

## Studies of Confinement and Pasture Management Systems for Swine

*J. A. Whatley, Jr., I. T. Omtvedt,  
J. C. Hillier, and A. L. Byram*

In 1957 and 1958 at the Ft. Reno station 107 sows and litters were used to compare the effects of pasture and confinement managements on pre-weaning and post-weaning performance of pigs. In these earlier trials the same rations were fed on pasture as in confinement. Sows on pasture weaned heavier pigs and heavier litters than those on concrete floors in confinement. These differences were less when adequate anemia preventative treatment was given the confinement pigs, but even when this was done pigs raised on pasture were heavier than those in confinement. There was little difference in litter size. Confinement pigs gained faster and slightly more efficiently than pasture pigs after weaning. They were slightly fatter at market weight, but pasture pigs were sounder on their legs. The best combination system in these earlier trials was pasture for the sows and litters up to weaning and then confinement feeding of the pigs from weaning to market weight. This combination system gave the highest rate of gain and the most efficient feed conversion.

In 1959 and 1960 Hillier and associates conducted a series of tests at Stillwater to improve the creep ration for pigs and the lactation ration for sows in confinement. Confinement raised pigs were somewhat smaller at weaning and had lower hemoglobin levels than pasture raised pigs. The hemoglobin levels of confinement pigs, however, was not critically low. Additional trace mineral supplementation or the addition of soil to the creep ration was not effective in preventing a drop in hemoglobin level of confinement pigs. However, a second iron injection at 21 days (first injection at three days) did prevent a drop in hemoglobin level. Under adverse weather conditions fewer pigs were lost and pigs were heavier in confinement than on pasture. Sows fed trace mineral fortified rations in confinement consumed more feed, lost less weight, and their pigs were 4 lbs. heavier at 42 days than sows that were not supplemented with trace minerals. Additional calcium and phosphorus in the sow ration seemed to have no beneficial effect.

### 1961 Fall Trial with Gilts and Litters

In the fall of 1961, 28 crossbred gilts and their litters were used to study pre-weaning performance on pasture and in confinement when extra vitamin and mineral supplementation was made in the confinement rations. The sow lactation rations are shown in Table 1 and the pig creep feed rations are shown in Table 2. The 28 Duroc x Beltsville No. 1 gilts were all bred to Hampshire boars. Gilts with equal size

Table 1.—Lactation Rations in 1961 Fall Confinement—Pasture Trial.

Ingredient	Confinement	Pasture
Milo	75.0	78.0
Soybean meal (44%)	11.0	9.5
Alfalfa meal	10.0	10.0
Dikal	1.5	1.5
Ground limestone	0.5	0.5
Trace mineralized salt	0.5	0.5
Vitamin-mineral premix*	1.7	---
Cost per cwt.	\$2.23	\$2.11

\* Premix provides 4 mgs. niacin, 5 mgs. pantothenic acid, 1.2 mgs. riboflavin, 200 mgs. choline, 10 mcgs. B<sub>12</sub>, 180 I.U. vitamin D, 45 mgs. iron, 2 mgs. copper, 0.88 mgs. cobalt, 18 mgs. manganese, and 50 ppm. zinc.

Table 2.—Creep Rations for Pigs in 1961 Fall Confinement—Pasture Trial.

Ingredient	Confinement	Pasture
Corn	31.0	32.0
Milo	32.0	32.0
Soybean meal (44%)	13.0	13.0
Dried Buttermilk	10.0	10.0
Fish meal	6.0	6.0
Liquid molasses	5.0	5.0
Dikal	0.5	0.5
Ground limestone	0.5	0.5
Trace mineralized salt	0.5	0.5
Hygromix	0.25	0.25
Aurofac 10	0.25	0.25
Vit. A	0.05	0.1
Vit. and min. premix*	0.95	---
Cost per cwt.	\$3.83	\$3.83

\* Premix provides 3 mgs. niacin, 5 mgs. pantothenic acid, 1.2 mgs. riboflavin, 200 mgs. choline, 12 mcgs. B<sub>12</sub>, 168 I.U. Vitamin D, 42 mgs. iron, 2 mgs. copper, 0.88 mgs. cobalt, 18 mgs. manganese, and 50 ppm. zinc.

litters at seven days of age were assigned to pasture and confinement treatments. The gilts were on test from the time each individual litter was seven days of age until weaning at 56 days. Confinement gilts raised their litters in individual pens in the farrowing barn. Each pen was equipped with a float type automatic waterer, a self-feeder for the gilt, and a creep area with feeder for the pigs. The pen area was 10 ft. by 12 ft. in the barn with a 6 ft. by 12 ft. concrete floor outside of the barn where the sow feeder was located.

