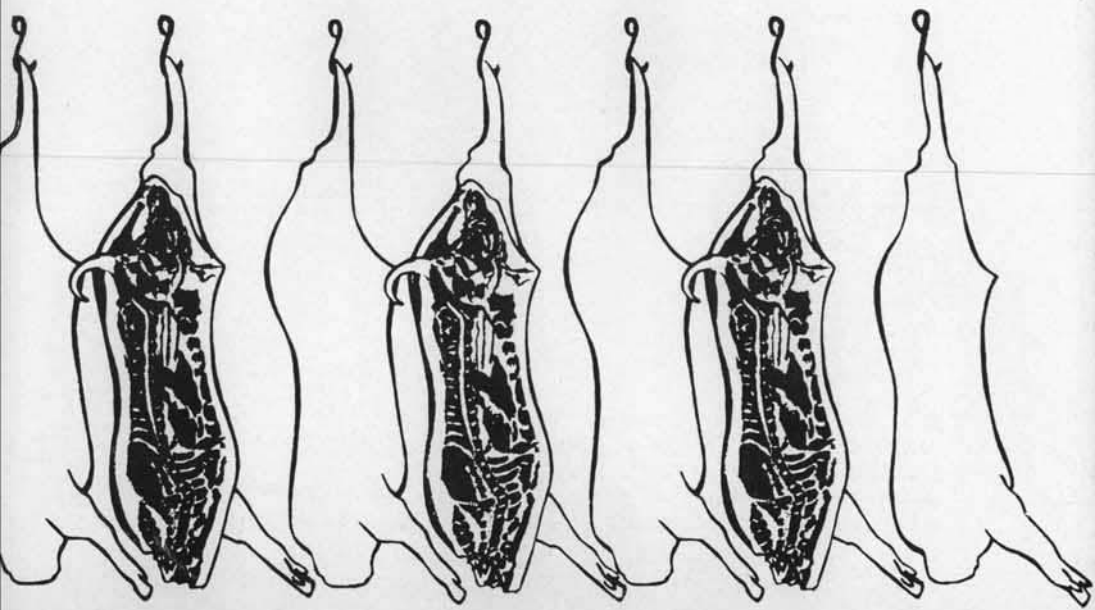
UNIVERSITY OF IDAHO
College of Agriculture

IDAHO SWINE TESTING PROGRAM

a Five-Year Summary

By J. J. Dahmen, Duane Sharp and L. E. Orme



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SUMMARY AND CONCLUSIONS

A swine testing station was established at the Caldwell Branch Station in the spring of 1960 as a means of selecting strains of swine that show superiority in such traits as feed conversion, rate of gain, meatiness and carcass quality. Sixty-three litters, totaling 199 head, have been tested under the program at the station. Only 19 of the 63 litters tested met all the requirements for the test program.

Loin eye areas less than 4 square inches were responsible for disqualification of 47 of the 123 head that were slaughtered.

Since loin eye area disqualified the greatest number of carcasses, it appears that greater emphasis should be placed on selection for larger loin eye area because it can be increased through selection of breeding animals from families or strains of hogs within the various breeds which have this important trait.

Twelve had a backfat thickness over 1.6 inches. Twelve measured less than 29 inches in carcass length. Twenty-six of the pigs on test failed to meet the minimum requirements for rate of gain and 20 of the 63 litters required more than the minimum 3.50 pounds of feed to produce a pound of gain.

The gilts tended to produce leaner, meatier carcasses than the barrows as indicated by loin eye area, percentage of lean cuts and backfat thickness.

Extreme variations in all the different traits among individuals under similar environmental conditions were evident. This indicates that improvement in meatiness and carcass quality is possible through a conscientious selection and breeding program.

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Changes in the type of swine being produced in Idaho have been brought about through consumer demands for more lean and less fat in pork products. To produce the "meat-type hog", swine breeders have selected and mated individual animals possessing such traits as superior muscling, greater carcass quality, greater feed efficiency and rates of gain.

The hog carcass may be influenced by environmental factors such as feeding and management practices or by modifying the genetic makeup of the animal through selection and breeding. Swine testing programs are basically designed to identify the families of hogs within the various breeds which have the meat-type traits swine breeders are looking for.

The University of Idaho, in cooperation with the Idaho Swine Producers Association, has established a swine testing station at the Caldwell Branch Experiment Station for improvement of swine in Idaho through improved selection and breeding. The important traits to be measured are average daily gain, efficiency of feed conversion, meatiness and carcass quality.

