RESEARCH BULLETIN 1009 January, 1975

UNIVERSITY OF MISSOURI-COLUMBIA
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
ELMER R. KIEHL, DIRECTOR

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SUMMARY

This research was conducted to compare enclosed confinement and outdoor nursery and finishing systems as evaluated by performance, management, economics, carcass measurements and pork quality. Crossbred sows and litters (144) were farrowed in April and moved from the farrowing facilities to an enclosed confinement nursery (CN) or a pasture nursery (PN) on the basis of farrowing facility and age (19 to 36 days). The sows and litters were in the CN or the PN approximately 32 days before weaning. The pigs were grown in their respective nursery facilities for 48.5 days post-weaning. Four pigs from 40 litters (20 litters from each nursery facility) were then assigned to an enclosed confinement or a drylot finishing facility. This gave four finishing groups based on the combination of nursery and finishing systems as follows: (1) Pasture nursery pigs finished in drylot, (2) Pasture nursery pigs finished in confinement, (3) Confinement nursery pigs finished in drylot, and (4) Confinement nursery pigs finished in confinement. Death losses were greater in the CN compared to the PN during both the pre- and post-weaning periods. Average daily gain at weaning was significantly ($P < .01$) greater for the PN pigs compared to the CN pigs. The reduced performance in the CN was attributed primarily to inadequate ventilation. Post-weaning performance was superior for the PN pigs compared to the CN pigs although CN pigs did show some post-weaning compensatory gains.

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[1]Contribution from the Missouri Agricultural Experiment Station. Experiment Station Research Bulletin No. 1009

[2]Experiment was conducted on a commercial swine (approximately 5,000 head farrow to finish annually, 1970) farm near Marshall, Missouri, owned and managed by Mr. Gerald Sandidge. Thanks are extended to Mr. Sandidge for his cooperation in the collection of these data; Mr. G.E. Gibson, Hunter Packing Co., East Saint Louis, Ill., for assistance in obtaining the carcass measurements and Dr. H.B. Hedrick for assistance in pork quality evaluation.

[3]Mr. Sprouse supervised and assisted in the daily collection of these data throughout the entire experiment as partial fulfillment for the Degree of Master of Science, Department of Animal Husbandry. Present Address: Farmland Industries Inc., Jefferson City, Mo.

[4]Department of Animal Husbandry, 110 Animal Science Research Center.

[5]Department of Agricultural Engineering.

[6]Department of Agricultural Economics.

The PN required 4.4 times more labor per pig compared to the CN. However, the total variable pre- and post-weaning cost to produce 99.0 lb. (45.0 kg) of pork was lower for the PN compared to the CN. Total fixed cost per pig based on four groups per year was considerably greater for the CN compared to the PN. The total production cost (variable plus fixed cost) required to produce 99.0 lb. (45.0 kg) of pork was greater for the CN compared to the PN.

The results of the finishing phase indicate that the mean daily gains were significantly ($P < .01$) greater for the pigs from the CN (finishing groups 3 and 4) compared to pigs from the PN (finishing groups 1 and 2), which may be attributed in part to compensatory gains. Gain/feed was also greater for the pigs from the CN compared to pigs from the PN. Pigs finished in drylot (groups 1 and 3) had a significantly ($P < .01$) greater mean daily gain compared to pigs finished in confinement (groups 2 and 4), while gain/feed was the same for pigs finished in both facilities.

Pigs from the PN had a significantly ($P < .01$) greater mean backfat thickness and mean Wisconsin Pork Quality Score compared to pigs from the CN. The Warner-Bratzler Shear Test also indicated that the PN pigs produced a more tender *longissimus* muscle compared to the CN pigs. Type of nursery facility had a much greater influence on pork quality than type of finishing facility in this experiment. These results indicate that outdoor systems may be as profitable as enclosed confinement systems where the climatic and economic conditions do not differ greatly from those inherent in this experiment.

INTRODUCTION

Jones *et al.* (1966) reported that a pole building nursery system where the litters were weaned at 6 weeks of age produced heavier pigs more efficiently at 8 weeks of age compared to litters weaned at 3 weeks of age and moved to either a partially or a totally enclosed confinement nursery, or litters in individual outdoor houses weaned at 6 weeks of age. Production costs were lower for the pole nursery system, primarily as a result of lower building costs, compared to the other nursery systems which had similar production costs per pig.

