VARIATION IN FEED EFFICIENCY AND CARCASS CHARACTERISTICS OF INDIVIDUALLY FED SWINE

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Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

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AN ABSTRACT

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In the history of hog production in America, changes in type have been numerous and sometimes extreme. The present type change is different from the situation which prevailed in other periods in that a "meat-type" hog is in the process of being developed because of consumer preference for leaner cuts.

Swine carcass evaluation has received considerable attention in recent years due to the lower price of lard compared with the price of lean cuts of pork and the prices paid for live hogs. The most recent method for evaluating the carcass value of live hogs has been the probing technique. The research program herein reported deals with the feed efficiency of littermates and evaluation of the carcass from live hog probes.

Nine crossbred pigs, six of which were littermates of a Duroc - Berkshire cross and three Yorkshire - Chester White (littermates), five barrows and four gilts, were divided into nine lots and placed on self-feeders containing a 16 percent protein ration. Throughout the experiment, the pigs and the amount of feed consumed were weighed weekly. At 125 pounds the protein was reduced to 12 percent. The pigs were probed at three points; posterior to the shoulder blade, central lumbar region, and side of ham, at the live weights of 100, 150, and 215 pounds which was the slaughter weight. Carcass data included primal cut weights, body and leg length, backfat, and eye muscle measurements. The primal cut out ranged from 46.7 to 53.0 percent. Average backfat measurements ranged from 1.44 to 2.11 inches. Consumption of feed per 100 pounds of gain ranged from 337 to 422 pounds.

The second trial consisted of nine purebred Chester White pigs (littermates), three barrows, and six gilts. The feeding, weighing and probing locations were comparable to the first trial. Similar carcass data were obtained as in Trial 1. The primal cut out ranged from 44.2 to 48.9 percent. Average backfat measurements ranged from 1.70 to 2.22 inches. Consumption of feed per 100 pounds of gain ranged from 369 to 450 pounds.

Analysis of the data disclosed the following results:

1. Feed efficiency among littermates varied and when analyzed it was found to be significant at the 5 percent level between breeds.
2. Variation in daily gain between littermates ranged from .03 to .51 pounds between the purebred Chester Whites of Trial 2; from 0 to .04 pounds between the Yorkshire - Chester White cross; and from 0 to .22 pounds between the Duroc - Berkshire cross of Trial 1. Statistically, no significant difference was found when average daily gains were analyzed.
3. No significant differences were found when the data were analyzed for age at slaughter, carcass length, and dressing percent.
4. Significant differences were found between average backfat thickness between breeds. Highly significant differences were found between breeds of the percent of live and carcass primal cut out, and of the percent of lean cuts on live and carcass weight basis.
5. As the age at slaughter increases, the percent of lean cuts on live weight basis does not necessarily increase.
6. Highly significant correlations between percent of lean area in

cross section of rough loin and percent of live and carcass primal cut out were found.

7. A highly significant relationship was found to exist between the eye muscle of the third rib and the eye muscle of the last rib.
8. No correlation was found between the average live probe, shoulder probe, and last lumbar probe with the average carcass backfat thickness.

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INTRODUCTION

In the history of hog production in America, changes in type have been numerous and sometimes extreme. The changes from a large, late maturing hog to a small, short-bodied animal and back again to a larger type, has not been the result of studied efforts to comply with market demands. Only during the last century have swine been prominent in the meat supply of the nation and the type has been raised to be adapted to the needs of the pork trade. The changes in type which have been made were the results of fads and fancies to a larger extent than through the preferences of the consumers.

Greater refinement and quality were emphasized as producers became interested in fixing definite types for the breeds resulting in some decrease in the size of the hogs, but, a radical change did not occur until the time of the "hot-blood" boom in the Poland China breed. The preferred type was a very short, chuffy, lardy, early maturing pig which was one of the least profitable types of swine ever produced in America. Other breeds were somewhat affected by the trend toward small size, but the greatest extreme was reached by the Poland China breed. The requirements of the pork trade had no part in influencing the change to the small type nor later to the big type.

The present type change is different from the situation which prevailed in other periods in that a "meat-type" hog is in the process of being developed. There have been various concepts as to what character-

istics make up a meat-type hog. Birmingham, Brady, Hunter, Grady, and Kiehl (1954) defined "a meat-type hog as a heavily muscled hog, free from excess fat, well balanced and uniform in length and depth of body, and produces a larger proportion of lean to fat, which will yield approximately 50 percent primal cuts, be 29 to 30 inches long, have a backfat thickness of 1.3 to 1.6 inches and have a carcass weight of approximately 150 pounds." Zobrisky, Lasley, Brady, and Weaver (1954) defined a meat-type hog as well balanced, heavily muscled, well developed in the ham and loin, firm in flesh, trim of underline and jowl, and carries enough finish to produce a firm, high quality, high yielding carcass that has a desirable carcass length of 29 to 31 inches for a 200 to 230 pound hog.

The solution to the production of a meat-type hog does not lie solely in a specific plan of management or in any given breed. One method is selection for desirable carcass qualities. A rotational cross-breeding program would be another method for developing the meat-type hog. A third possibility would be limited feeding (Crampton, Ashton, and Lloyd, 1954) which would reduce the yield of fat and in turn increase the yield of lean meat with acceptable quality.

Swine carcass evaluation has received considerable attention in recent years due to the lower price of lard as compared with the price of lean cuts of pork and the prices paid for live hogs. According to Peterson and Baird (1952) it is more difficult to evaluate the live hog than the carcass because the live hog is one step further removed from the wholesale cuts, which in the final analysis determine the value of the animal. The most recent method for evaluating the carcass value of

live hogs has been the probing technique. The research program herein reported deals with the feed efficiency of littermates and evaluation of the carcass from live hog probes.

OBJECT OF THE STUDY

The lack of consumer demand for lard and its resultant low price has increased the price of the leaner and more desirable pork cuts. Both the producer and consumer would benefit materially from hogs that yield a higher percentage of the lean or muscled cuts. The swine population must be altered to meet the market demand for a "meat-type" hog. The research problem herein reported was designed to study the feed efficiency of littermates individually fed ad libitum, carcass characteristics, and mechanical measurement of backfat of live hogs as compared with carcass backfat measurements.

REVIEW OF LITERATURE

Very little investigation of variation between littermates concerning feed efficiency and carcass characteristics has been done.

Blunn and Baker (1947) studied the data from 416 hog carcasses, 58 of which were from littermate pigs that received the same ration but were fed out in larger groups. They divided the feeding period roughly into two portions so that the gain made during the growing period (56 to 112 days) could be separated from the gain made during the fattening period (112 days to slaughter). According to McMeekan, (1940) most of the pigs' skeletal and muscular growth is made during the first 116 to 120 days and after that most of the increase in weight is due to fat deposition. Blunn and Baker found a significant difference of +.023 pounds between litters within sires for average daily gain from weaning (56 days) to time of slaughter and a highly significant difference of +.090 inches between litters within sires for depth of backfat. However, where they determined the analysis of variance for differences between littermate hogs (58), they found no significance in the depth of backfat (.044 inches) and average daily gain from weaning to time of slaughter (.017 pounds). A positive correlation of .292 was found between average daily gain from weaning to time of slaughter and depth of backfat. Blunn and Baker concluded that there may be a breed difference in the relation between fatness and rate of gain.

