

## Economic Impact of Strategies to Increase Pig Weaning Age

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The development of multi-site production systems has encouraged the financial performance for each phase of production (sow, nursery, finishing or wean-to-finish) to be independently evaluated. The sow farm is either a cost or a profit center depending on if ownership of the weaned pig is transferred at weaning. Regardless of being a cost or profit center, sow farm revenue and production costs are typically calculated on a per weaned pig basis. In contrast, other phases of production use weight to derive cost and revenue. Thus, the accepted standard for measuring cost and revenue assumes that all weaned pigs meeting minimum standards have equal value. These accepted accounting practices generally encourage a reduction in lactation length and weaning age because increasing weekly farrowings will typically increase pigs weaned per week. With only a fixed amount of lactation space is available the increase in litters farrowed each week results in weaning age being reduced. We believe these practices have led to utilization of relatively short lactation lengths (16 to 18 d) in large segments of the North American swine industry. These practices drive down weaned pig cost based on the assumption that regardless of weaning age or weight weaned pig value is the same. Therefore, we embarked on a project over the last several years to measure the impact of lactation length on postweaning growth performance and develop an economic framework for evaluating changes in lactation length have on whole herd profit (Main et al. 2004, 2005a,b).

These experiments were completed with pigs originating from a 7,300-head sow farm with pigs flowing into single source, all-in all out nursery and finishing sites. In Trial 1, treatments included weaning litters of pigs at 12, 15, 18, or 21 days of age. In Trial 2, litters were weaned at 15, 16, 18, 19, 21, or 22 days of age. This resulted in three wean age treatments (15.5, 18.5, and 21.5 days of age, i.e., 15.5 days = 50% 15 day pigs, and 50% 16 day pigs). Litters were ear notched at birth (18 to 20 litters/day of weaning age in each block), and all pigs were subsequently individually ear-tagged, weighed, and gender recorded three days prior to weaning. Each trial had four blocks. Each block consisted of all weaning age treatments weaned on the same day into the same nursery. Each block remained intact as pigs were transferred from nursery to finishing site.

In both trials there were linear improvements in nursery growth rate and mortality (Table 1 and 2). This resulted in a significant linear improvement in d 42 after weaning weight and weight per day of age. Pigs were evaluated for growth rate and mortality in the subsequent finishing period (Table 3 and 4). Finisher ADG was again improved linearly in both trials but mortality was unaffected as weaning age increased. Wean to finish growth rate and mortality were linearly improved in both trials. These improvements in growth rate resulted in linear improvements in off-test weight on d 156 after weaning in Trial 1 and d 153 after weaning in trial 2. As an additional measure to evaluate the impact

of weaning age the mortality and off test average weight were combined to calculate a weight sold per pig weaned. Again, the weight sold per pig weaned was linearly improved with increasing weaning age in both trials.

There were several striking observations from the trial. The first was the consistency of the response across the two trials seemed to indicate that within this production system that the response was fairly predictable. Also, these data have been reproduced across several production systems in North America and has largely agreed with this data very well. The growth rate response appears to be more predictable than the mortality decrease. The mortality decrease appears to be highly dependant upon the baseline mortality of the production system. The second striking observation was that these linear improvements in growth and mortality largely occur in the 42-day post-weaning period, with some ongoing growth improvements in the finishing phase. The major implications of this finding is that nursery exit weights at a fixed time after weaning can be easily monitored within a production system as an indirect measure of whether the expected growth rate improvements are being captured in the entire wean to finish period. Finally, this data also clearly indicates that when evaluating nursery performance mean and variability in lactation length need to be known to adequately benchmark the performance.

Due the consistency between trials, we developed regression equations to determine the slopes of the responses across the two trials (Table 5). Subsequently, we used these slopes to determine an economic model to evaluate the impact of lactation length and weaning age on costs and revenue (Main et al., 2005a). From these models we developed an impact on income or profitability per day of weaning age increase. These were determined to range from \$0.58 per day in a finishing system (limited space) where a decrease in growth rate would reduce market weight to a value of \$0.39 in a finishing system with adequate capacity to maintain an adequate market weight with slower growth rate.

Further economic analysis was performed to evaluate different strategies to manipulate lactation length through the increase in farrowing crate utilization, construction of additional lactation space, or reduction in sow inventory (Main et al. 2005b). The major conclusions from this work indicate that reducing sow inventory to increase lactation length leads to little improvement in overall system profitability. This is largely mediated through the reduction in inventory that leads to a lower number of pigs weaned. Although these pigs are heavier and grow faster, these improvements in efficiency do not make up for the reduced total number of pigs produced. Increasing farrowing crate utilization has good return without additional capital inputs. However, on many farms crate utilization is can not be increased further. Although capital intensive, the marginal addition of additional farrowing crates results in increased growth and productivity of every pig produced from the farm. Our experience has indicated that the return for adding additional lactation spaces to increase lactation length has a payback of less than two years in many production systems.