Kadlec *et al.* (1966) found that growing-finishing pigs reared in enclosed confinement systems had reduced daily gains and mean backfat thickness compared to the pigs reared in an open front pole building or a pasture system, although type of facility did not have any consistent effect on pork quality.

Limited information is available on the effects of nursery and finishing rearing systems and management on performance, carcass measurements, pork quality and economy of production. This research was conducted to compare enclosed confinement and outdoor nursery and finishing systems as evaluated by performance, economics, management, carcass measurements and pork quality.

METHODS AND MATERIALS

The 144 sows and litters used in this experiment were farrowed in three different farrowing systems as described by Sprouse, Veum and McFate (1973). In April, 1970 the sows and litters (Duroc-Hampshire-Yorkshire) were moved from the farrowing facilities to either an enclosed confinement nursery (CN) or a pasture nursery (PN)

on the basis of farrowing facility and age (19 to 36 days). The sows were fed a 16% crude protein diet containing 20% oats, 60% corn and 20% supplement[7]. The pigs received creep feed[8] in both nurseries.

The sows and litters were in the CN or the PN an average of 29.68 and 34.25 days, respectively, before weaning. After weaning the pigs remained in their respective nursery facilities and were placed on an 18% crude protein ration containing 77.5% corn and 22.5% supplement[9] for 48.5 days. The diets were prepared on the farm in an automatic continuous flow hammer mill[10] and transported from the storage bins to the nursery facilities with an auger wagon.

Labor records were kept on the basis of the time required to complete all the tasks performed for each facility. Temperature and relative humidity recordings were obtained continuously inside the building and outside during the experiment. Total variable and fixed costs were obtained for both nursery systems.

Pasture Nursery (PN). A red clover pasture ("clean ground") adjacent to the farmstead was divided into 12 equal lots [1.5 ac (0.61 ha) per lot] with six sows and litters per lot. Each lot contained an open front house (10.0 x 6.0 ft) (3.05 x 4.88 m) with a dirt floor, a wood self feeder, a creep feeder and a metal shade. Four lots shared one automatic waterer and a catch pen for medication and sorting.

Confinement Nursery (CN). This enclosed insulated building (36.0 x 104.0 ft) (11.0 x 31.7 m) was completely slatted [6.0 in (15.24 cm) concrete slat with a 1.0 in (2.54 cm) slot] except for the 3.0 ft (0.9 m) center alley. The floor to ceiling height was 8.0 ft (2.44 m). The building contained 20 pens (10.0 x 16.0 ft) (3.05 x 4.88 m) which covered a concrete pit 7.4 ft (2.24 m) deep. Each pen contained four sows and litters and an automatic waterer. Two pens shared a wood self feeder (six feeding spaces per side). One third of the self feeder was used for creep feed. A metal gate kept the sows from eating creep feed. Two augers extending the length of the building dropped sow feed into the feeders.

Eight exhaust fans [0.25 h.p., 1,725 rpm, 18.0 in (45.72 cm) diameter, four blades] with individual thermostats were proportionately spaced on the side walls (four per wall). A centrally located air inlet duct in the ceiling extended the length of the building and utilized 52 ceiling outlets equipped with horizontally mounted baffles to disperse the air over the pens toward the side walls. The average capacity of each fan was 3,285 cfm (93 cmm) as determined by AMCA[11] test procedures using a hot wire anemometer under field conditions when static pressure measured 0.14 in (0.34 cm) of water column. Based on this determination the eight fans would change the air in the building (excluding pit area) once every 1.15 minutes. The air velocity through the 52 inlets varied from 459 to 1,001 ft/min (140 to 305 m/min) which provided very uneven air distribution throughout the building. A thermostatically controlled space heater (132,000 BTU) on each end of the building kept the temperature from falling below 70 F (21 C).

In early July, 1970, two barrows and two gilts were randomly selected from 40 crossbred litters at approximately 107.6 lb. (48.9 kg). Twenty litters had been reared in an enclosed confinement nursery and 20 litters had been reared in a pasture

[7]Pioneer sow concentrate (Hales and Hunter Co., Minneapolis, Minn.).