Tucker, Dickerson, and Lasley (1952) studied the effects of full feeding from weaning to market weight on the crosses of Landrace with

Duroc, Poland China and Hampshire, and the four purebred stock of each breed. They found that under full feeding, the crossbred hogs gained 7 percent faster and reached final weight 10 days earlier, but consumed 6 percent more feed daily and were no more efficient than the parental purebreds.

Dickerson and Grimes (1947) selected for high and low individual feed requirements per pound of gain in two strains of Duroc swine. All the pigs from each litter were full fed a mixed ration in individual pens and selection was based largely on differences between littermates. They found the differences to be 24 percent heritable.

According to Headley (1947) variations in gain are due in part to differences in the quality and quantity of protein, composition of feeds, inherited characteristics of the individual animal and breed.

Crampton, Ashton, and Lloyd (1954) studied the effect of restricting feed intake during the finishing period. They reported results obtained from 120 purebred Yorkshires which were fed over a period of two farrowing seasons (winter and summer), 60 pigs in each season. The hogs were full fed up to 110 pounds and then the feed was restricted until slaughter weight. They found that restricted feeding increased the size of the loin muscle over the full fed hogs and also the lean area in the bacon rasher. They also reported that the lean-fat proportions of the hog carcass were significantly correlated with size of the loin muscle and also the lean area of the bacon rasher.

Merkel, Bray, Grummer, Phillips, and Bohstedt (1953) reported that by limited feeding, the length of the feeding period was increased and

the average daily gain was depressed. In addition, they found that the dressing percentage and backfat thickness were decreased and significantly leaner and firmer carcasses were produced. The body length was also significantly increased.

Winters, Sierk, and Cummings (1949) studied four different levels of feed intake and resultant carcass quality in swine. The first lot was self-fed the entire feeding period; the second lot was self-fed until the pigs weighed 125 pounds, then the feed was restricted to 3 percent of the body weight; the third lot was restricted feed to 3 percent of the body weight until the pigs weighed 125 pounds, and then self-fed to the slaughter weight of 215 pounds; the fourth lot was restricted to 3 percent of the body weight for the entire feeding period. They found that the range of feed efficiency of the four lots was from 365 to 391 pounds of feed per hundred pounds of gain with the restricted group being the more efficient and the restricted, full-fed (third lot) the least efficient. They found that the third lot required a longer period (266 days) to reach the slaughter weight as compared to 206 days for the full-fed group. There was little difference between the remaining groups and the full-fed lot. They reported also that the group fed the restricted ration throughout, yielded the highest percent of primal cuts (72.11) whereas the full-fed group yielded the least (69.47). The other two groups yielded approximately identical percent cut outs.

Crampton (1937) reported data from 7 Yorkshire litters, totalling 40 pigs which were fed individually, 20 hand-fed and 20 self-fed. He found that the self-fed hogs gained less than the hand-fed hogs. The

self-fed hogs averaged 1.37 pounds of daily gain as compared to 1.50 pounds for the hand-fed hogs and, therefore, required slightly longer (7 days) to reach market weight. The feed required per 100 pounds of gain was 409 and 383 pounds respectively; the hand-fed hogs required about 50 pounds less feed to reach 200 pounds market weight. The carcasses of self-fed hogs were on the average shorter by about 7/8 inch than those hand-fed as reported by Crampton.

Crampton (1940) set up an experiment feeding pigs individually which were full-fed 3 times daily to 100 pounds and then 2 times daily thereafter. He found no significant relationship between rate of gain and leanness or length of carcass.

Hammond and Murray (1937) showed that the weight of the live hog and the weight of the carcass is directly related to the weight of the bacon sides. They found that the actual live weight of the hog affects the percentage of bacon it will yield much more than does breed or type. The actual rate of increase of the thickness of the backfat slows down as the sides increase in weight. With the increase in weight of the side, the changes in thickness of fat over the loin, shoulder, and flank are closely related. According to these workers, fat is deposited in the following order, shoulder, rump, and lastly in the region of the loin. They also found that as the pig grows his length increases with age and live weight. In this study, they found that the backfat thickness varies in the different breeds for any given length of side. They found that crossbred pigs when compared with pure parent breeds at similar body weights are longer in body length but in backfat and belly thickness they are practically intermediate.

Hetzer, Hankins, King, and Zeller (1948) reported from data of 141 crossbred pigs, that the live body measurement of length showed practically no relationship with yield of trimmed and untrimmed cuts.

Aunan and Winters (1952) used a coring device for carcass sampling to estimate the fat and lean content of the swine carcass. Locations at which the 70 carcasses of 11 different breeds and crosses were probed with the coring device were: between the fifth and sixth ribs of the belly, between the eighth and ninth ribs of the loin, between the eleventh and twelfth ribs of the belly at the subcostal arches, the last rib of the loin, and the pocket of the belly. They reported that the fifth and sixth rib sample of the belly had the highest degree of association with with lean content of the carcass when percentage figures were used and gave the correlation coefficient of +.79 which was the highest of the 5 locations. A correlation coefficient of +.70 was found for the relationship between average backfat thickness and fat content of the carcass.

Hazel and Kline (1952) reported backfat measurements from 96 live hogs. The sites chosen for probing were 1 $\frac{1}{2}$ inches off the midline of the body above the longissimus dorsi; namely, behind the shoulder, middle of the back, middle of the loin and middle of the loin over the exact midline of the body. They reported the following correlations between the average backfat thickness on the carcass and the individual live-hog measurements: at the middle of the loin over the longissimus dorsi, +.67; and average of the four live-hog measurements, +.81. Hazel and Kline concluded that the location behind the shoulder was the most accurate single measure of carcass fatness and that the middle of the back was the poorest location for measuring backfat on live hogs.

Hazel and Kline (1953) studied backfat measurements of live hogs weighing approximately 210 pounds, which were probed prior to slaughter. Eight sites were probed. They made correlations between the percent lean cuts, percent fat cuts and the depth of fat measured by probing. The following results were obtained: behind the shoulder, over the longissimus dorsi -.69, +.76; middle of back over the longissimus dorsi -.55, +.54; middle of loin over the longissimus dorsi -.70, +.76; middle of loin over the lumbar vertebra -.48, +.53; top of the ham -.65, +.66; tailhead -57, +.43; side of shoulder, -.47, +.54; and side of ham -.29, +.40. Correlations between four backfat measurements taken on carcasses and the percentages of lean cuts and fat cuts were -.75 and +.79 respectively. From the figures obtained, they concluded that measurements at some of the sites reflect fatness and leanness as accurately as backfat measurements on the carcasses. They concluded from their data that the sites behind the shoulder, over the loin, and top of the ham have greatest accuracy in predicting leanness and carcass value.