## Literature Cited

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**Table 1. Influence of weaning age on nursery performance in trial 1<sup>a</sup>**

Item	Trial 1 Weaning age <sup>a</sup>				SE	Probability (P<)	
	12	15	18	21		Linear	Quad
Allotment weight, kg	3.4	4.3	4.9	5.7	0.05	0.001	0.77
ADG, g	299	368	409	474	7	0.001	0.66
ADFI, g	426	511	565	654	11	0.001	0.64
Gain/feed	0.70	0.72	0.73	0.72	0.01	0.001	0.03
Mortality, %	5.2	2.8	2.1	0.5	0.76	0.001	0.55
d 42 post-weaning, kg	16.9	20.3	22.6	25.8	0.26	0.001	0.60
d 42 post-weaning weight per d of age, g	313	356	377	410	4	0.001	0.08

<sup>a</sup>2272 pigs with 34 or 36 pigs per pen (50% barrows, 50% gilts), and 16 replications (pens) per treatment, or a total of 64 pens on test.

**Table 2. Influence of weaning age on nursery performance in trial 2<sup>a</sup>**

Item	Trial 2 Weaning age <sup>b</sup>				SE	Probability (P<)	
	15.5	18.5	21.5	SE		Linear	Quad
Allotment weight, kg	4.1	4.8	5.6	0.09	0.001	0.001	
ADG, g	435	481.5	525	14	0.001	0.70	
ADFI, g	565	631.5	701	15	0.001	0.79	
Gain/feed	0.77	0.76	0.75	0.005	0.001	0.69	
Mortality, %	2.2	1.6	1.3	0.5	0.09	0.69	
d 42 post-weaning, kg	22.9	25.4	28.1	0.64	0.001	0.57	
d 42 post-weaning weight per d of age, g	398	420	442	10	0.001	0.91	

<sup>a</sup>3456 pigs with 36 pigs per pen (18 barrows, 18 gilts), and 16 replications (pens) per treatment, or a total of 96 pens on test.

**Table 3. Influence of weaning age on finishing and wean to finish performance, Trial 1<sup>a</sup>**

Item	Weaning age				SE	Probability (P<)	
	12	15	18	21		Linear	Quad
<u>Finishing</u>							
ADG, g	722	728	736	768	11	0.002	0.19
Mortality, %	4.4	5.2	4.8	3.1	0.94	0.32	0.19
<u>Wean to Finish</u>							
ADG, g	580	616	637	687	8	0.001	0.36
Mortality, %	9.9	7.9	6.8	3.7	0.95	0.001	0.39
<u>Weight, kg</u>							
Off-test, d 156 postweaning	103.9	109.1	112.1	117.3	0.81	0.001	0.94
Sold per pig weaned, kg	94.1	100.5	104.4	113.1	1.30	0.001	0.35

<sup>a</sup>1920 pigs were allotted from the nursery to the finishing phase of this study on

d 42 post-weaning with 20 pigs (10 barrows, 10 gilts) per pen and 24 replications (pens) per treatment, or 96 pens on test.

**Table 4. Influence of weaning age on finishing and wean to finish performance, Trial 2<sup>a</sup>**

Item	Weaning age			SE	Probability (P<)		
	15.5	18.5	21.5		Linear	Quad	
<u>Finishing</u>							
ADG, g	782.5	789	805.5	12	0.003	0.58	
Mortality, %	1.80	1.90	1.20	0.62	0.30	0.42	
<u>Wean to Finish</u>							
ADG, g	671	699	718	7	0.001	0.78	
Mortality, %	4.95	2.99	2.77	0.69	0.03	0.69	
<u>Weight, kg</u>							
Off-test, d 153 postweaning	112.0	115.6	119.2	1.33	0.001	0.91	
Sold per pig weaned, kg	106.9	111.8	115.7	1.2	0.001	0.70	

<sup>a</sup>3000 pigs were allotted from the nursery to the finishing phase of this study on

d 42 post-weaning with 25 pigs (12 barrows, 13 gilts) per pen and 20 replications (pens) per treatment, or a total of 120 pens on test.

**Table 5. Linear rates of change as wean age increases from 15 to 21.5 days at \$88/100 kg (\$40/cwt) live-weight market price**

Item	Rates of linear change per day increase in weaning age	
	Change per day	SE
42-day post-weaning weight, kg	0.89	0.02
Growth and economic performance, assuming limited grow-finish capacity		
Off-test weight, kg	1.26	0.08
Weight sold per pig weaned, kg <sup>4</sup>	1.68	0.14
Cost per 100 kg, (US\$)	-\$0.41	\$0.05
Income over costs per pig weaned, (US\$)	\$0.58	\$0.06
Growth and economic performance, assuming non-limited grow-finish capacity		
Post-weaning days to common market weight	-1.73	0.11
Weight sold per pig weaned, kg	0.50	0.13
Cost per 100 kg at common market weight, (US\$)	-\$0.31	\$0.04
Income over costs per pig weaned, (US\$)	\$0.39	\$0.06
Cost per head sold at a common market weight, (\$US)	-\$0.37	\$0.05