[8]Pioneer Pig Tasties (Hale and Huntet Co., Minneapolis, Minn.) containing 0.11 g chlortetracycline, 0.11 g sulfamethazine and 0.55 g penicillin per kg, 19% crude protein, 5% fat (minimum) and 2.5% crude fiber (maximum).

[9]Pioneer pig grower concentrate (Hales and Hunter Co., Minneapolis, Minn.).

[10]Mix Mill Inc., Autmoatic Feed Processing Systems, Bluffton, Ind.

[11]Air Moving and Conditioning Association.

nursery as previously described. One barrow and one gilt from each litter were randomly allotted to either a drylot finishing facility or an enclosed confinement finishing facility.

Drylot Finishing Facility. Two lots adjacent to the confinement finishing buildings were used with 40 pigs per lot. Each lot (1.0 ac) (0.4 ha) contained a self feeder, a shade, two open front houses (10.0 x 16.0 ft) (3.05 x 4.88 m), and an automatic waterer. There was no forage in the lots. The lots had been used continuously for several years.

Enclosed Confinement Finishing Building. This enclosed, insulated building (36.0 x 114.0 ft) (11.0 x 34.8 m) contained 20 partially slatted floored pens (11.1 x 15.5 ft) (3.38 x 4.72 m). The floor to ceiling height was 8.0 ft (2.44 m). A centrally located manure pit 8.0 ft (2.44 m) wide and 6.0 ft (1.83 m) deep ran the length of the building. Thus, each pen had an area of solid concrete 11.1 x 11.5 ft (3.38 x 3.51 m) which sloped down to the slatted area 4.0 x 11.1 ft (1.22 x 3.38 m) located at the rear of each pen. The concrete slats were 6.0 in (15.24 cm) wide with 1.0 in (2.54 cm) spacings. Alleys (2.5 ft) (0.76 m) were located on the sides of the building. Two pens shared a self feeder and each pen had an automatic waterer. Two augers extending the length of the building dropped feed into the feeders.

Eight turn-around fans [0.33 h.p., 1140 rpm, 24.0 in (61.0 cm) diameter, four blades] with individual thermostats, were proportionately spaced on the side walls (four per wall). The average capacity of each fan was 5,227 cfm (148 cmm) as determined by the procedures described for the confinement nursery. Thus, the eight fans would change the air in the building (excluding pit area) once every 1.22 minutes. Hot wire anemometer readings at various interior locations indicated relatively uniform air movement throughout the building. The fans were turned to exhaust air (blow out) for winter ventilation with the fresh air coming into the building from the attic through an adjustable, centrally-located slot inlet in the ceiling which extended the length of the building. The fans were turned to blow fresh air into the building for summer ventilation during this study with the warm, moist stale air being forced out under the eaves through two 6-in (15.24 cm) wide screened vents, each extending the length of the building at the junction of the wall and ceiling (one on each side wall).

Four centrally-located pens were used in this study with 20 pigs per pen. The pigs received a 13% crude protein diet containing 87.5% corn and 12.5% supplement[12]. The diet was prepared and delivered to the finishing facilities as described for the nursery facilities. The four finishing facility groups were: (1) Pasture nursery pigs finished in drylot, (2) Pasture nursery pigs finished in confinement, (3) Confinement nursery finished in drylot, and (4) Confinement nursery pigs finished in confinement.

Chilled carcass measurements were taken as follows: Length (anterior edge of first rib to aitch bone), backfat (average thickness at first rib, last rib and last lumbar vertebrae), *longissimus* muscle area (cross section at 10th rib) and the weights of the trimmed ham, loin and belly. Wisconsin Pork Quality Scores were obtained on the *longissimus* muscle at the 10th rib of all pigs slaughtered. The loins of nine pigs from each treatment group were selected at random for further quality evaluation with the Warner-Bratzler Shear Test.

The date were subjected to a 2 x 2 factorial (two previous nursery facilities

[12]Pioneer hog finisher concentrate (Hales and Hunter, Minneapolis, Minn.).

and two types of finishing facilities) analysis of variance (Steel and Torrie, 1960) and Duncan's Multiple Range Test (Duncan, 1955) when required to test the four interactions (facility group) means.