De Pape and Whately (1954) studied probing measurements behind the shoulder, over the loin, and over the back, $\frac{1}{2}$ inch from the mid-line, taken at monthly intervals from weaning to market weight. They found that the probes taken at ages younger than 140 days had very low predictive values and that measurable differences occurred between breeds in backfat deposition at 140 days and older. They stated that the probes behind the shoulder and over the loin on both sides are good indicators of leanness and carcass value. These results seem to coincide with those found by Hazel and Kline (1953).

Cole, Riley, Smith and Hobbs (1953) studied carcass data from 250 head of hogs that had been divided into six weight groups from 155 to 305 pounds at 30 pound intervals and classified as to types... chuffy (small), intermediate, and rangy (large)... which were handled uniformly as to feed, fill, and shrink. They reported the following results: 1. A highly significant correlation existed between type and dressing percentage. They found that the longest hogs with deepest chest measurements had the lowest dressing percent. 2. The rangy hogs had a higher percentage of their live weight in primal cuts, but this advantage diminished as the live hog weight approached 300 pounds. 3. The rangy carcasses had 23.4 percent more spareribs of a leaner kind than the chuffy type. 4. They stated that a standard shrink should not be used in carcass evaluation because of the significant differences in percentage of viscera between different types of hogs at any given weight. 5. They found that kill weight is probably a more constant basis for determining cutting yields as the total percentage of primal cuts based on packer or shipper style carcasses decreases as the live hog weight increases.

Zobrisky, Brady, and Lasley (1953) studied carcass and live hog data from 207 hogs and reported significant negative correlations between the four lean cuts and the live hog backfat probes. They also reported similar results, but somewhat lower, between the same measurements and the five primal cuts. A significant positive correlation between the probes and the total fat was also reported.

EXPERIMENTAL PROCEDURE

A. Feeding Period

Trial 1. Nine October crossbred pigs were started on experiment January 5, 1954. Six were Duroc-Berkshire pigs at an average weight of 45 pounds (littermates) and three were Yorkshire-Chester White pigs at an average weight of 76 pounds (littermates). At that time, the pigs, five barrows and four gilts, were weighed and divided into nine lots and placed on self-feeders containing a 16 percent protein ration consisting of:

652	lbs. Corn
100	lbs. Oats
130	lbs. Soy Bean Oil Meal
50	lbs. Tankage
10	lbs. Fish Solubles
25	lbs. Dehydrated Alfalfa Meal
14	lbs. Limestone
10	lbs. Dicalcium Phosphate
5	lbs. Iodized Salt
1	lb. Trace Minerals
0.5	lbs. Vitamins A and D
1	lb. Fortafeed 2-49-90
1.5	lbs. TM-5 (3 #/ton)

The pigs were continued on this feeding program until a weight of approximately 125 pounds was reached. Throughout the experiment, the

pigs and the amount of feed consumed, were weighed weekly. Water was provided ad libitum.

At 125 pounds, the ration was adjusted to give a 12 percent protein ration by increasing the corn to 752 pounds and reducing the soybean oil meal to 60 pounds, and tankage to 20 pounds per 1,000 pounds of mixed feed. The amounts of all the other ingredients remained the same. Records were kept of the feed consumed by each lot from which feed efficiency was calculated.

The pigs were probed at three points; posterior to the shoulder blade, central lumbar region, and side of ham, at the live weights of 100, 150, and 215 pounds which was the slaughter weight. An incision, $\frac{1}{4}$ inch in width, transversely to the longissimus dorsi, was made at the mentioned points by a lancet. A metal ruler was inserted into the fatty tissue until it reached the muscle tissue and a reading was taken which included the skin.

Trial 2. Nine March purebred Chester White littermates, three barrows and six gilts, averaging 48 pounds were divided into nine lots and started on experiment May 13, 1954. Although one barrow was excluded from feeding and carcass data due to illness, only the longissimus dorsi area data of this pig was used. The feeding and weighing procedure and probing positions were identical with Trial 1.

B. Cutting and Slaughter Procedure

Trials 1 and 2. The animals were taken off feed at approximately 215 pounds and given access to fresh water for a period of 24 hours prior to

slaughter. At the time of slaughter, a live weight was recorded which was used as a basis for calculating live weight cut out, live weight percent lean cuts, dressing percent, and percent shrink. The hogs were slaughtered packer style and chilled for 24 hours at a temperature of 32^{o} - 36^{o} F., at which time a chilled carcass weight was recorded, excluding the leaf fat and kidney.

All carcass measurements were made and recorded in inches. The length of the body was measured from the anterior edge of the first rib near the first thoracic vertebra to the anterior edge of the aitch bone. The leg length was measured from the anterior edge of the aitch bone to the coronary band. The number of ribs of each carcass was recorded. Backfat measurements were made over the first rib opposite the first thoracic vertebra; over the seventh thoracic vertebra; over the last rib; and over the midpoint of the last lumbar vertebra. The backfat thickness for each carcass was calculated by averaging these measurements.

The carcasses were cut into primal cuts and the weights of each recorded. The neck bones, jowl, clear plate and forefoot cut across the knee joint, were removed from the $2\frac{1}{2}$ rib shoulder. The remaining cut, the New York style shoulder, was weighed as the first primal cut.

The ham was removed between the second and third sacral vertebrae on a line perpendicular to the hind leg. The tail, flank, surplus fat, and foot (at the hock joint) were removed. A skinned ham was made, leaving about 3/8 inch of fat on the ham. This cut was weighed as the second primal cut.

The rough loin and belly were separated along a line beginning one inch below the tenderloin muscle at the posterior end to about one inch

from the end of the backbone of the blade end. At this time, tracings were made of the cross-sectional area of the right rough loin at the blade end and also between the last two ribs. A planimeter was used to determine the area of lean and fat from these tracings and the percent of lean was calculated. A chop containing the next to the last rib was removed from the rough loin and saved for photographic records. The rough loin was weighed in order to determine the loin index by comparison with the weight of the trimmed loin. The back fat was removed from the loin leaving about a $\frac{1}{4}$ inch of fat on the loin. The trimmed loin was weighed as the third primal cut. The spare ribs were removed from the belly which was trimmed and weighed as the fourth and last primal cut. Of the four primal cuts, the skinned ham, New York style shoulder and trimmed loin, were considered as the lean cuts in calculating the percent of lean cuts.

Analysis of variance and t-tests were calculated for feed consumed per hundred pounds of gain, average daily gain, age at slaughter, dressing percent, average backfat, carcass length, percent of live weight cut out, percent of carcass cut out, percent of lean cuts on live basis, and percent of lean cuts on carcass basis, according to the methods of C.H. Goulden (1952). Correlation coefficients (Snedecor, 1946) were determined between percent lean area in cross section of rough loin and both the percent carcass cut out and percent live weight cut out; between eye muscle area of the third rib and last rib; between average probe, last lumbar probe, and shoulder probe with the average backfat measurements. The statistical formulae used are shown in Table 1.

