSM of C and the average LSM of L and Y were also computed for all traits.

RESULTS AND DISCUSSION

Year-season effects were important for all traits (P < 0.01). The LSM across year-season subclasses ranged from 234.7 ± 62.3 d to 732.8 ± 54.6 d for **LPL** (498 d), 23.4 ± 4.7 piglets to 55.4 ± 2.6 piglets for **LB** (22 piglets), 4.9 ± 1.1 piglets to 9.5 ± 0.6 piglets for **LL** (5 piglets), 18.5 ± 4.1 piglets to 48.3 ± 2.3 piglets for **LW** (30 piglets), and 17.5 ± 3.4 d to 40.7 ± 2.9 d for **LN** (23 d). Differences in LSM for **LPL**, **LB, LL**, **LW** and **LN** indicated that environmental effects differed greatly among year-seasons in this herd. Considering average LSM across seasons in particular years, significant changes were found only for **LPL** (-19.3 ± 6.9 d/yr; P = 0.01) and **LN** (-1.2 ± 0.3 d/yr (P = 0.001). The decreasing trend over years for **LPL** was associated with a decreasing trend for **LN** (r = 0.81; P < 0.001). This producer may have tried to keep a certain level of productivity (**LB**, **LL** and **LW**) related to market demand, while simultaneously reducing the number of non-productive sow days (**LN**), with the aim of reducing costs of production and increasing profitability per sow.

Table 1. Regression coefficients and their P-values for length of productive life and lifetime production traits

Traits	Regression Coefficients of beginning age (month)	P value
Length of productive life, d	-17.35 ± 7.07	0.0143
Lifetime piglets born alive, piglets	-1.20 ± 0.54	0.0254
Lifetime piglet death loss, piglets	-0.01 ± 0.13	0.9652
Lifetime piglets weaned, piglets	-1.22 ± 0.47	0.0087
Lifetime non-productive sow days, d	0.40 ± 0.37	0.2888

Sows that began to farrow at older ages had significantly shorter **LPL** (-17.4 ± 7.1 d/mo; P = 0.01), lower **LB** (-1.2 ± 0.5 piglets/mo; P = 0.03), and lower **LW** (-1.2 ± 0.5; piglets/mo; P = 0.009) than sows that started farrowing at younger ages (**Table 1**). These results suggested that gilts that reached puberty at earlier ages got pregnant more quickly, had lager litter sizes at birth and at weaning, and consequently stayed longer in the production system. These results were similar to those found in swine farms in the tropics of Mexico, as reported by Segura-Correa *et al.* (2011). However reducing age at first farrowing or making replacement gilts to farrow at younger ages should be accompanied by better management and nutrition to guarantee that they reach puberty at an appropriate body weight.

Table 2. Least squares means for length of productive life and lifetime production traits in Landrace, Yorkshire and their Crossbreds