RESULTS

The average litter weight and average daily gain (ADG) at weaning were significantly ($P < .01$) greater for the pasture nursery (PN) pigs compared to the confinement nursery (CN) pigs (table 1). Pre-weaning pig losses in the CN were 7.9% compared to the 5.7% in the PN. Pigs on pasture consumed more creep feed than the pigs in the CN. Sows in the CN lost an average of 13.29 lb. (6.04 kg) while the sows on pasture consumed more feed and gained an average of 9.81 lb. (4.46 kg). The reduced performance in the CN was attributed primarily to inadequate ventilation caused by stale air pockets and poor air distribution even though the CN had an estimated air change (excluding pit area) once every 1.15 minutes. The pigs in the CN developed symptoms associated with noxious gases in confinement (Taiganides and White, 1969). When these symptoms were observed attempts were made to improve the CN ventilation system. Research by Fritschen and Underdahl (1971) has shown that pigs reared in environmentally controlled confinement buildings may be predisposed to respiratory problems as indicated by a greater incidence of pneumonia compared to pigs reared in modified open front buildings.

The average daily temperature and relative humidity were 73 F (23 C) and 68% for the CN and 64 F (18 C) and 63% outside. The diurnal variation was considerably greater outside compared to the more uniform temperature and humidity over a 24-hr period in the insulated, heated CN. Mangold, Hagen and Hays (1967) reported that *ad libitum* fed growing pigs performed similarly at air temperatures ranging from 50 to 75 F (10 to 24 C), although 60 F (16C) tended to be more desirable than the extremes indicated above.

Jones *et al.* (1966) reported that pigs reared in an open front pole nursery with an outside pen had heavier and more efficient 8 week weights than pigs reared in an enclosed confinement nursery with either total or partial slats. An extensive facility study by Kadlec *et al.* (1966) indicated pigs (68 to 200 lb.) (31 to 91 kg) reared in portable buildings on pasture had a significantly ($P< .05$) greater rate of gain and required less feed per unit of gain than pigs reared in enclosed confinement buildings with either solid concrete, partially slatted or totally slatted floors. There was no relationship between stage of growth and performance in the various facilities (Kadlec *et al.*, 1966).

The post-weaning performance results of this study indicate that the PN pigs had heavier weaning and final weights compared to the CN pigs (table 2). The PN pigs also consumed more feed and had a greater and more efficient ADG than the CN pigs. However, pigs in the CN did show some post-weaning compensatory improvement in ADG and feed/gain compared to the pre-weaning performance previously discussed (table 1). Post-weaning pig losses were 3.3 and 0.3%, respectively, for the CN and PN facilities.

The total variable pre- and post-weaning cost per pig (table 3) was greater for the PN compared to the CN as a result of the greater feed and labor costs. However, the variable cost per 99.0 lb (45.0 kg) of pork produced was less for the PN compared to the CN, even though the labor required per pig produced

was 4.4 times greater for the pasture facility.

The total investment cost for the CN was greater than that for the PN (table 4). The annual fixed cost was calculated based on the actual investment costs for the CN plus land and equipment for both nurseries. The annual fixed cost was obtained by multiplying the investment cost times the annual interest (%). The annual interest for land is the sum of 7% for loan interest plus 1% for repairs, taxes and insurance. The CN and equipment were depreciated at 10% per year while it was assumed that land would not depreciate. The loan interest for the CN and equipment was based on 8% over a 10-year depreciation period which results in an average loan rate of 4%. The fixed cost per pig based on four groups per year was considerably greater for the CN compared to the PN (table 4). Previous reports (Jones *et al.*, 1966; Kadlec *et al.*, 1966) have also indicated that the fixed cost per pig in an enclosed confinement nursery facility was greater than that in an open front pole nursery with outside pens or portable pasture facilities.

The total production cost (variable plus fixed) required to produce 99.0 lb. (45.0 kg) of pork was $1.55 higher for the CN ($16.74) compared to the PN ($15.19). However, the total production cost *per pig* produced was greater for the PN ($14.42) in contrast to the CN ($11.17) as a result of the greater feed consumption and labor costs on pasture. The data of Jones *et al.* (1966) indicated that the total production cost per pig from 21 to 56 days of age was greater for the individual portable house with a slatted outdoor platform system compared to either an enclosed confinement building (total or partial slats) or an open front pole nursery with an outside pen. The smaller size of the experimental units used by Jones *at al.* (1966), plus the additional variation in environmental and management considerations, would explain in part why the results of this study are not directly comparable to those of Jones *et al.* (1966).