Methods and Procedures

The first group of test hogs was put on test in the spring of 1960. The results of the first 35 litters, totaling 111 head, were summarized in Idaho Agricultural Research Progress Report No. 76, April 1963.

To date, 63 litters, totaling 199 head, have been tested under this program.

To be eligible for the testing program, a litter must be Production Registry qualified with its respective breed association, between 49 and 63 days of age when delivered and have an average weight of 50 pounds with individual weights within the range of 40 to 60 pounds. An entry consists of 2 weaned barrows and 1 or 2 boars. On several occasions gilts have been used in lieu of barrows.

Performance requirements for qualification under the testing program have been established as follows: **(a) Average daily gain minimum—1.6 pounds; (b) Feed efficiency—350 pounds or less of feed per 100 pounds gain; (c) Backfat—maximum 1.3 inches average on each boar (probe method); and (d) Carcass data—(1) Minimum of 4 square inches loin eye area; (2) At least 29 inches long; (3) Backfat thickness not to exceed 1.6 inches.**

After an adjustment period of 1 week the pigs are fed a standard pelleted ration in self feeders. When the pigs reach 100 pounds, the ration is changed to meet the lowered protein requirements of the pigs. These rations are listed in Table 1. Accurate records are maintained so that feed efficiency and daily rates of gain may be determined for each pen. All pigs are weighed off test at 200 to 220 pounds live-weight and probed for backfat thickness.

Approximately 24 hours after slaughter the chilled carcass weight is obtained; the backfat is measured at the first rib, the last rib and the last lumbar vertebra; and the carcass measured for length from the anterior edge of the aitchbone to the anterior edge of the first rib. The weight and yield of trimmed lean cuts—comprised of loin, ham, shoulder and primal cuts including the 3 lean cuts plus the fresh side or bacon—are obtained. The cross-sectional area of the loin eye or longissimus dorsi muscle is traced at a point between the 10th and 11th ribs and measured by a com-

TABLE 1. RATIONS USED FOR THE SWINE TESTING PROGRAM

No. 1 swine feed (16% protein—crude basis)

Feed ingredient	Pounds	Additives
Ground barley and wheat	1300	Vitamin D2, 1,000,000 units
Ground corn	300	Vitamin A, 6,000,000 units
Meat scraps 50%	220	Niacin, 25g
Soybean meal 44%	150	Pantothenic acid, 10g
Cane molasses	40	Riboflavin, 5g
Iodized salt	10	3 Nitro, ½ lb.
Trace minerals (swine)	10	Dicalcium phosphate, 20 lb.

No. 2 swine feed (14% protein—crude basis)

Feed ingredient	Pounds	Additives
Ground barley	1660	Aureomycin, 20g
Meatmeal	120	Vitamin D2, 1,000,000 units
Soybean meal	100	Vitamin A, 6,000,000 units
Cane molasses	60	Niacin, 25g
Iodized salt	10	Pantothenic acid, 10g
Minerals	10	Riboflavin, 5g
Dicalcium phosphate	20	3 Nitro, ½ lb.

pensating planimeter. Backfat and carcass length measurements are read in inches and tenths, weight in pounds and ounces and loin eye area in square inches.

The type of ration, management practices and environment all have been shown to affect performance records. Although attempts were made to keep these factors uniform during each testing season, the effect of season upon performance cannot be entirely discounted. Also the variation between performance traits of different breeds must be considered.

Results and Discussion

Only 19 of the 63 litters tested at the Station met all the performance requirements established for the test program. A summary of the conditions for the 44 litters that failed to meet the production requirements is presented in Table 2.

TABLE 2. SUMMARY OF THE VARIOUS TRAITS WHERE PIGS FAILED TO MEET PRODUCTION REQUIREMENTS IN THE TEST

	Number of pigs	Number of litters
Average daily gain	26	0
Feed efficiency		20
Loin eye area	47	32
Length of carcass	12	11
Backfat thickness	12	10
Backfat—boar (determined by live probe method)	13	9

Twenty-six of the 123 hogs slaughtered at the end of the testing periods failed to meet the minimum requirements for rate of gain while 20 of the 63 litters required more than the minimum 3.50 pounds of feed to produce a pound of gain. Lack of sufficient loin eye area caused the greatest number of disqualifications. Forty-seven head failed to produce a loin eye measuring 4 square inches in area. Twelve measured less than 29 inches in carcass length. Also, 12 had a backfat thickness over 1.6 inches.