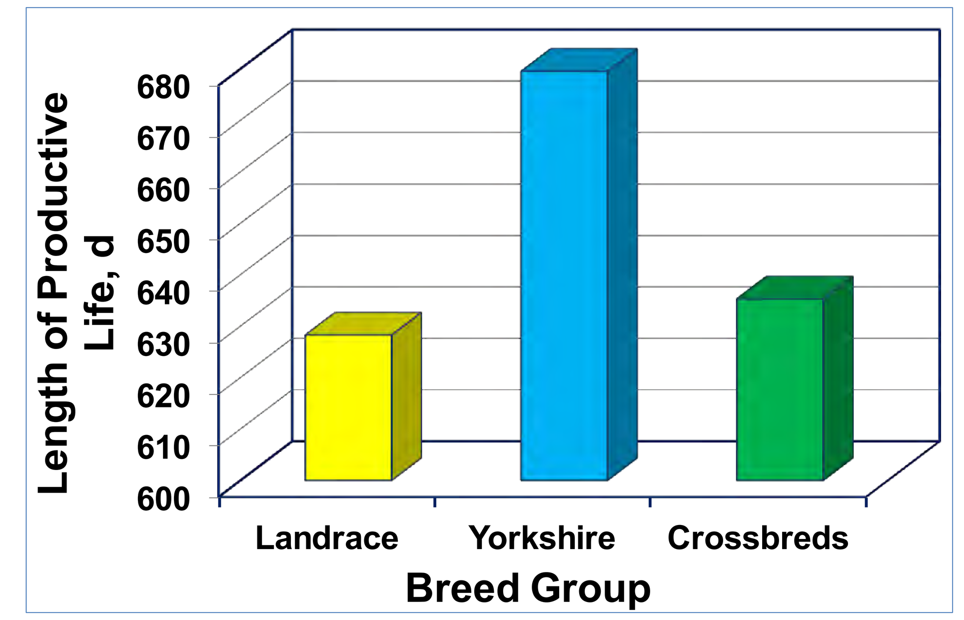
Traits	Breed Groups		
	Landrace	Yorkshire	Crossbreds
Length of productive life, d	628.25 ± 11.16^{b}	679.51 ± 19.64^{a}	635.29 ± 32.91^{ab}
Lifetime piglets born alive, piglets	50.87 ± 0.85	52.05 ± 1.49	52.64 ± 2.50
Lifetime piglet death loss, piglets	7.41 ± 0.97^{b}	8.49 ± 0.35^{a}	7.71 ± 0.59^{ab}
Lifetime piglets weaned, piglets	43.57 ± 0.74^{b}	47.62 ± 1.29^{a}	45.24 ± 2.17^{ab}
Lifetime non-productive sow days, d	30.25 ± 0.59^{b}	33.01 ± 1.03^{ab}	33.48 ± 1.74^{a}

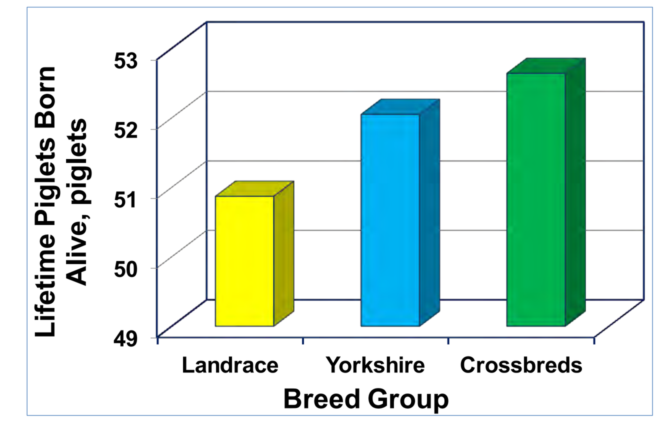
$^{a, b}$ Least squares means within the same row with different superscripts are differ (P < 0.05)

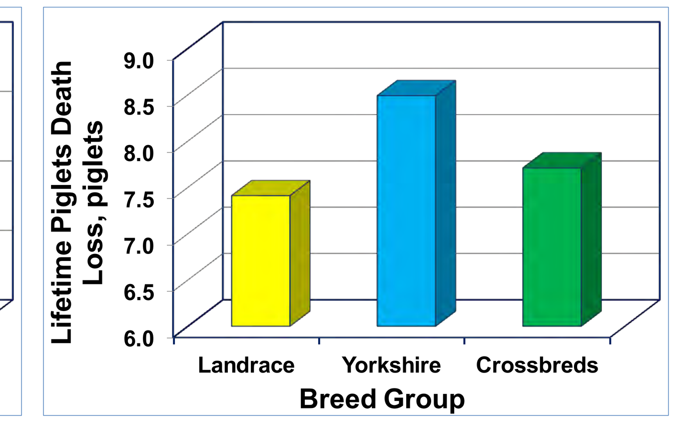
Breed group effects were significant (P < 0.05) for **LL**, **LW** and **LN**, but not for **LPL** and **LB**. Yorkshire sows had the highest **LL** (8.5 ± 0.4 piglets) and **LW** (47.6 ± 1.3 piglets), L sows had the lowest **LL** (7.4 ± 1.0 piglets), **LW** (43.6 ± 0.7 piglets), and **LN** (30.3 ± 0.6 d), and C sows had the highest **LN** (33.5 ± 1.7 d) of all breed groups. Non significant differences among L, Y and C for **LPL** and **LB** found here may have occurred either because sows from these 3 breed groups had similar genetic potential or because environmental conditions were insufficient for genetic differences among breed groups to be expressed. Although Y sows had higher piglet death losses (**LL;** 8.49 ± 0.35 piglets *vs.* 7.41 ± 0.97 piglets; P < 0.05) than L over their lifetime, they had more lifetime piglets weaned (**LW**; 47.62 ± 1.29 piglets *vs.* 43.57 ± 0.74 piglets; P < 0.05) than L. In contrast, the LSM of C for **LL** and **LW** were in between Y and L, except for **LN** (**Table 2**). Thus, Y sows were the most productive (highest **LW**) of all breed groups over their lifetime in this commercial herd.