TABLE 1

FORMULAE USED IN STATISTICAL ANALYSIS

Analysis of variance: (Goulden, 1952)

$$SX^2 - \frac{(SX)^2}{N} = \text{Total sum of squares.}$$

$$\frac{(SX_1)^2}{N_1} + \frac{(SX_2)^2}{N_2} + \text{----} \frac{(SX_n)^2}{N_n} - \text{C.T.} = \text{Between sum of squares.}$$

t-test

$$t = \frac{\bar{z}_1 - \bar{z}_2}{\sigma(\bar{z}_1 - \bar{z}_2)} \; ; \; \sigma(\bar{z}_1 - \bar{z}_2) = \sqrt{\sigma_{\bar{z}_1}^2 + \sigma_{\bar{z}_2}^2} \; ; \; \sigma_{\bar{z}} = \frac{S}{\sqrt{N}}$$

$\sigma(\bar{z}_1 - \bar{z}_2)$ (table for t) = Significant level between means.

Correlation analysis: (Snedecor, 1946)

$$r_{xy} = \frac{SXY - \frac{(SX)(SY)}{N}}{\sqrt{(SX^2 - \frac{(SX)^2}{N})(SY^2 - \frac{(SY)^2}{N})}}$$

$$b = \frac{SXY - \frac{(SX)(SY)}{N}}{SX^2 - \frac{(SX)^2}{N}}$$

RESULTS AND DISCUSSION

A. Feed Consumption

All the animals in Trials 1 and 2 were individually fed. The range in feed efficiency of the littermates for Trial 1 was 337 to 422 pounds of feed per 100 pounds of gain. For the littermates of Trial 2, the range was 369 to 450 pounds of feed per 100 pounds of gain. On the average, Trial 1 consumed 381.6 pounds of feed as compared to 404.1 pounds for Trial 2 which showed that there was a variation in feed efficiency between Trials. See Appendix Tables I and II.

From these data it appears that the crossbred pigs (Duroc - Berkshire and Yorkshire - Chester White) of Trial 1 were more efficient than the purebred Chester White pigs of Trial 2. The difference in feed efficiency may have been due to the climatic conditions at the time they were being fed. Trial 1 was made during the winter season whereas Trial 2 was conducted in the summer.

A statistical analysis was made of the feed consumed per 100 pounds of gain. The analysis of variance given in Table 2 follows the method given by Goulden (1952).

TABLE 2

ANALYSIS OF VARIANCE OF FEED CONSUMED PER 100 POUNDS OF GAIN

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	16303		
Breed	2	6938	3469	5.19*
Error	14	9365	669	

The analysis of variance of feed consumed per 100 pounds of gain was made as shown in Table 2. Here the F-test shows a significant difference at the 5 percent level in the feed consumed per 100 pounds of gain between breeds. It appears that heredity factors played an important role in causing the differences in feed consumption for 100 pounds of gain.

A t-test (Table 1) was made to determine where the significance existed. The difference between the average consumption of the Yorkshire - Chester White and Duroc - Berkshire gave a t value of 2.68 which was significant at the 2 percent level. Similarly, the difference between the average consumption of the Chester White breed and Duroc - Berkshire gave a t value of 2.62 at the 2 percent level. There was no significant difference between the Yorkshire - Chester White and Chester Whites since the average consumption difference was less than the standard deviation of 18.3.

B. Daily Gain

The variation in average daily gain between littermates of Trial 1 was 1.58 to 1.80 pounds and the range for Trial 2 was 1.40 to 1.91 pounds. The differences in daily gain between littermates ranged from .03 to .51 pounds for the purebred Chester White hogs of Trial 2; from 0 to .04 pounds within the Yorkshire - Chester White cross; and from 0 to .22 pounds within the Duroc - Berkshire cross of Trial 1. The littermates of the purebred Chester Whites showed the most variation.

There was little difference in average daily gain for the three groups. The average daily gain of the Duroc - Berkshire cross was 1.67

pounds, of the Yorkshire - Chester White cross, 1.68 pounds, and for the Chester White, 1.62 pounds.

King, Gobble, and Henning (1952) found that crossbred hogs made greater average daily gains of 1.26 pounds per day or .09 pounds more per day than the pedigreed hogs.

TABLE 3

ANALYSIS OF VARIANCE OF AVERAGE DIALY GAIN

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	44.92		
Breed	2	.01	.005	.002
Error	14	44.91	3.21	

The analysis of variance of average daily gain was made as shown in Table 3. The F-test did not show any significant difference in the average daily gain between breeds.

The age at slaughter within littermates varied in Trial 1 from 166 to 187 days and in Trial 2 from 157 to 193 days. However, between breeds the averages of the age at slaughter show very little difference. For the Duroc - Berkshire cross, the average slaughter age was 175 days, for the Yorkshire - Chester White, 179 days and for the purebred Chester Whites, 176 days.

King, Gobble, and Henning (1952) found that the cross bred pigs showed a definite economic advantage in the number of days required to

reach market weight. The crossbreds averaged 158 days to reach approximately 225 pounds as compared to 176 days for the pedigreed hogs.

TABLE 4

ANALYSIS OF VARIANCE OF AGE AT SLAUGHTER

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	1850		
Breed	2	36	18	0.139
Error	14	1814	129.6	

The analysis of variance of the age at slaughter was made as shown in Table 4. The F-test did not show any significant difference in the average age at slaughter between the breeds.

C. Carcass Measurements

Variation of carcass length between littermates of Trial 1 ranged from 29.25 to 31.1 inches as compared to 27.7 to 30.7 inches of the purebred Chester White hogs of Trial 2. The average difference of carcass length between breeds was very small. The average carcass length of the Duroc - Berkshire was 29.91 inches, Yorkshire - Chester White, 30.01 inches and for the purebred Chester White, 29.85 inches. See Appendix Tables I and II.

TABLE 5

ANALYSIS OF VARIANCE OF CARCASS LENGTH

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	5.93		
Breed	2	.07	.035	.084
Error	14	5.86	.419	

The analysis of variance of carcass length was made as shown in Table 5. The F-test did not show any significant difference in the carcass length between breeds.

The average backfat measurements for Trial 1 were fairly low as compared with those of Trial 2. In Trial 1, the range of the average backfat measurements was from 1.44 to 2.11 inches as compared to 1.70 to 2.22 inches for the Chester White hogs of Trial 2. There was a variation in the backfat thickness between littermates as shown in Appendix Tables III and IV. However, between breeds, the average backfat differences were large.

The depth of fat was greater at the carcass locations than at the live hog locations most nearly corresponding to them. The average of the four carcass measurements of both Trials was 1.84 inches while the average of the two live hog locations was 1.56 inches as measured by probing. See Appendix Table IV.