These results indicate that a more sophisticated level of management is required to obtain optimum performance in an enclosed confinement nursery compared to an outdoor facility. Ventilation as it relates to providing an adequate environment for optimum performance is one of the critical limiting factors in an enclosed confinement building.

The results of the finishing phase show that the mean starting weights (table 5) were significantly ($P < .01$) greater for the pigs raised on the pasture nursery (finishing groups 1 and 2) compared to pigs raised in the confinement nursery (finishing groups 3 and 4). However, the mean daily gains were significantly ($P < .01$) greater for the pigs from the confinement nursery (groups 3 and 4) compared to the pigs from the pasture nursery. The independent main effect of nursery facilities on performance of finishing swine (table 6) confirms these performance results comparing pigs reared in the pasture or the confinement nursery prior to the finishing experiment. The greater gains of the pigs from the CN may be attributed in part to compensatory gains. Gain/feed was also greater for the pigs from the CN (groups 3 and 4) compared to pigs from the pasture nursery (groups 1 and 2) which follows the same trend discussed for mean daily gain (tables 5 and 6). The pigs in groups 1 and 3, which were finished in drylot, had a slightly greater mean daily gain compared to the corresponding pigs in groups 2 and 4, respectively, which were finished in confinement, even though gain/feed was the same for the pigs in both finishing facilities.

The carcass results in table 5 have shown that the pigs in group 1 had a significantly ($P < .01$) greater backfat thickness and *longissimus* muscle area compared to the pigs in group 4. None of the other carcass measurements obtained were

significantly ($P < .05$) influenced by facility group. However, the Wisconsin Pork Quality Scores (table 5) showed that the color and firmness scores of the ham face and *longissimus* muscle (cross section at 10th rib), and the mean pork quality scores of groups 1 and 2 (PN pigs) were significantly ($P < .01$) superior to the scores obtained for groups 3 and 4 (CN pigs). The Warner-Bratzler Shear Test also indicated that the pigs in groups 1 and 2 produced more tender *longissimus* muscles compared to the pigs in groups 3 and 4.

The independent main effect of nursery facilities on carcass measurements and carcass quality (table 6) indicates that the PN pigs had a significantly ($P < .01$) greater mean backfat thickness and Wisconsin Pork Quality Score for color and firmness of the ham face and *longissimus* muscle, marbling of the *longissimus* muscle and mean pork quality score compared to CN pigs. The Warner-Bratzler Shear Test also indicated that the PN pigs produced more tender *longissimus* muscles compared to the CN pigs. These results indicate that type of nursery facility had a much greater influence on pork quality than did type of finishing facility used in this experiment.

These results clearly emphasize the importance of a complete coordinated swine production system as shown by the effects of the nursery facilities on pork quality and subsequent performance in the finishing facilities. Thus, greater economy in lean pork production may be achieved with a production system that utilizes complementary facilities in each phase of the production cycle such that a facility used in one phase of production does not produce a negative carry over effect in a subsequent phase of production.

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TABLE 1. PREWEANING PERFORMANCE OF SOWS AND LITTERS IN THE CONFINEMENT AND PASTURE NURSERY FACILITIES

Item	Confinement nursery	Pasture nursery
No. of litters	72	72
No. of days in nursery at weaning	29.68	34.25
No. of pigs per litter at start	9.19	8.74
No. of pigs per litter at weaning	8.47	8.23
Litter weight at start, lb.	131.19 (59.63 kg)	122.47 (55.67 kg)
Litter weight at weaning, lb.	273.57[a] (124.35 kg)	382.72[b] (173.96 kg)
Creep feed consumed per litter, lb.	106.70[a] (48.50 kg)	347.20[b] (157.82 kg)
ADG of pigs from start to weaning, lb.	0.58[a] (0.26 kg)	0.92[b] (0.42 kg)
Feed/gain[c]	4.48	3.38
Sow weight at start, lb.	489.75 (222.61 kg)	462.58 (210.26 kg)
Sow weight at weaning, lb.	476.43 (216.56 kg)	472.42 (214.74 kg)
Feed consumed per sow, lb.	471.30 (214.23 kg)	565.90 (257.22 kg)

[a,b]Significantly different ($P < .01$) from each other in that row.