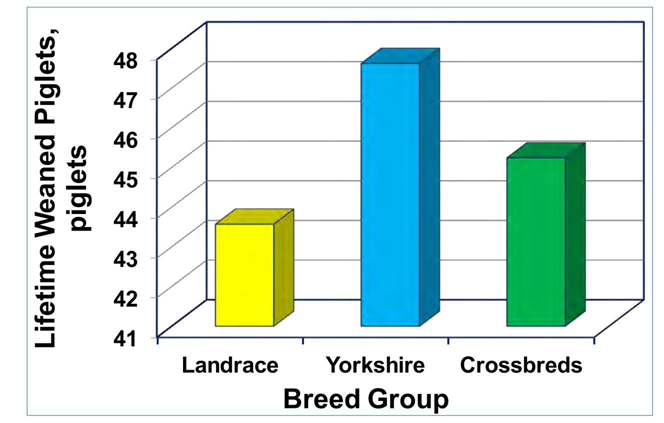
The LSM of C sows was more favorable than the average LSM values of L and Y sows for **LB** (2.3%) and **LL** (-3.0%), but not for **LPL** (-2.8%), **LW** (-4.3%) and **LN** (5.8%). These results may be related to the combined effects of heterosis, additive genetic, and environmental effects. Heterosis increased fertility (higher **LB**) and survival (lower **LL**) of C sows, but perhaps they required a higher level of nutrition than Y and L sows to maintain milk production levels and to rebreed quickly resulting in lower **LW**, higher **LN**, and consequently, lower **LPL** than L and Y sows.

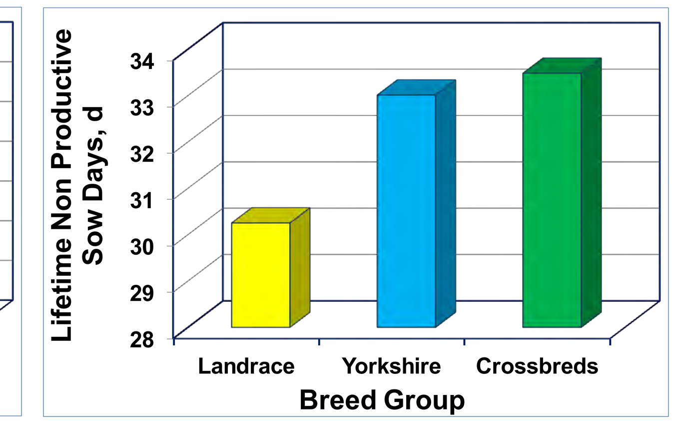
Sows in this population had **LPL** 631.5 d (SD = 354.1 d), **LB** 51.0 piglets (SD = 26.5 piglets), **LL** 7.9 piglets (SD = 6.2 piglets), **LW** 44.3 piglets (SD = 23.0 piglets), and **LN** 30.7 d (SD = 17.9 d). The **LPL** of sows here was higher than values reported in other studies (496 to 584 d; Lucia *et al*., 2000; Englblom *et al.*, 2008; Segura-Correa *et al.*, 2011). In addition to genetics, health, nutrition, and culling and replacement practices in this farm may have contributed to differences in **LPL**. This study needs to be repeated with a large number of farms to verify if the results obtained here appropriately represent the swine population in Thailand.











FINAL REMARKS

- Year-season, breed group and age at first farrowing were important for all traits.
- Sows that began to farrow at older ages had significantly shorter lengths of productive life and lower lifetime production than sows that started farrowing at younger ages.
- Yorkshire sows had the longest length of productive life of all breed groups.
- Purebred sows had lower number of non-productive sow days than crossbred sows.

LITERATURE CITED

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