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Examining Phenotypic Structural Traits as Indicators for Reproductive Longevity Success in Sows

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PROBLEM

- Structure is the second most common reason that sows are culled on swine operations.
- If a sow is culled before she achieves her third parity, then she was not an economic asset to the operation.
- After parity three, each piglet a sow raises gives a profit of two dollars and thirty cents.
- Sow longevity is also a major welfare issue for the pork industry.
- The longevity of sows is important to all sow farms locally, nationally, and internationally.

Materials and Methods

- 494 females in 4 reps were videoed for structure traits across 17 time points throughout their life.
- Still images were pulled from the videos when the sow was standing in her natural stance.
- The images were analyzed and interpreted objectively with ImageJ.
- Structural data was analyzed for association with reproductive efficiency and longevity traits using JMP statistical software.

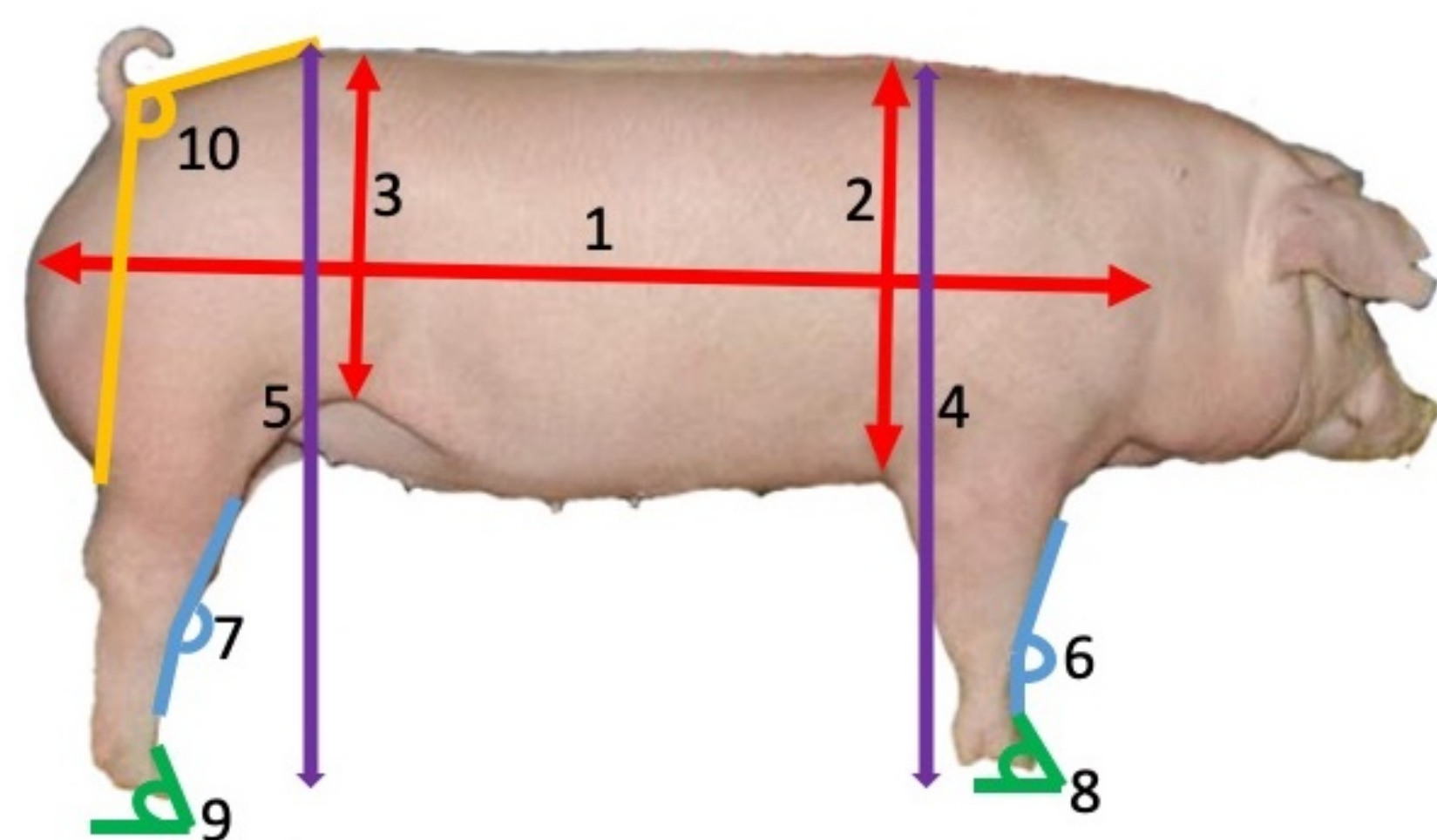


Figure 1. Structural traits measured.
1: body length, 2: body depth shoulder, 3: body depth flank, 4: height shoulder, 5: height flank, 6: knee angle, 7: hock angle, 8: front pastern angle, 9: rear pastern angle, 10: rump slope.

RESULTS

- Significant associations ($P < 0.05$) are shown in red.
- Trait associations showing a trend for significance ($P = 0.05 - 0.1$) are shown in black.