[c]Includes the weight gain of the pigs and weight loss of the sows in the confinement nursery and the weight gain of both sows and pigs on the pasture nursery. Not analyzed statistically.

TABLE 2. POSTWEANING PERFORMANCE OF THE PIGS IN THE CONFINEMENT AND PASTURE NURSERY FACILITIES FOR 48.5 DAYS[a]

Item	Confinement nursery	Pasture nursery
No. of pigs at weaning[b]	610	593
Weaning weight per pig, lb.	32.30 (14.68 kg)	46.50 (21.09 kg)
Final weight per pig, lb.	81.90 (37.23 kg)	106.90 (48.50 kg)
Avg daily gain, lb.	1.02 (0.46 kg)	1.25 (0.57 kg)
Feed/gain	3.14	3.02

[a]Statistical analysis of pig weight and ADG was not possible since the pigs were not weighed individually or by litter.

[b]Includes 20 and two pigs, respectively, which were lost post weaning in the confinement and pasture nurseries. Postweaning final weight and avg daily gain were determined on the basis of the number of live pigs at the final weighing. Feed/gain includes the feed consumed by pigs lost during the postweaning period.

TABLE 3. VARIABLE COST COMPARISON FOR THE CONFINEMENT AND PASTURE NURSERY FACILITIES

Item	Confinement nursery	Pasture nursery
	- Cost per pig -	
Pig feed[b]	$ 6.91	$ 9.85
Sow feed[b]	2.31	2.77
Labor[c]	0.13	0.57
Medication[d]	0.30	0.30
Bedding[e]	----	0.16
Electricity[f]	0.17	----
Total variable cost	9.82	13.65
Variable cost per 99.0 lb. (45.0 kg) of pork produced[g]	14.71	14.38

[a]Includes the pre and postweaning variable costs.

[b]Feed costs of $120.00, $80.50 and $80.50 per ton ($132.24, $88.71 and $88.71 per metric ton, respectively) for creep, sow and pig feed, respectively, including processing and hauling.

[c]Labor charges of $2.00 per hour. Includes time required for feeding and observation in both nurseries plus bedding and cleaning waterers in the pasture nursery. Includes time required to move the pasture nursery facilities and equipment to clean ground once annually.

[d]Includes worming and vaccinations.

[e]Straw at $0.50 per bale.

[f]Electricity at $0.015 per KWH.

[g]Includes sow weight loss and gain, respectively, in the confinement and pasture nurseries.

TABLE 4. INVESTMENT AND FIXED COST COMPUTATION FOR EACH NURSERY FACILITY[a]

Item	Total investment cost	Annual interest[b] %	Annual fixed cost	Fixed cost per pig
		Confinement nursery[c]		
Land, 1.0 ac (0.40 ha)	$ 400.00	8	$ 32.00	$0.01
Permanent building	16,850.00	16	2,969.00	1.03
Equipment[d]	5,020.00	16	803.20	0.31
Total	$22,270.00		$3,531.20	$1.35
		Pasture nursery[e]		
Land, 18.0 ac (7.2 ha)	$ 7,200.00	8	$ 576.00	$0.24
Equipment[f]	7,750.00	16	1,240.00	0.53
Total	$14,950.00		$1,816.00	$0.77

[a]Actual investment in each facility as used in this experiment.

[b]Annual interest for each category of investment is calculated for a 10 year period as follows:

	Land	Building and equipment
Depreciation, %	----	10.0
Loan interest, %	7.0	4.0
Repairs, taxes and insurance, %	1.0	2.0
Total annual interest,%	8.0	16.0

The loan interest for permanent and portable buildings and equipment is based on 8% over a 10 year depreciation schedule which results in an average loan interest rate of 4%.

[c]Based on a capacity of 80 litters of 655 pigs (80 litters x 8.19 pigs raised per litter) with four groups annually.

[d]Includes self feeders and auger feeding system, ventilation system, electrical wiring, plumbing and waterers, and two gas heaters.

[e]Based on a capacity of 72 litters or 591 pigs (72 litters x 8.21 pigs raised per litter) with four groups annually.

[f]Includes shades, houses, self feeders, creep feeders, waterers, waterlines, woven wire fence, gates and labor for lot construction.