TABLE 6

ANALYSIS OF VARIANCE OF AVERAGE BACKFAT THICKNESS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	.69		
Breed	2	.32	.16	6.15*
Error	14	.37	.026	

The analysis of variance of the average backfat thickness was made as shown in Table 6. Here, the F-test shows a significant difference at the 5 percent level between the average backfat thicknesses of the breeds.

A t-test (Table 1) was made to determine where the significance existed. A difference between the average backfat thickness of the Yorkshire - Chester White hogs and Duroc - Berkshire produced a t-value of 3.25 which was highly significant at the 1 percent level. The t-value between the Chester White hogs and Duroc - Berkshire cross gave a significant difference at the 5 percent level. There was not any significant difference between the purebred Chester White hogs and Yorkshire - Chester White cross since the difference was less than 0.11.

Rust (1953) found no significant differences of average backfat thickness among related purebred Chester White hogs.

D. Slaughter and Cutting Data.

From the data, Appendix Tables V and VI, there was very little variation between littermates in dressing percent. The range in dressing

percent for Trial 1 was from 72.3 to 75.9 percent with a mean average of 74.8 percent. As for Trial 2, the range in dressing percent was from 72.8 to 76.8 percent with a mean average of 75.1 percent. The two mean percentages compare favorably with the average of the two Trials which was 74.9 percent. The mean difference between the two Trials was 0.3 percent which is too slight to show any significance.

TABLE 7

ANALYSIS OF VARIANCE OF DRESSING PERCENT

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F-Value
Total	16	25.71		
Breed	2	0.5	.25	.139
Error	14	25.21	1.80	

The analysis of variance of the dressing percent of the breeds was made as shown in Table 7. Here, the F-test did not show any significant difference in the average dressing percent between the Duroc - Berkshire cross, Yorkshire - Chester White cross and Chester White hogs.

Rust (1953) found no significant difference statistically in dressing percent of related purebred Chester White hogs.

Between littermates of Trial 1, the variation in percent primal cut out varied from 46.7 to 53.0 percent while the percent primal cut out of Trial 2 ranged from 44.2 to 48.9 percent. A difference between the means of the percentage live weight cut out shows that the crossbred hogs of Trial 1 cut out higher in primal cuts, (51.5 percent) than the Chester White hogs (47.2 percent).

TABLE 8

ANALYSIS OF VARIANCE OF PERCENT OF LIVE WEIGHT PRIMAL CUT OUT

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	100.05		
Breed	2	70.58	35.29	16.73**
Error	14	29.47	2.11	

The analysis of variance of the percent of live weight primal cut out was made as shown in Table 8. Here, the F-test shows a highly significant difference in the percent of live weight primal cut out between breeds at the 1 percent level.

A t-test was used to determine where the highly significant difference in percent of live weight primal cut out existed. A highly significant difference in favor of the Duroc - Berkshire over the Yorkshire - Chester White showed up when the t value was found to be 3.98 at the 1 percent level. A t value of 5.48 was found to be highly significant at the 1 percent level between the Duroc - Berkshire and Chester Whites of Trial 2. No significant difference was found between the means of the Chester Whites of Trial 2 and Yorkshire - Chester White.

Rust (1953) found no significant difference in percent of live weight primal cut out among related purebred Chester White hogs.

The variation of percent of carcass cut out for Trial 1 ranged from 61.7 to 71.0 percent as compared to 60.7 to 65.2 percent in Trial 2. There was variation in percent of carcass primal cut out between individ-

ual littermates as can be seen from the data compiled in Appendix Tables VII and VIII. From the averages of percent of carcass primal cut out, the hogs in Trial 1 were superior to those in Trial 2. Trial 1 had a mean average of 67.1 percent as compared to 62.9 percent for Trial 2.

TABLE 9

ANALYSIS OF VARIANCE OF PERCENT OF CARCASS PRIMAL CUT OUT

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	185.16		
Breed	2	140.16	70.8	22.06**
Error	14	45.00	3.21	

The analysis of variance of the percent of carcass primal cut out was made as shown in Table 9. The F-test shows a highly significant difference between breeds in carcass primal cut out at the 1 percent level.

A t-test was made to determine where the highly significant difference existed. A t value of 4.49 between the means of the carcass primal cut out of the Duroc - Berkshire and Yorkshire - Chester White proved to be highly significant at the 1 percent level. Similarly, a t value of 6.30 between the means of the same carcass characteristic of the Duroc - Berkshire and purebred Chester Whites showed a highly significant difference at the 1 percent level. The variance of the means between the Yorkshire - Chester White hogs and Chester White was less than 1.27 and therefore no significant difference was shown.

Rust (1953) found no significant difference in the percent of carcass primal cut out when treated statistically among related purebred Chester White hogs.

Between littermates there was a difference in the percentage of lean cuts based on live weight. Between the Duroc - Berkshire littermates, the difference ranged from 0 to 3.8 percent, between the littermates of the Yorkshire - Chester White from .1 to 1.0 percent and from 0 to 5.4 percent between littermates of the Chester Whites. The mean averages of the percent of lean cuts on live basis for the Duroc - Berkshire was 39.3 percent, for the Yorkshire - Chester White 36.3 percent, and 35.8 percent for the purebred Chester White. It appears that there is a difference in the percent of lean cuts on live basis among the breeds.

TABLE 10

ANALYSIS OF VARIANCE OF PERCENT OF LEAN CUTS ON LIVE BASIS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	79.46		
Breed	2	44.12	22.06	8.75**
Error	14	35.34	2.52	

The analysis of variance of percent of lean cuts on live weight basis between breeds was made as shown in Table 10. Here, the F-test shows a highly significant difference between breeds in the percent of lean cuts on live weight basis at the 1 percent level.

A t-test was made to find out where the highly significant difference existed between the breeds. The mean difference between the Duroc - Berkshire cross and Yorkshire - Chester White cross gave a t value of 2.68 which was significant at the 5 percent level. However, the mean difference between the Duroc - Berkshire and purebred Chester Whites was highly significant at the 1 percent level which gave a t value of 12.91. No significant difference existed between the means of the Yorkshire - Chester White and Chester White hogs.

Rust (1953) found no statistical significance in percent of lean cuts on live weight basis among related purebred Chester White pigs.

Variation in the percent of lean cuts on carcass basis between littermates of the Duroc - Berkshire ranged from 48.6 to 54.4 percent with a mean average of 52.6 percent. For the Yorkshire - Chester White hogs, the range varied from 47.6 to 49.5 percent with a mean average of 48.4 percent. The purebred Chester White hogs ranged from 44.6 to 50.4 percent with a mean average of 47.7 percent. The average percent of the lean cuts on carcass basis of the Duroc - Berkshire, which was 52.6 percent, was above the total average of both trials which was 49.6 percent.