Seventy-six boars were on the test program and 13 of these probed more than the maximum 1.3 inches in backfat thickness.

Data from the Idaho Swine Testing Station illustrate the extreme variation for the different traits between individuals under similar environmental conditions. Summaries of the extreme variability of the important traits are presented on the following pages in Tables 3 through 9.

TABLE 3. DATA SHOWING THE VARIATION IN AVERAGE DAILY GAINS UNDER SIMILAR ENVIRONMENTAL CONDITIONS

Average daily gain	Boars	Barrows	Gilts
pounds			
1.31 to 1.40	2	1	0
1.41 to 1.50	2	4	4
1.51 to 1.60	5	8	4
1.61 to 1.70	10	19	11
1.71 to 1.80	6	19	5
1.81 to 1.90	19	18	3
1.91 to 2.00	12	11	1
2.01 to 2.10	12	5	1
2.11 to 2.20	2	3	0
2.21 to 2.30	5	6	0
2.31 to 2.40	0	0	0
2.41 to 2.50	0	0	0
2.51 to 2.60	1	0	0
Total head	76	94	29
Average	1.86	1.80	1.69

Daily rate of gain varied from a low of 1.32 pounds for one boar to a high of 2.53 pounds for another boar, from a low of 1.31 pounds for one barrow to a high of 2.25 pounds for three different barrows and from a low of 1.49 pounds for one gilt to a high of 2.09 pounds for another gilt. The average daily rate of gain for the boars was 1.86 pounds, for the barrows 1.80 pounds and for the gilts 1.69 pounds.

TABLE 4. DATA SHOWING THE VARIATION IN FEED CONVERSION UNDER SIMILAR ENVIRONMENTAL CONDITIONS

Pounds feed/pound gain	Number of pens
2.51 to 2.60	1
2.61 to 2.70	0
2.71 to 2.80	0
2.81 to 2.90	6
2.91 to 3.00	6
3.01 to 3.10	11
3.11 to 3.20	1
3.21 to 3.30	3
3.31 to 3.40	8
3.41 to 3.50	5
3.51 to 3.60	8
3.61 to 3.70	5
3.71 to 3.80	1
3.81 to 3.90	2
3.91 to 4.00	1
4.01 to 4.10	2
4.11 to 4.20	0
4.21 to 4.30	0
4.31 to 4.40	1
4.41 to 4.50	0
4.51 to 4.60	1

Feed conversion varied from a low of 2.52:1 per pen for one pen to a high of 4.52:1 per pen for another.

TABLE 5. DATA SHOWING THE VARIATION IN BACKFAT THICKNESS UNDER SIMILAR ENVIRONMENTAL CONDITIONS

Range	Average backfat (Probe) Boars	Average backfat thickness Barrows	Gilts
Inches			
0.51 to 0.60	1	0	0
0.71 to 0.80	2	0	0
0.81 to 0.90	1	0	0
0.91 to 1.00	13	0	0
1.01 to 1.10	15	9	5
1.11 to 1.20	14	10	4
1.21 to 1.30	16	13	11
1.31 to 1.40	8	23	3
1.41 to 1.50	3	9	5
1.51 to 1.60	2	15	1
1.61 to 1.70	1	8	0
1.71 to 1.80	0	4	0
1.81 to 1.90	0	2	0
Total head	76	93	29
Average	1.14	1.40	1.26

The average backfat thickness of the boars as determined by the probe method ranged from 0.55 to 1.66 inches. The mean of all boars was 1.14 inches. The average backfat thickness of the slaughtered animals ranged from 1.00 to 1.83 inches for the barrows and from 1.03 to 1.55 for the gilts. The mean of all barrows was 1.40 inches while the gilts averaged only 1.26 inches.

TABLE 6. DATA SHOWING THE VARIATION IN CARCASS LENGTH AND LOIN EYE WITHIN PIGS UNDER SIMILAR ENVIRONMENTAL CONDITIONS

Range	Carcass length Barrows	Gilts	Range	Loin eye area Barrows	Gilts
Inches			Inches		
28 to 29	11	1	2.00 to 2.50	1	0
29 to 30	31	8	2.51 to 3.00	4	0
30 to 31	30	11	3.01 to 3.50	19	0
31 to 32	18	3	3.51 to 4.00	22	3
32 to 33	3	6	4.01 to 4.50	22	4
33 to 34	1	0	4.51 to 5.00	13	5
			5.01 to 5.50	8	4
			5.51 to 6.00	3	6
			6.01 to 6.50	1	4
			6.51 to 7.00	1	2
			7.01 to 7.50	0	1
Total head	94	29		94	29
Average	30.18	30.74		4.16	5.25

The carcass lengths varied from 28.5 to 33.10 inches for the barrows and from 29.00 to 32.70 inches for the gilts. The gilts averaged 30.74 inches and the barrows averaged 30.18 inches in length.

