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LINEAR EFFECTS OF INCREASING WEANING AGE IN THREE-SITE PRODUCTION

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Summary

Two studies were conducted to measure the biologic and economic effects of weaning age in a three-site production system. Wean-to-finish growth and financial performance improved linearly as weaning age increased up to 21.5 days. Data from these trials were modeled to determine the linear rates of improvement observed as weaning age increased from 15 to 21.5 days. Each day increase in weaning age increased initial weight (taken prior to weaning) 0.565 ± 0.009 lb and weight sold to slaughter 3.71 ± 0.32 lb per pig weaned. In the financial analysis, income over cost increased $0.94 ± 0.07 per wean age d in the limited finishing space scenario and $0.53 ± 0.06 per wean age d in the non-limited space scenario. Therefore, if finishing space is limited, increasing weaning age from 16 to 19 d is predicted to improve income over cost by $2.82 per pig. These rates of improvement can be used to model the effects of weaning age on wean-to-finish throughput and financial performance in a three-site production system.

(Key Words: Weaning age, Throughput, Economics.)

Introduction

Pigs are commonly weaned in the United States at 15 to 21 days of age. Managers or farm owners typically regard pigs in this age range as being of equal in value, as long as minimum quality standards are met. Two studies in this report evaluated the effects of weaning age on growth and financial performance in a three-site production system. (i.e., Effects of Weaning Age on Pig Performance in Three-Site Production, and Effects of Weaning Age on Cost and Revenue in Three-Site Production). These studies observed linear improvements in wean-to-finish growth and economic performance as weaning age was increased from 12 to 21, and 15.5 to 21.5 days in Trials 1 and 2, respectively. The linear responses observed enable trial data to be readily modeled and applied to a variety of decision-making activities. The objective of this study is to model the linear rates of improvement observed as weaning age increased from 15 to 21.5 days.

Procedures

Two trials were completed to evaluate the effects of weaning age on biologic and financial response criteria. Further details of the trial design, procedures, and economic assumptions are described in the associated articles in this report. The range of weaning ages modeled included 15, 18, and 21 d from Trial 1 and 15.5, 18.5, and 21.5 d from Trial 2. Data from 12-d-old weaned pigs were collected in Trial 1. However, these data were not used to evaluate a similar range of ages in each trial. Data were analyzed in a single sta-

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tistical model to define the linear incremental rates of improvement observed as weaning age increased from 15 to 21.5 days. The analysis includes wean-to-finish growth and financial performance from 192 finishing pens (PIC C280 × C22, n = 4,518 weaned pigs). Results are presented as the rate of change per day increase in weaning age. These rates of change per day of weaning age also were translated to a per pound of weaning weight basis. However, these per pound of weaning weight improvements need to be interpreted with the understanding that the incremental pound increase in weaning weight is due to increasing lactation length. Due to the confounding nature of weaning age and weight in these trials, it is not possible to separate out the effects of weaning age and weight independently. Analyses were completed to quantify the effect of weaning age in operations either limited or non-limited in finishing capacity. Limited finishing capacity describes the effects of weaning age in terms of operations with a fixed or limited number of finishing spaces. Therefore, finishing barns need to be sold out on a common number of days post-weaning. Non-limited space describes effects of weaning age for operations with a non-limited number of finishing spaces. Thus, all age groups can be sold at a common average pig weight, regardless of growth rate.

Results and Discussion

The modeled rates of change per day increase in weaning age, as well as the translations of these values back to a per pound of weaning weight basis, are outlined in Table 1. The primary difference in the limited versus non-limited finishing capacity is that the value of growth rate is more fully recognized when finishing spaces are limited. In non-limiting finishing space scenarios, all pigs can be grown to common pig weight for slaughter. The linear improvements observed with increasing weaning age illustrate the magnitude of the measured response to increasing weaning age from 15 to 21.5 days in these studies. Understanding the effect of weaning age on weaned pig value demonstrates the need to identify lactation crate utilization inefficiencies or facility restrictions that may be constraining whole-system throughput. There was a $ 3.18 (unlimited G-F space) to $ 5.64 (limited G-F space) per weaned pig difference in realized margin observed as weaning age increased from 15 to 21.5 days. The data indicate that simply assessing a common value to wean pigs, regardless of age or weight, may lead to incorrect conclusions concerning sow herd productivity.

Understanding operationally dependent rates of biologic and economic improvement (characterized by the slopes of the regression lines in this study) due to increasing weaning age facilitates a series of strategic decision-making activities. Quantifying these slopes allows managers to understand cost-benefit relationships of altering weaning age within a production system. Improving lactation crate utilization, altering weekly farrowing targets, decreasing week-to-week variability in the number of sows farrowed, or increasing lactation capacity are the primary means of increasing and maintaining consistency in weaning age.

Table 1. Linear Rates of Change as Wean Age is Increased from 15 to 21.5 days[a]

Item	Rates of Linear Change per Day in Wean Age		Translating Linear Effects of Weaning Age to a Change per lb of Weaning Weight
	Change per day	SE	Change per lb at Weaning
Allotment weight, lb[b]	0.565	0.009	1.00
42-day post-weaning, lb	1.96	0.047	3.47
Growth & Economic Performance, Assuming Limited Grow-Finish Capacity[c]			
Off-test weight, lb	2.78	0.18	4.92
WF ADG, lb[d]	0.02	0.002	0.035
WF Mortality, %[e]	-0.42	0.11	-0.74
Pounds sold / pig weaned, lb[f]	3.71	0.32	6.57
Cost / CWT, $	-0.30	0.02	-0.53
Income over costs / pig weaned, $	0.94	0.07	1.66
Growth & Economic Performance, Assuming Non-Limited Grow-Finish Capacity[g]			
Post-weaning days to common market weight	-1.74	0.11	-3.08
Pounds sold / pig weaned, lb[f]	1.11	0.28	1.96
Cost / CWT at common market weight, $	-0.18	0.02	-0.32
Income over costs / pig weaned, $	0.53	0.06	0.93

[a]Modeling the rate of linear change (slopes) in wean-to-finish throughput and financial performance observed as wean age increased from 15 - 21.5 days (Trial 1 = 72 finishing pens with 20 pigs/pen, and Trial 2 = 120 finishing pens with 25 pigs/pen.).

[b]Allotment weights were taken on all pigs 3 days prior to weaning.

[c]Limited finishing space is defined as having a fixed number of finishing spaces available. Therefore, analysis assumes all age groups have to be sold on a fixed number of days post-weaning, or off-test weigh day in this analysis.

[d]WF ADG = ((Finisher pen weight sold - (nursery allotment weight * # of wean pigs required to place finishing pen)) / (# of wean pigs required to place finishing pen * # of days post-weaning)

[e]WFMortality = (1 - (Finishing pen inventory weighed off-test / # of wean pigs required to place finishing pen))*100.

[f]Pounds sold / pig weaned = Off-test pen weight / # of wean pigs required to place finishing pen.

[g]Non-limiting finishing space is defined as having an unlimited number of finishing spaces available. Therefore, all age groups can be grown to an equal weight.