1997

Impact of Feeder and Drinker Designs on Pig Performance, Water Use and Manure Production

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Summary and Implications

Two experiments were conducted to examine the impact of feeder and drinker designs on pig performance, water use and manure volume. In the first experiment, pigs with access to a Crystal Springs® wet/dry feeder grew faster, but had a poorer feed conversion and similar carcass merit as pigs using dry feeders with wall-mounted nipple drinkers. Water use was reduced 25.6% in the combined winter and summer trials and manure volume reduced 28.9% in the summer trial for the wet/dry feeder system versus the dry feeder and wall-mounted nipple drinker system. In the second experiment, there was no difference in pig performance or carcass merit for pigs using Trojan WaterSwing® drinkers versus gate mounted Trojan nipple drinkers. There was an 11.1% reduction in water use and a 16.2% reduction in manure volume for pigs using the swinging waterer. The reduction in manure volume for both systems compared to a conventional dry feeder and gate-mounted nipple drinker system has implications for designing manure storage devices and estimates of time necessary for manure removal. While the volume needed to store 180 days of manure production decreases with either the wet/dry feeders or swinging nipple drinker, the estimated acres of cropland to utilize the stored manure as a fertilizer resource does not change. It appears the difference in volume is due to a reduction in water wastage only. The total pounds of nutrients (N, P, K, etc) in the stored manure do not change, only their concentration per 1,000 gallons.

Introduction

Selection of feeders and waterers in growing-finishing facilities represents a major cash outlay that impacts pig performance and facility management for the life of the equipment (often seven to 10 years or longer). In addition to concerns regarding the impact of the equipment selected on pig performance, an increasing number of producers are making equipment decisions on the basis of water use and the resulting implications on manure storage requirements. These experiments compared different feeder and waterer systems to a conventional system consisting of stainless steel dry feeders with nipple drinkers mounted over partial slats.

Methods

General. In each experiment, pigs were housed in similar, mechanically ventilated, partially slatted finishing barns at the University of Nebraska's Northeast Research and Extension Center at Concord. Each barn had six 12 ft x 15 ft pens with 50% of the pen area slatted. There were 24 pigs per pen at the start of each trial. Pen size was not adjusted in the event of pig death or removal for poor performance.

The manure system in each barn was a shallow pit drained periodically into a lagoon (i.e., a pull-plug system). The pens on each side of a center aisle had a common pit and pull-plug system. Feeders and drinkers were assigned to either the north or south side of the aisle so manure production could be estimated from manure depth in the common pit for each feeder or waterer type.

Water disappearance (animal intake and waste) was measured for each drinker or feeder type in each barn by water meters installed in the water delivery line corresponding to the manure pit location. Manure production was estimated by recording the manure depth in each pit prior to removal of the pull-plug.

Carcass lean was measured on individually identified pigs at slaughter using total body electrical conductivity (TOBEC) technology at SiouxPreme Packing Co, Sioux Center, IA.

Experiment 1. Both a winter and a summer trial were conducted to compare the Crystal Springs® wet/dry feeding system to conventional dry feeders with nipple drinkers. The Crystal Springs® feeders provided two feeding spaces for 24 pigs and a single nipple drinker in the feed trough. No other drinking water source was provided in these pens.

Two 3-hole Smidley® stainless steel feeders were provided as the conventional comparison. The feeders were located three to four feet apart so pig access to all feeder holes was not restricted. There were two nipple drinkers provided on the wall opposite the feeders over the slatted portion of the pens.

Corn-soybean meal based diets (meal form) containing 3% added fat were formulated to contain either .9%, .8% or .7% lysine; these diets were fed from 41 to 90 pounds, 90 to 170 pounds and 170 pounds to slaughter weight, respectively. Diets were switched on the week pigs in individual pens achieved the target weights. Overhead sprinklers were used for summer heat relief in all pens. Individually identified pigs were slaughtered the week they weighed 230 pounds or greater.