The loin eye areas varied tremendously. The smallest loin eye area was 2.27 square inches and the largest was slightly less than 7.0 square inches in the barrows. The smallest was 3.5 and the largest was slightly more than 7.0 square inches in the gilts. The average loin eye area was 4.16 for the barrows and 5.25 for the gilts.

TABLE 7. DATA SHOWING THE VARIATION IN DRESSING PERCENT AMONG INDIVIDUALS UNDER SIMILAR ENVIRONMENTAL CONDITIONS

Dressing Percent[1] Range	Number of Pigs	
	Barrows	Gilts
55 to 60 %	1	0
61 to 65%	12	0
66 to 70%	44	18
71 to 75%	36	11
76 to 80%	1	0
Total head	94	29
Average	69.19%	69.93%

[1] Dressing percent based upon the packer-style dress method.

The gilts averaged slightly higher dressing percentages, higher percentages of lean cuts and higher percentages of primal cuts than the barrows. The dressing percentages ranged from 59.5 to 76.3 for the barrows and from 67.2 to 73.14 for the gilts. The

TABLE 8. DATA SHOWING THE VARIATION IN THE PERCENTAGE OF LEAN CUTS AND THE PERCENTAGE OF PRIMAL CUTS UNDER SIMILAR ENVIRONMENTAL CONDITIONS

Percent Lean Cuts[1]	Barrows	Gilts	Percent Primal Cuts[2]	Barrows	Gilts
43.1 to 44%	1	0	60.1 to 61%	1	0
44.1 to 45%	0	0	61.1 to 62%	0	0
45.1 to 46%	0	0	62.1 to 63%	1	0
46.1 to 47%	1	0	63.1 to 64%	2	0
47.1 to 48%	1	0	64.1 to 65%	2	0
48.1 to 49%	1	0	65.1 to 66%	5	1
49.1 to 50%	2	0	66.1 to 67%	4	0
50.1 to 51%	4	0	67.1 to 68%	8	0
51.1 to 52%	6	1	68.1 to 69%	11	0
52.1 to 53%	13	0	69.1 to 70%	8	1
53.1 to 54%	10	2	70.1 to 71%	14	3
54.1 to 55%	15	1	71.1 to 72%	12	6
55.1 to 56%	10	5	72.1 to 73%	9	2
56.1 to 57%	13	3	73.1 to 74%	7	5
57.1 to 58%	7	4	74.1 to 75%	8	7
58.1 to 59%	4	5	75.1 to 76%	2	2
59.1 to 60%	2	1	76.1 to 77%	0	0
60.1 to 62%	4	4	77.1 to 78%	0	0
61.1 to 62%	0	1	78.1 to 79%	0	2
62.1 to 63%	0	2			
Average	54.48	57.67		70.08	72.93

[1] Weight of the trimmed loin, N. Y. shoulder and skinned ham expressed as a percent of chilled carcass weight.

[2] Weight of the trimmed loin, N. Y. shoulder, skinned ham and trimmed side expressed as a percent of chilled carcass weight.

average dressing percent was 69.19 for the barrows and 69.93 for the gilts.

The percentage of lean cuts ranged from 43.9 to 60.95 for the barrows and from 51.2 to 62.7 for the gilts. The average was 54.48% for the barrows and 57.67% for the gilts. The percentage of primal cuts varied from 60.22 to 75.6 for the barrows and from 65.5 to 78.07 for the gilts. The average was 70.08% for the barrows and 72.93% for the gilts. The percentage of lean cuts is shown in Table 8.