TABLE 11

ANALYSIS OF VARIANCE OF PERCENT OF LEAN CUTS ON CARCASS BASIS

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-Value
Total	16	136.38		
Breed	2	87.63	43.81	12.59**
Error	14	48.75	3.48	

The analysis of variance of percent of lean cuts on carcass basis between breeds was made as shown in Table 11. The F-test shows a highly significant difference at the 1 percent level between the breeds in percent of lean cuts on carcass basis.

A t-test was made to determine the exact significant difference between breeds. The mean difference of percent of lean cuts on carcass basis between the Duroc - Berkshire cross and Yorkshire - Chester White cross produced a t value of 3.18 which was highly significant at the 1 percent level. Similarly, when the mean difference between the Duroc - Berkshire cross and purebred Chester White hogs was taken, a t value of 4.85 was found and it proved to be highly significant at the 1 percent level. However, there was no significant difference between the Yorkshire - Chester White and purebred Chester White.

Rust (1953) found no statistical significance in percent of lean cuts on carcass weight basis among related purebred Chester White hogs.

TABLE 12

PERCENT OF LEAN CUTS ON LIVE BASIS RANKED ACCORDING TO AGE AT SLAUGHTER

Trial 1 Pig No.	Age (Days)	% Lean Cuts	Trial 2 Pig No.	Age (Days)	% Lean Cuts
12-5	166	40.4	1-4	157	34.4
12-3	166	40.3	1-1	157	32.4
12-2	173	36.6	1-6	171	36.5
9-4	179	36.9	1-10	171	35.5
9-3	179	36.0	1-8	178	37.2
9-5	179	35.9	1-12	186	36.4
12-4	180	40.3	1-9	193	37.8
12-9	180	37.8	1-7	193	36.4
12-8	187	40.4	1-5	193	34.6

As the age of slaughter increases, the percent of lean cuts on live basis does not necessarily increase. In the Duroc - Berkshire cross of Trial 1 (litter number 12), their ages at slaughter varied from 166 to 187 days and the percent of lean cuts on live basis from 36.6 to 40.4 percent. Among the Yorkshire - Chester White littermates of Trial 1 (litter number 9) the age at slaughter was identical but the percent of lean cuts on live weight basis varied from 35.9 to 36.9 percent. In Trial 2, there was variation between the littermates as their ages varied from 157 to 193 days and the percent of lean cuts on live basis from 32.4 to 37.8 percent.

TABLE 13

CORRELATION AND REGRESSION COEFFICIENTS OF VARIOUS CARCASS MEASUREMENTS

Carcass Measurements	D.F.	Sum of Squares and Products			r	b^1
		SX^2	SXY	SY^2		
Percent lean area in cross section of rough loin vs percent live weight primal cut out.	16	35797.02	38714.04	42543.59	+.8136**	.2815
Percent lean area in cross section of rough loin vs percent carcass primal cut out	16	35797.02	51697.00	75891.58	+.7947**	.3661
Eye muscle of third rib vs eye muscle of last rib	16	83.99	179.53	405.93	+.6918**	.6035
Average live probe vs average carcass backfat thickness	16	46.37	52.27	61.57	+.0291	.0196
Shoulder probe vs average carcass backfat thickness	16	60.15	59.03	61.57	+.0000	.0000
Last lumbar probe vs average carcass backfat thickness	16	34.95	45.44	61.57	+.0232	.0189

** Highly significant at 1 percent level.

b^1 Regression coefficient (slope of line)

The coefficient of correlation and regression between the percent lean area in cross section of the rough loin and percent live weight primal cut out is presented in Table 13. The correlation and regression coefficients of +.8136 and +.2815 respectively are highly significant statistically. These results agree with Soule's (1950) findings of a significant correlation of .8186 for similar data. These results contradict the non-significant correlation coefficient of .352 obtained by Rust (1953).

A highly significant correlation coefficient of +.7947 and regression coefficient of +.3661 was found between the percent lean area in cross section of rough loin and percent carcass primal cut out. Soule bore out this fact by obtaining a highly significant correlation of +.8550 between the same two characteristics. However, Rust found a value of +.466 which was significant at the 5 percent level.

The longissimus dorsi muscle of the third rib was correlated with the same muscle of the last rib which showed a highly significant correlation of +.6918. From this highly significant correlation we can assume that if the longissimus dorsi of the third rib is large then the longissimus dorsi of the last rib will be large.

E. Live Probe Measurements.

Efforts to improve carcass value in hogs by genetic means have been handicapped for lack of a rapid and accurate method of measuring carcass value in prospective breeding animals. New methods are constantly being devised to measure carcass value of live hogs more accurately. The most recent mechanical method for evaluating the carcass value of live hogs has been the probing technique.

A correlation coefficient between the average live probe and average carcass backfat thickness was found to be +.0291 (Table 13) which was non-significant. This statistical analysis shows that there is no relationship between the average live probe and average carcass backfat thickness.

Correlations were made between both the shoulder and last lumbar probe with the average carcass backfat thickness. Both correlations were found to be insignificant (Table 13).

Hazel and Kline (1952) reported that probing behind the shoulder was the most accurate single factor of carcass fatness and the location at the middle of the loin about $\frac{1}{2}$ inch off the midline of the body was the second accurate indication of carcass leanness. They found a highly significant correlation of +.79 behind the shoulder and a significant correlation of +.73 about $\frac{1}{2}$ inch off the midline of the body.

Since probing is rather rapid and results are made available immediately, this method would seem to be of practical importance to select breeding stock for leaner, higher yielding hogs in carcass primal cut out before marketing. The low correlations which were obtained in this study may have been due to the inexperience of the author in the probing technique.

CONCLUSIONS

1. Feed efficiency among littermates varied in Trial 1 from 337 to 422 pounds of feed per 100 pounds of gain and from 369 to 450 pounds of feed per 100 pounds of gain in Trial 2. The difference between trials was found to be significant at the 5 percent level.

2. Differences in daily gain between littermates ranged from .03 to .51 pounds between purebred Chester Whites of Trial 2; from 0 to .04 pounds between the Yorkshire - Chester White cross; and from 0 to .22 pounds between the Duroc - Berkshire cross of Trial 1. The littermates of the purebred Chester Whites showed the most variation. No significant differences were found when average daily gain was analyzed statistically.

3. Statistically, no significant differences were found when the data were analyzed for age at slaughter, carcass length, and dressing percent.

4. A significant difference was found at the 5 percent level between the average backfat thicknesses of the breeds. Highly significant differences of the percent of live and carcass primal cut out and of the percent of lean cuts on live and carcass weight basis were found between breeds.

5. As the age of slaughter increases, the percent of lean cuts on live weight basis does not necessarily increase.

6. Highly significant correlations between percent lean area in cross section of rough loin and percent of live and carcass primal cut out were found. A value of +.8136 was found in the former relationship and +.7947 was obtained in the latter.

7. A highly significant relationship was found to exist between the area of the longissimus dorsi at the third rib and the same muscle at the last rib. The correlation coefficient was found to be +.6918 which was highly significant.