Experiment 2. One winter trial was conducted to compare pig performance and water use with the Trojan WaterSwing® swinging nipple drinker versus conventionally installed Trojan

nipple drinkers. The WaterSwing® drinker consisted of two nipple drinkers attached to a delivery pipe which was suspended from a chain anchored to the ceiling in the middle of the pen of pigs. The conventional nipple drinkers were installed on the slotted portion of the pen partition over the slatted portion of the pen. The two conventional nipple drinkers were spaced 32 inches apart to limit pig dominance activities when drinking from one of the drinkers. Pigs were weighed every two to three weeks. Both nipple drinker types were adjusted for height, to provide two to four inches of clearance between the shoulder of the pigs (while standing) and the bottom of the drinker.

All diets were corn-soybean meal based (meal form) with no added fat and formulated to meet the University of Nebraska recommendations for pigs of high lean gain potential. Diets were switched on the week pigs in individual pens averaged 80, 130 and 190 pounds. Individually identified pigs were removed for slaughter on the week they weighed 240 pounds or greater.

Results and Discussion

Experiment 1. There was no interaction between feeder type and season. The main effects of feeder type are presented in Table 1. Pigs using the two-hole Crystal Springs® wet/dry feeding system gained weight faster and ate more feed than those using two three-hole Smidley® dry feeders. Because feed disappearance increased more than daily gain, feed:gain was poorer for pigs with access to the wet/dry feeders. There was no effect of feeder type on the number of pigs that died or were removed for poor performance or on carcass lean at slaughter.

Total water use (gallons/pig/day) was reduced 25.6% for the wet/dry feeders compared to the dry feeders and nipple drinkers. There was no effect of season on water use, even though the summer of 1995 was extremely hot.

Manure volume was not statistically analyzed for the winter trial due to a water leak problem in one of the manure pits for part of the trial period, resulting in only one observation of manure volume for the wet/dry feeder. For the summer trial, there was a 28.9% reduction in daily manure volume for pigs with access to the wet/dry feeders. While manure samples were not collected for an estimate of manure dry matter content, it can be theorized the reduction in manure volume was due to a reduction in water wastage.

Experiment 2. There was no effect of nipple drinker type on average daily gain, feed intake, feed conversion efficiency, carcass lean or on the number of pigs that died or were removed from the experiment due to poor performance. Total water use was reduced 11.1% for the WaterSwing® drinker compared to the conventional nipple drinkers. There was a 16.2% reduction in manure volume for the first 103 days of the trial. A water leak in a manure pit prevented collection of manure volume data following the first 103 days of the trial.

Conclusion

Installation and use of either the Crystal Springs® wet/dry feeder or Trojan WaterSwing® drinker resulted in a significant reduction in daily water use and manure volume compared to conventional dry feeders and wall or gate-mounted nipple drinkers. Pigs with access to the wet/dry feeder grew faster as a result of a higher daily feed intake, but they had a poorer feed conversion efficiency. There was no effect of the WaterSwing® on any performance trait measured.

Table 1. Effect of feeder type on pig performance

	Feeder type		
Item	Wet/dry	Dry	P Value
No. pens	12	12	
Pig weight, lb			
Initial	40.9	40.9	
Final	238.1	236.7	
Average daily gain, lb	1.72	1.68	<.05
Average daily feed, lb	5.24	4.96	<.001
Feed:gain	3.05	2.96	<.005
Carcass % lean[a]	46.7	47.0	>.10
Water, gallons/pig/d	1.19	1.60	<.05
Manure production, gallons/pig/d			
Winter[b,c]	.85	1.30	
Summer[d]	1.33	1.87	<.05

[a]Containing 5% fat.
[b]Not statistically analyzed due to a water leak.
[c]One estimate for wet/dry feeders and two for dry feeders.
[d]Two estimates for each feeder type.

Table 2. Effect of drinker type on pig performance

	Drinker type		
Item	Conventional	Swing	P Value
No. pens	6	6	
Pig weight, lb			
Initial	40.3	40.2	
Final	242.3	242.6	
Average daily gain, lb	1.65	1.66	>.10
Average daily feed, lb	5.09	5.08	>.10
Feed:gain	3.09	3.06	>.10
Carcass % lean[a]	52.2	52.3	>.10
Water, gallons/pig/day	1.53	1.36	<.05
Manure volume to d 103, gallons/pig/d	1.17	.98	<.05

[a]Containing 5% fat.

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