Table 1. Association Between Body Size and Production Traits

	P1 Success	LTNP	LT-NBA	LT-TNB	LT-PWM	LT-NW	P1 LFI	P1 LWL	P1 WEI
T1 Length	0.18	0.13	0.18	0.24	0.47	0.76	0.96	0.82	0.72
T2 Length	0.22	0.56	0.57	0.54	0.6	0.36	0.96	0.56	0.24
T3 Length	0.52	0.28	0.54	0.82	0.76	0.23	0.81	0.56	0.03
T1 Depth Shoulder	0.18	0.03	0.18	0.25	0.17	0.61	0.73	0.89	0.48
T2 Depth Shoulder	0.16	0.57	0.1	0.88	0.42	0.09	0.04	0.11	0.12
T3 Depth Shoulder	0.49	0.09	0.3	0.45	0.14	0.07	< 0.01	0.03	0.85
T1 Depth Flank	0.18	0.06	0.19	0.26	0.25	0.82	0.92	0.61	0.27
T2 Depth Flank	0.29	0.69	0.41	0.29	0.09	0.05	0.1	0.21	0.03
T3 Depth Flank	0.33	0.38	0.69	0.95	0.01	< 0.01	0.07	0.31	0.57
T1 Height Flank	0.02	< 0.01	0.03	0.05	0.2	0.9	0.62	0.72	0.4
T2 Height Flank	0.45	0.05	0.09	0.14	0.12	0.09	0.91	0.52	< 0.01
T3 Height Flank	0.13	0.01	0.21	0.07	0.38	0.44	0.11	0.03	0.74

Table 2. Association Between Body Angles and Production Traits

	P1 Success	LTNP	LT-NBA	LT-TNB	LT-PWM	LT-NW	P1 LFI	P1 LWL	P1 WEI
T1 Knee	0.82	0.68	0.97	0.9	0.98	0.16	0.15	0.06	0.3
T2 Knee	0.96	0.37	0.67	0.47	0.89	0.92	0.32	0.4	0.93
T3 Knee	0.09	0.02	0.11	0.08	< 0.01	0.1	0.88	0.52	0.64
T1 Hock	0.53	0.78	0.88	0.71	0.28	0.18	0.17	0.19	0.74
T2 Hock	0.45	0.15	0.11	0.1	0.89	0.8	0.99	0.24	0.54
T3 Hock	0.56	0.78	0.8	0.71	0.08	0.23	0.71	0.93	0.51
T1 Front Pastern	0.04	0.08	0.1	0.06	0.58	0.83	0.71	0.49	0.66
T2 Front Pastern	0.94	0.77	0.94	0.95	0.82	0.72	0.1	0.54	0.56
T3 Front Pastern	0.47	0.56	0.77	0.81	0.53	0.79	0.24	0.81	0.38
T1 Back Pastern	0.85	0.64	0.35	0.44	0.37	0.87	0.4	0.65	0.87
T2 Back Pastern	0.08	0.34	0.37	0.36	0.44	0.51	0.92	0.87	0.31
T3 Back Pastern	0.03	0.06	0.11	0.1	0.43	0.89	0.27	0.13	0.48

P1 Success (Successfully produced to Parity 1), LTNP (Lifetime Number Parities Produced), LT-NBA (Lifetime Number Born Alive through 4 parities), LT-TNB (Lifetime Total Number Born though 4 parities), LT-PWM (Lifetime Prewaning Mortality through 4 parities), LT-NW (Lifetime Number Weaned through 4 parities), P1 LFI (Parity 1 Lactation Feed Intake), P1 LWL (Parity 1 Lactation Weight Loss), P1 WEI (Parity 1 Weaning to Estrus Interval), T1 (112 Days of Age), T2 (210 Days of Age), T3 (Early First Gestation).

DISCUSSION

- The height at the flank (Table 1) at all timepoints had a significant impact on LTNP and it was also significant for P1 Success, LT-NBA, and LT-TNB at T1.
- The depth at the shoulder (Table 1) is significant at both T2 and T3 for P1 LFI and is also trending toward significance for LT-NW. Additionally, at T3 LTNP was trending toward significance.
- The depth at the flank (Table 1) at T2 and T3 is trending toward significance for LT-LFI.
- The knee angle (Table 2) at T3 was significant for LTNP and LT-PWM and is trending toward significance for P1 Success, LT-TNB, and LT-NW. The T1 was trending toward significance for P1 LWL.
- The hock angle (Table 2) at T2 was trending toward significance for TNB.
- The front pastern angle (Table 2) at T1 was significant for P1 Success trending toward significance for LTNP, LT-NBA, LT-TNB and was.
- The back pastern angle (Table 2) at T3 was significant for P1 Success and is trending toward significance for LTNP and LT-TNB.
- The angle measurements on young sows are not as consistent as older, calmer sows.

CONCLUSION

- Front pastern angle was significantly associated with P1 Success at 112 days of age. This trait is critical to early survival before any animals are culled.
- Angles showed significance or trended toward significance predominately at the early first gestation timepoint.
- Height at flank at all timepoints is significantly associated with LTNP. The data (not shown) indicates that smaller animals have a greater success reaching parity 4 and significant advantages in lifetime reproduction traits compared to the larger animals. As producers are making selections on their replacement gilts, they should avoid selecting the largest females.