8. No correlation was found between the average live probe, shoulder probe and last lumbar probe with the average carcass backfat thickness.

APPENDIX TABLE I

FEED DATA

Trial 1

	Hog No.	Initial Wt.	Final Wt.	Total Gain Lbs.	Avg. Daily Gain Lbs.	Total Feed Lbs.	Feed Per 100 Lbs. Gain.
Lot 1	12-2	53	217	164	1.58	605.5	369
Lot 2	12-3	48	222	174	1.80	612	352
Lot 3	12-5	42	216	174	1.80	641	368
Lot 4	12-4	48	227	179	1.61	745	416
Lot 5	12-9	42	225	183	1.65	617.5	337
Lot 6	12-8	36	223	187	1.58	655	350
Total		269	1330	1061	10.02	3876	2192
Average		45	221.6	176.8	1.67	646	365.3
Lot 7	9-4	75	217	142	1.71	585.5	412
Lot 8	9-5	80	219	139	1.67	587	422
Lot 9	9-3	74	213	139	1.67	568.5	409
Total		229	649	420	5.05	1741	1243
Average		76	216.3	140	1.68	580.3	414.3
Lot Total		498	1979	1481	15.07	5617	3435
Lot Average		55	219.8	164.5	1.67	624.1	381.6

APPENDIX TABLE II

FEED DATA

Trial 2

	Hog No.	Initial Wt.	Final Wt.	Total Gain Lbs.	Avg. Daily Gain Lbs.	Total Feed Lbs.	Feed Per 100 Lbs. Gain
Lot 1	1-10	47	216	169	1.67	655.5	388
Lot 2	1-9	48	220	172	1.40	773.5	450
Lot 3	1-1	59	225	166	1.91	675	407
Lot 4	1-8	41	218	177	1.64	690.5	390
Lot 5	1-6	53	225	172	1.70	635.5	369
Lot 6	1-7	40	216	176	1.43	700.5	381
Lot 7	1-4	57	210	153	1.76	669	437
Lot 9	1-12	47	218	171	1.47	703.5	411
Lot Total		392	1748	1356	12.98	5503	3233
Lot Average		49	218.5	169.5	1.62	687.8	404.1

Total Feed Data of Trials 1 and 2

Trial 1	Total	498	1979	1481	15.07	5617	3435
Trial 2	Total	392	1748	1356	12.98	5503	3233
Total		890	3727	2837	28.05	11120	6668
Average		52.4	219.2	166.9	1.65	654.1	392.2

APPENDIX TABLE III

CARCASS MEASUREMENT DATA

Trial 1

	Hog No.	Average Probe	Carcass Length Inches	Average backfat thickness (inches) 1st Rib	7th Rib	Last Rib	Last Lumbar	Average
Lot 1	12-2	1.75	29.25	2.25	1.75	1.50	1.75	1.81
Lot 2	12-3	1.55	29.25	2.13	2.00	1.63	1.50	1.81
Lot 3	12-5	1.45	29.50	2.06	1.75	1.50	1.44	1.69
Lot 4	12-4	1.65	29.88	2.25	1.88	1.50	1.38	1.75
Lot 5	12-9	1.55	30.50	2.00	1.38	1.25	1.13	1.44
Lot 6	12-8	1.40	31.13	1.88	1.50	1.06	1.38	1.45
Total		9.35	179.51	12.57	10.26	8.44	8.58	9.95
Average		1.56	29.91	2.10	1.71	1.41	1.43	1.66
Lot 7	9-4	.95	30.10	2.13	1.69	1.50	2.13	1.86
Lot 8	9-5	1.05	29.75	2.88	1.81	1.63	2.13	2.11
Lot 9	9-3	1.15	30.19	2.75	1.94	1.63	2.13	2.11
Total		3.15	90.04	7.76	5.44	4.76	6.39	6.08
Average		1.05	30.01	2.59	1.81	1.59	2.13	2.03
Lot Total		12.50	269.55	20.33	15.70	13.20	14.97	16.03
Lot Average		1.39	29.95	2.26	1.74	1.47	1.66	1.78

APPENDIX TABLE IV

CARCASS MEASUREMENT DATA

Trial 2

	Hog No.	Average Probe	Carcass Length Inches	Average backfat thickness (inches) 1st Rib	7th Rib	Last Rib	Last Lumbar	Average
Lot 1	1-10	2.10	29.25	2.76	2.17	1.77	2.17	2.22
Lot 2	1-9	1.75	30.35	1.93	1.50	1.50	1.85	1.70
Lot 3	1-1	1.65	29.4	2.76	1.89	1.54	1.85	2.01
Lot 4	1-8	1.70	29.8	2.56	1.65	1.65	1.77	1.91
Lot 5	1-6	1.73	30.51	2.72	1.77	1.57	1.50	1.89
Lot 6	1-7	1.80	29.9	2.44	1.93	1.34	1.61	1.83
Lot 7	1-4	1.45	28.9	2.32	1.77	1.57	1.77	1.86
Lot 9	1-12	1.80	30.7	2.48	1.85	1.26	1.97	1.89
Lot Total		13.98	238.81	19.97	14.53	12.20	14.49	15.31
Lot Average		1.75	29.85	2.50	1.82	1.53	1.81	1.91

Carcass Measurements of Trials 1 and 2

Trial 1	Total	12.50	269.55	20.33	15.70	13.20	14.97	16.03
Trial 2	Total	13.98	238.81	19.97	14.53	12.20	14.49	15.31
Total		26.48	508.36	40.30	30.23	25.40	29.46	31.34
Average		1.56	29.90	2.37	1.78	1.49	1.73	1.84

APPENDIX TABLE V

SLAUGHTER DATA

Trial 1

	Hog No.	Feed Lot Wt. Lbs.	Slaughter Wt. Lbs.	Age at Slaughter Days	Shrink Lbs.	Shrink %	Cold Carcass Wt. Lbs.	Dressing %
Lot 1	12-2	217	207	173	10	4.83	156	75.4
Lot 2	12-3	222	214	166	8	3.74	162.5	75.9
Lot 3	12-5	216	207	166	9	4.35	154	74.3
Lot 4	12-4	227	213	180	14	6.57	159	74.6
Lot 5	12-9	225	213	180	12	5.63	154	72.3
Lot 6	12-8	223	210	187	13	6.19	159	75.7
Total		1330	1264	1052	66	31.31	944.5	448.2
Average		221.6	210.6	175.0	11	5.22	157.4	74.7
Lot 7	9-4	217	208	179	9	4.33	155	74.5
Lot 8	9-5	219	207	179	12	5.80	155	74.9
Lot 9	9-3	213	201	179	12	5.97	152	75.6
Total		649	616	537	33	16.10	462	225.0
Average		216.3	205.3	179	11	5.37	154	75.0
Lot Total		1979	1880	1589	99	47.41	1406.5	673.2
Lot Average		219.8	208.8	177	11	5.27	156.2	74.8