**Table 3.—Pigs Per Litter and Weights of Pigs and Gilts in Confinement  
—Pasture Trial, 1961 Fall.**

	Confinement	Pasture	Diff.
Number of gilts	14	14	
Pigs per litter at 7 days	8.29	8.29	0
Pigs per litter at 21 days	8.00	7.14	0.86
Pigs per litter at 42 days	8.00	7.00	1.00
Pigs per litter at 56 days	8.00	6.93	1.07
% death loss, 7 to 56 days	3	16	-13
Wt. per pig at 21 days, lbs.	11.1	10.4	0.7
Wt. per pig at 42 days, lbs.	24.0	24.3	- 0.3
Wt. per pig at 56 days, lbs.	38.9	39.8	- 0.9
Avg. litter wt. at 21 days, lbs.	89.0	74.3	14.7
Avg. litter wt. at 42 days, lbs.	192.3	170.0	22.3
Ave. litter wt. at 56 days, lbs.	310.9	276.1	34.8
<b>Gilt Weights in lbs.</b>			
109th day of gestation	401	393	8
21 days after farrowing	374	376	- 2
42 days after farrowing	369	377	- 8
56 days after farrowing	355	379*	-24
Weight loss 109th day to 56 days	46	14	32

\* One gilt not included that died on 54th day.

Two gilts and their litters were assigned to each of seven one acre lots on pasture. About one-half acre of each lot was in field peas. Each pasture lot had a self-feeder near an automatic waterer for the gilt and a creep pen and feeder in a movable house. All gilts were self-fed. When the pigs were two weeks old feed was placed in the creep feeders but none was consumed until after three weeks of age.

The number of pigs per litter and the weights of pigs and gilts is shown in Table 3. A greater death loss resulted among the pigs on pasture. Pasture averaged 6.93 pigs per litter at 56 days as compared to eight pigs per litter at the same age in confinement. There was little difference in the individual weights of the pigs. Confinement pigs were slightly heavier at 21 days, but at 56 days pasture pigs were slightly heavier. However, due to the lower death losses and larger litters, confinement litters were 35 lbs. heavier at 56 days than pasture litters.

Confinement gilts lost more weight than pasture gilts although the confinement gilts were thrifty and showed no evidence of stiffness or other undesirable leg conditions. All gilts were on pasture and fed the same ration during gestation. They were brought to the farrowing barn and weighed on the 109th day of gestation. From the 109th day of gestation to weaning of their litters at 56 days, the confinement gilts lost 46 lbs. as compared to a 14 lb. loss for the pasture gilts.

The amount of feed consumed and the feed costs for the gilts and litters are given in Table 4. Without allowing for the forage consumed by pasture gilts, the confinement gilts consumed more feed than pasture gilts. Confinement litters also consumed more creep feed (42 lbs.) than pasture litters, but because of the larger litters raised in confinement this difference was only 2 lbs. more per pig. Feed cost of the confinement gilts was \$15.80 as compared to \$13.67 for the pasture gilts. The cost of creep feed for confinement litters was \$7.78 as compared to \$6.17 for the pasture litters. Total cost of sow and creep feed per litter in confinement was \$23.58 as compared to \$19.84 on pasture—a difference of \$3.74 in total feed cost without any charge for pasture. On an individual pig basis, however, the feed cost per pig raised in confinement was \$2.95 as compared to \$2.86 per pig raised on pasture.

Table 4.—Feed Consumption and Costs for Gilts and Litters in 1961  
Fall Confinement—Pasture Trial.\*

	Lbs. Feed Consumed			Feed Cost, \$		
	Confinement	Pasture	Diff.	Confinement	Pasture	Diff.
<b>Sow feed in lbs.</b>						
0 to 7 days	30	30	0	0.63	0.63	0
7 to 21 days	177	156	21	3.95	3.29	0.66
21 to 42 days	322	263	59	7.18	5.55	1.63
42 to 56 days	181	199	-18	4.04	4.20	-0.16
Total	710	648	62	15.80	13.67	2.13
Avg. daily feed	12.7	11.6	1.1	0.28	0.24	0.04
<b>Creep feed in lbs.</b>						
7 to 21 days	0	0	0	0	0	0
21 to 42 days	50	53	-3	1.92	2.03	-0.11
42 to 56 days	153	108	45	5.86	4.14	1.72
Total	203	161	42	7.78	6.17	1.61
<b>Total feed per litter</b>						
Sow feed	710	648	62	15.80	13.67	2.13
Creep feed	203	161	42	7.78	6.17	1.61
Total	913	809	104	23.58	19.84	3.74
<b>Feed per pig weaned</b>						
Sow feed	.89	.94	-.05	1.98	1.97	0.01
Creep feed	.25	.23	.02	.97	.89	0.08
Total	1.14	1.17	-.03	2.95	2.86	0.09
Value of weight lost by sow**				6.44	1.96	4.48
Feed cost per pig plus credit for weight loss by sow				3.75	3.14	0.61
Iron injections per pig				.30	.00	

\* Ration costs per cwt.