TABLE 9. DATA SHOWING THE VARIATION AMONG THE VARIOUS WHOLESALE CUTS OF DIFFERENT INDIVIDUALS UNDER SIMILAR ENVIRONMENTAL CONDITIONS

Percentage	Skinned ham		Trimed loin		N. Y. shoulder		Side	
	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts
12.1 to 13%	0	0	1	0	0	0	3	0
13.1 to 14%	0	0	12	0	0	0	6	1
14.1 to 15%	0	0	32	2	0	0	23	10
15.1 to 16%	1	0	30	9	2	0	30	11
16.1 to 17%	1	0	13	10	1	1	21	4
17.1 to 18%	3	0	6	6	11	1	8	3
18.1 to 19%	17	3	0	2	20	3	3	0
19.1 to 20%	28	3	0	0	31	8	0	0
20.1 to 21%	22	8	0	0	18	10	0	0
21.1 to 22%	19	9	0	0	11	3	0	0
22.1 to 23%	3	6	0	0	0	3	0	0
Average	19.90	20.87	15.12	16.43	19.50	20.19	15.55	15.36

The gilts averaged a larger percent of chilled carcass weight in the form of all wholesale cuts except for percentage of side or belly. Percentage of skinned ham varied from 15.76 to 22.5 for the barrows and from 18.14 to 22.45 for the gilts. Percentage of trimmed loin varied from 12.54 to 17.78 for the barrows and from 14.78 to 18.48 for the gilts. Percentage of New York shoulder ranged from 15.1 to 21.99 for the barrows and from 16.9 to 22.14 for the gilts. Percentage of side varied from 12.38 to 18.6 for the barrows and from 13.4 to 17.42 for the gilts.

The results obtained under the testing program illustrate the need for a planned testing and selection program to discover and propagate those strains of swine which exhibit superiority in the desired traits. The object is to identify the families of hogs within the various breeds that have desirable rates of gain, feed conversion, meatiness and carcass quality. Such an effort on the part of the swine producers of the state would result in slaughter hogs that would show more uniformity, meatiness and quality resulting in more efficient production of quality lean pork.

Table 10 presents average values for the heritability estimates

for various traits in swine as compiled by Lasley, Day and Tribble (1961).

TABLE 10. AVERAGE VALUES FOR THE HERITABILITY ESTIMATES FOR VARIOUS TRAITS IN SWINE

	Average Heritability
Performance	Percent
Weight of pig at 5 months	21
Growth rate from weaning to 200 lb.	30
Economy of gains, weaning to 200 lb.	38
Carcass traits	
Length	61
Loin eye area	48
Backfat thickness	46
Belly thickness	61
Percent of ham	58
Percent of fat cuts	60
Percent of shoulder	47
Percent of lean cuts	34

To make progress in selection, one must have variation. This variation is evidenced in several of the traits in previous tables.

Although rate of gain is medium to low in heritability, there is room for improvement in this trait through a selection program according to Lasley (1961). Efficiency of gain is 35-40% heritable, indicating that improvement in this trait is possible through selection.

TABLE 11. IMPROVEMENT IN LOIN EYE AREA MADE BY ONE BREEDER IN A PERIOD OF FIVE YEARS

Year	Loin eye area	
	Barrows	Gilts
	Square inches	Square inches
1960	3.25	
	3.26	
1961	3.59	
	2.71	
	3.61	
	3.07	
Average	3.25	
1962	5.16	5.60
	4.42	4.44
		4.31
		5.13
1963	5.25	6.52
	4.75	5.38
	5.15	
	4.41	
	4.15	
1964	4.75	3.85
Average	4.76	5.03

Heritability estimates of the various carcass traits are relatively high indicating that considerable progress in selecting and propagating the strains of hogs showing greater meatiness and higher quality is possible through a conscientious testing program of this type.

An example is shown in Table 11. Progress can be made when selecting for loin eye area which has an average heritability estimate of .48.

During the first 2 years of testing this breeder's hogs passed all of the test requirements except the necessary 4 square inches of loin eye area. From his first 6 test barrows slaughtered, the smallest loin eye area measured 2.71 and the largest 3.61 with an average of 3.25 square inches.

Through selection for larger loin eye area this breeder was able to increase the loin eye area to 5.25 for the largest and 4.15 for the smallest with an average of 4.76 square inches on 8 test barrows over the next 3-year period. During this same 3-year period 7 test gilts were slaughtered. The largest loin eye area measured 6.52 and the smallest 3.85 with an average of 5.03 square inches. The gilt with the 3.85 inches of loin eye area was slaughtered at a live weight of 196 pounds.

The increase in loin eye area in the example given is probably a larger increase in a given time interval than would normally be expected but does show to what an extent improvement in loin eye area can be made.

REFERENCES

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2. Sharp, D., J. J. Dahmen and L. E. Orme. Improvement of Swine through an Idaho Swine Testing Program. Idaho Agricultural Research Progress Report No. 76. April, 1963.

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