APPENDIX TABLE VI

SLAUGHTER DATA

Trial 2

	Hog No.	Feed Lot Wt. Lbs.	Slaughter Wt. Lbs.	Age at Slaughter Days	Shrink Lbs.	Shrink %	Cold Carcass Wt. Lbs.	Dressing %
Lot 1	1-10	216	204	171	12	5.56	153.5	75.2
Lot 2	1-9	220	212	193	8	3.64	159	75.0
Lot 3	1-1	225	213	157	12	5.33	155	72.8
Lot 4	1-8	218	207	178	11	5.05	159	76.8
Lot 5	1-6	225	215	171	10	4.44	157.5	73.3
Lot 6	1-7	216	208	193	8	3.70	159	76.4
Lot 7	1-4	210	201	157	9	4.29	150	74.6
Lot 9	1-12	218	209	186	9	4.13	160	76.6
Lot Total		1748	1669	1406	79	36.14	1253	600.7
Lot Average		218.5	208.6	176	9.88	4.52	156.6	75.1

Combined Slaughter Data of Trials 1 and 2

Trial 1	Total	1979	1880	1589	99	47.41	1406.5	673.2
Trial 2	Total	1748	1669	1406	79	36.14	1253	600.7
Total		3727	3549	2995	178	83.55	2659.5	1273.9
Average		219.2	208.8	176	10.5	4.91	156.4	74.9

APPENDIX TABLE VII

CUTTING DATA

Trial 1

	Hog No.	Weight of Cuts (Lbs.)					Live Wt. % Primal Cut Out	Carcass % Primal Cut Out	Total Lean Cuts Lbs.	Lean Cuts % of Carcass Wt.	Lean Cuts % of Live Wt.
		Skinned Ham	Trimmed Belly	N.Y. Shoulder	Trimmed Loin	Total Wt. of Cuts					
Lot 1	12-2	27.3	25.0	25.7	22.8	100.8	48.7	64.6	75.8	48.6	36.6
Lot 2	12-3	30.5	27.3	31.3	24.4	113.5	53.0	69.8	86.2	53.0	40.3
Lot 3	12-5	29.3	25.6	29.0	25.4	109.3	52.8	71.0	83.7	54.4	40.4
Lot 4	12-4	31.4	25.7	28.5	25.9	111.5	52.3	70.1	85.8	54.0	40.3
Lot 5	12-9	28.8	26.2	27.6	24.1	106.7	50.1	69.3	80.5	52.3	37.8
Lot 6	12-8	31.4	24.9	28.9	24.6	109.8	52.3	69.1	84.9	53.4	40.4
Total		178.7	154.7	171.0	147.2	651.6	309.2	413.9	496.9	315.7	235.8
Average		29.8	25.8	28.5	24.5	108.6	51.5	69.0	82.8	52.6	39.3
Lot 7	9-4	28.4	23.5	26.6	21.8	100.3	48.2	64.7	76.8	49.5	36.9
Lot 8	9-5	27.0	23.8	27.2	20.2	98.2	27.4	63.4	74.4	48.0	35.9
Lot 9	9-3	26.9	21.4	24.4	21.1	93.8	46.7	61.7	72.4	47.6	36.0
Total		82.3	68.7	78.2	63.1	292.3	142.3	189.8	223.6	145.1	108.8
Average		27.4	22.9	26.1	21.0	97.4	47.4	63.3	74.5	48.4	36.3
Lot Total		261.0	223.4	249.2	210.3	943.9	451.5	603.7	720.5	460.8	344.6
Lot Average		29.0	24.8	27.7	23.4	104.9	50.2	67.1	80.1	51.2	38.3

APPENDIX TABLE VIII

CUTTING DATA

Trial 2

	Hog No.	Weight of Cuts (Lbs.)					Live Wt. % Primal Cut Out	Carcass % Primal Cut Out	Total Lean Cuts Lbs.	Lean Cuts % of Carcass Wt.	Lean Cuts % of Live Wt.
		Skinned Ham	Trimmed Belly	N.Y. Shoulder	Trimmed Loin	Total Wt. of Cuts					
Lot 1	1-10	28.2	22.6	25.1	19.2	95.1	46.6	62.0	72.5	47.2	35.5
Lot 2	1-9	31.4	23.6	26.9	21.8	103.7	48.9	65.2	80.1	50.4	37.8
Lot 3	1-1	25.3	25.0	25.2	18.6	94.1	44.2	60.7	69.1	44.6	32.4
Lot 4	1-8	28.6	21.8	26.4	22.0	98.8	47.7	62.1	77.0	48.4	37.2
Lot 5	1-6	28.7	23.1	27.6	22.2	101.6	47.3	64.5	78.5	49.8	36.5
Lot 6	1-7	27.1	23.1	26.5	22.2	98.9	47.5	62.2	75.8	47.7	36.4
Lot 7	1-4	26.1	26.3	25.2	17.8	95.4	47.5	63.6	69.1	46.1	34.4
Lot 9	1-12	29.0	24.3	25.2	21.8	100.3	48.0	62.7	76.0	47.5	36.4
Lot Total		224.4	189.8	208.1	165.6	787.9	377.7	503.0	598.1	381.7	286.6
Lot Average		28.1	23.7	26.0	20.7	98.5	47.2	62.9	74.8	47.7	35.8

Cutting Data of Trials 1 and 2

Trial 1	Total	261.0	223.4	249.2	210.3	943.9	451.5	603.7	720.5	460.8	344.6
Trial 2	Total	224.4	189.8	208.1	165.6	787.9	377.7	503.0	598.1	381.7	286.6
Total		485.4	413.2	457.3	375.9	1731.8	829.2	1106.7	1318.6	842.5	631.2
Average		28.6	24.3	26.9	22.1	101.9	48.8	65.1	77.6	49.6	37.1

APPENDIX TABLE IX

PERCENT LEAN AND FAT AREA OF EYE MUSCLE OF LAST RIB CHOP

Trial 1			Trial 2		
Hog No.	Percent Lean Area	Percent Fat Area	Hog No.	Percent Lean Area	Percent Fat Area
Duroc - Berkshire			Chester White		
12-5	51.2	48.8	1-1	37.1	62.9
12-3	48.2	51.8	1-4	35.8	64.2
12-2	41.5	58.5	1-6	44.9	55.1
12-9	47.0	53.0	1-10	39.2	60.8
12-4	60.1	39.9	1-8	45.8	54.2
12-8	60.9	39.1	1-7	35.2	64.8
Total	308.9	291.1	1-12	45.0	55.0
Average	51.5	48.5	1-5	36.2	63.8
Yorkshire - Chester White			1-9	43.0	57.0
9-3	39.8	60.2	Total	362.2	537.8
9-4	38.0	62.0	Average	40.2	59.8
9-5	42.9	57.1			
Total	120.7	179.3			
Average	40.2	59.8			

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