Confinement sow ration	\$2.23
Pasture sow ration	\$2.11
Confinement creep ration	\$3.83
Pasture creep ration	\$3.83

\*\*Calculated at \$14 per cwt.

There are two other cost items that should perhaps be charged to the pigs. One of these is the weight loss of the gilt. Charging the feed cost and the weight loss of the dam to each pig made the cost \$0.61 more per pig raised in confinement than on pasture. A further charge of \$0.30 per pig for iron injections should be made on confinement pigs. These pigs were given a 2 cc. injection of iron dextrin at three days of age and a 1 cc. injection at 21 days of age. Pasture pigs were not given iron dextrin injections. The cost of iron dextrin injections, differences in feed cost, and weight loss of gilt charged to the pigs made a total difference in the cost of raising pigs in confinement \$0.91 more per pig than on pasture. This does not include any charge for pasture. If such a charge were made the difference would be considerably less and likely would be unimportant.

None of the differences in this 1961 fall trial were statistically significant. Comparable pigs were raised in confinement to those on pasture by fortification of the lactation sow ration and creep ration. Larger litters were raised in confinement, but confinement gilts consumed more feed and lost more weight than gilts on pasture.

### 1959-60 Growing-finishing Trials

A total of 240 pigs from three lines of breeding were used in three trials in 1959 and 1960 at Ft. Reno to compare the post-weaning performance of pigs fed a fortified, pelleted ration in confinement with those fed a simple, free-choice ration on pasture. Because of sickness or death, 17 of the 240 pigs failed to finish the test. The ingredients in the rations are given in Tables 5 and 6. Trials 1 and 2 were conducted in the spring and fall of 1959. Each trial had three pasture and three confinement lots of 12 pigs each. Trial 3 was conducted in the spring of 1960 with four pasture and four confinement lots, making a total of 10 lots of 12 pigs each on each treatment. In each trial the pigs were started on test at about 40 lbs. at 8 to 10 weeks of age. All pigs were handled alike on pasture prior to weaning at approximately eight weeks of age. An equal number of barrows and gilts were used from a Duroc line, a Hampshire line, and a Hampshire x Duroc-Beltsville No. 1 cross. Pigs were equalized on treatment by sex, weight, and line of breeding. They were weighed off test individually at weights of 198 lbs. or over on biweekly weigh days. The last pig in a lot was removed regardless of weight when the next to last pig reached 198 lbs. When weighed off test each pig was probed at four sites for backfat thickness. These sites were about 1½ inches on each side of the midline of the back at about the 5th rib and the 4th lumbar vertebra. These four probes on each pig were averaged and adjusted to a 200 lb. barrow equivalent. All barrows were slaughtered for carcass measurements, and, in addition, cut-outs were obtained on the barrows in the first two trials.

Table 5.—Pasture Ration for Growing-Finishing Pigs in 1959-1960 Trials. (Free Choice)

Ingredients	Percent of Mix
Shelled corn	100.0
Protein supplement mix	
Tankage	50.00
Soybean meal	25.00
Alfalfa meal	25.00
Mineral supplement mix	
Salt	33.3
Bone meal	33.3
Ground limestone	33.3

Table 6.—Pelleted Confinement Rations for Growing-Finishing Pigs in 1959-1960 Trials.

Ingredients	1st Month Ration	After 1st Month Ration
Ground Corn	38.00	41.00
Ground Milo	38.00	41.00
Soybean Meal	13.00	10.00
Meat and Bone Scraps	5.00	3.00
Alfalfa Meal	3.50	3.00
Dikal	1.00	1.00
Trace Mineral Salt	.50	.50
Vitamin-Antibiotic pre-mix	.75	.50
Hygromix	.25	--
TOTAL	100.00	100.00

The confinement lots had concrete floors with a 10 by 10 ft. area inside the barn and a 10 by 12 ft. area outside of the barn. Self-feeders and automatic waterers were located inside the barn. A mist type sprinkler under a shade outside of the barn was used during the summer.

Each pasture lot for 12 pigs averaged 1½ acres in size and had an automatic waterer and self-feeder with compartments for shelled corn, protein supplement, and mineral supplement. Movable houses were used for shelter in both summer and winter. In the first trial in the summer of 1959, an old alfalfa field was used for pasture. Although this was a thin stand, there was ample alfalfa pasture for the pigs. In the winter of 1959 excellent wheat pasture was used. In the summer of 1960 about half of each lot was planted in oats, for grazing during April and May, and the other half was planted in sudan for summer grazing. Pasture lots were rotated and no lot was used more than once in these trials.