TABLE 5. EFFECT OF PASTURE OR CONFINEMENT NURSERY FOLLOWED BY DRYLOT OR CONFINEMENT FINISHING ON PERFORMANCE, CARCASS MEASUREMENTS AND CARCASS QUALITY OF FINISHING SWINE

Facility group no. Nursery facility Finishing facility	1 Pasture drylot	2 Pasture confinement	3 Confinement drylot	4 Confinement confinement
No. of pigs	40	40	40	40
Mean starting wt, lb.	123.28[a] (56.04 kg)	119.03[a] (54.10 kg)	94.23[b] (42.83 kg)	93.90[b] (42.68 kg)
Mean finishing wt, lb.	265.35[a] (120.61 kg)	245.80[b] (111.73 kg)	249.70[b] (113.50 kg)	239.10[b] (108.68 kg)
Mean daily gain, lb.	1.50[a] (0.68 kg)	1.37[a] (0.62 kg)	1.89[b] (0.86 kg)	1.75[b] (0.79 kg)
Gain over feed	0.25	0.25	0.28	0.28
Dressing percentage, %	73.29	73.89	73.63	73.48
Carcass length, in.	31.41 (79.79 cm)	31.17 (79.16 cm)	31.29 (79.47 cm)	31.57 (80.20 cm)
Mean backfat thickness, in.	1.41[a] (3.58 cm)	1.32[a,b] (3.35 cm)	1.34[a,b] (3.41 cm)	1.25[b] (3.18 cm)
Belly, %	16.82	16.82	17.06	16.61
Ham and loin, %	38.00	38.64	38.37	38.82
Longissimus muscle, in^2	5.43[a] (35.04)	5.14[a,b] (33.14)	5.34[a,b] (34.45)	5.00[b] (32.24)
Wisconsin Pork Quality Score:[d]				
Color and firmness of ham face	3.50[a]	3.42[a,b]	2.98[b]	3.18[a,b]
Color and firmness of *longissimus* muscle	3.65[a,b]	3.79[a]	3.12[c]	3.26[b,c]
Marbling of *longissimus* muscle	3.80	3.89	3.42	3.32
Mean quality score	3.65[a]	3.70[a]	3.17[b]	3.26[b]
Warner-Bratzler Shear Test[e]	7.62	7.55	8.31	8.33

[a,b,c]Treatment means in the same row with different superscripts are significantly ($P < .01$) different.

[d]Wisconsin Pork Quality Standards with 1 as the lowest and 5 as the highest quality score.

[e]Each Warner-Bratzler Shear Test means represents a total of 9 randomly selected *longissimus* muscles (pigs) per treatment.

TABLE 6. THE INDEPENDENT MAIN EFFECT OF NURSERY FACILITIES ON PERFORMANCE, CARCASS MEASUREMENTS AND CARCASS QUALITY OF FINISHING SWINE[a]

Item	Nursery facility	
	Pasture	Confinement
No. pigs	80	80
Mean starting wt, lb.	121.15[b] (55.07 kg)	94.06[c] (42.76 kg)
Mean finishing wt, lb.	255.58[b] (116.17 kg)	244.40[c] (111.09 kg)
Mean daily gain, lb.	1.43[b] (0.65 kg)	1.82[c] (0.83 kg)
Gain/feed	0.25	0.28
Dressing percentage, %	73.58	73.55
Carcass length, in.	31.29 (79.48 cm)	31.43 (79.82 cm)
Mean backfat thickness, in.	1.36[b] (3.46 cm)	1.30[c] (3.30 cm)
Belly, %	16.82	16.84
Ham and loin, %	38.31	38.59
Longissimus muscle area, in.^{2}	5.29 (34.12 cm^2)	5.17 (33.37 cm^2)
Wisconsin Pork Quality Score:		
Color and firmness of the ham face	3.46[b]	3.08[c]
Color and firmness of the longissimus muscle	3.72[b]	3.19[c]
Marbling of the longissimus muscle	3.85[b]	3.37[c]
Mean quality score	3.68[b]	3.21[c]
Warner-Bratzler Shear Test[d]	7.58	8.32

[a]The 160 pigs in the finishing study were selected from litters reared in the nursery facilities.

[b,c]Means with different superscripts are significantly ($P < .01$) different from each other.

[d]Each Warner-Bratzler Shear Test means represents a total of 18 randomly selected longissimus muscles (pigs) from each nursery facility.