**Table 7.—Confinement Vs. Pasture Systems for Growing—Finishing Pigs, 1959, 1960 Trials.**

	Confinement	Pasture	Difference
Number of pigs	113	110	
Avg. initial wt., lbs.	43.0	42.9	0.1
Avg. final wt., lbs.	206.0	201.4	4.6
Avg. daily gain, lbs.	1.62	1.32	0.30
Feed per 100 lbs. gain	320.0	338.0	—18.0
Feed cost per 100 lbs. gain, \$	10.61	7.94	2.67
Probed backfat thickness, in.	1.57	1.45	0.12
No. carcasses measured	55	53	
Carcass backfat, in.	1.55	1.47	0.08
Carcass length, in.	29.5	29.8	—0.3
Loin eye area, sq. in.	3.53	3.33	0.20
No. carcasses cut	32	30	
Dressing %	72.0	70.4	1.6
% ham	12.7	12.8	—0.1
% loin	10.4	10.4	0
% shoulder	11.4	11.6	—0.2
% belly	13.0	11.7	1.3
% lean cuts (ham, loin, shoulder)	34.5	34.7	—0.2
% primal cuts	47.4	46.4	1.0

Confinement pigs gained .3 lbs. per day faster than pasture pigs and required 18 lbs. less feed per 100 lbs. of gain (Table 7). The confinement ration, however, cost \$0.93 per hundred more than the pasture ration so that the cost of 100 lbs. gain in confinement was \$2.67 more than on pasture. The confinement ration was a complete pelleted ration delivered to the station in 50 lb. bags. The average cost of the ration as consumed was \$3.28 per hundred lbs. The simple, free-choice ration had no processing charge, as the corn was not ground and the supplements were mixed on the farm. The cost of this pasture ration as consumed was \$2.35 per hundred lbs. In comparing the two rations on the basis of the cost of ingredients, the cost per cwt. of the confinement ration was \$2.47, which made it only \$0.12 higher than the pasture ration. The major difference in the cost of the ration was in the processing and handling charges.

Pasture pigs were slightly leaner than confinement pigs as shown by .12 inch less probed backfat on all pigs and .08 inch less carcass backfat on the barrows. Pasture pigs also had longer carcasses, but confinement pigs had larger loin eyes, a higher dressing percent, and a higher yield of belly. There was no difference in the yield of lean cuts (expressed as a percent of the live weight off test), but confinement pigs produced a one percent greater yield of primal cuts.

An interesting observation provided by these trials was the opportunity to compare response of the three lines of breeding to the two management systems. Although the three lines in these trials were quite different in most traits studied, they responded in a similar manner to the two managements. The non-significance of these line of breeding-management interactions indicated that the best performing line under one set of environmental conditions was also the best under the other set of conditions.

In summary, pigs fed on concrete floors in confinement gained faster, required less feed per lb. of gain, had more backfat, larger loin eye area, heavier bellies, higher dressing percent, and a higher yield of primal cuts than pigs fed a simple, free-choice corn and supplement ration. These differences were statistically significant. The lower cost of the pasture ration made the cost per hundred lbs. gain considerably less on pasture than in confinement in these trials. Pigs fed on pasture were sounder on their legs and produced slightly leaner and longer carcasses than those raised in confinement.

## Creep-Feeding Fall Calves

*L. R. Kuhlman, A. B. Nelson,  
and W. D. Campbell*

Creep-feeding is a method of increasing the gain and finish of suckling beef calves. One would expect creep-feeding to be of greater importance with fall calves than with spring calves because fall-calving cows nurse their calves during the winter when the dry forage of the native grass pastures is of lowest nutritive value. The milk production of these cows would be expected to be lower than if green grass were available unless the level of supplemental winter feeding was very high. Such high levels of feeding are costly.

Results of a four-year study (Okla. Agr. Exp. Sta. MP-55:72) indicated that creep-feeding fall calves nursing cows fed 1.5 lbs. of cottonseed meal per head daily increased calf gains 87 lbs., whereas providing high levels of supplemental feed for the cows (2.5 lbs. cottonseed meal and 3 lbs. grain per head daily) increased calf gains 52 lbs. These results suggest that increased levels of feed should be given to the calf rather than to the cow. Neither of these systems was as profitable as not creep-feeding and feeding the cows 1.5 lbs. of cottonseed meal per head daily. However, young cows will not perform satisfactorily when fed at such low levels. Creep-feeding only until spring grass becomes available may be a satisfactory practice. A high proportion of the gain resulting from creep-feeding occurred during the winter months while the largest proportion of creep-feed was consumed during the following summer.