EFFECTS OF DELAYED CASTRATION AND RESTRICTED FEEDING UPON THE GROWTH AND CARCASS CHARACTERISTICS OF SWINE

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EFFECTS OF DELAYED CASTRATION AND RESTRICTED FEEDING UPON THE GROWTH AND CARCASS CHARACTERISTICS OF SWINE

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I. INTRODUCTION

During the period 1913 to 1952 the value of lard dropped from 129 to 62 percent of the live price of swine as reported by Ault (1953). This decline in value means that the fatty tissue produced by the average 240 pound hog slaughtered at Chicago in 1952 would cost the processor $8.70, while at the same time its market value would be only $3.63. The difference, $5.07 per animal, can only be recovered by lower prices to the producer for the live animal or higher preferred cut prices to the consumer. Above and beyond this, it represents a waste of livestock feed. Feed is now being used partially by swine to help produce annually 350-400 million pounds of inedible fats for which there is no ready domestic use. The edible fat, lard, can be marketed only at a severe sacrifice in price as was previously indicated.

This situation can resolve itself in one of two ways, either by finding an increased use for fats or by reducing the production of them. Science has done a remarkable job in finding new outlets for surplus fats, however, these outlets have fallen far short of the steadily increasing fat surplus. The solution to this problem can perhaps be found in a limitation of our animal fat production.

Since swine are among the chief producers of animal fats, it is logical that efforts toward the limitation of fat production be concentrated in the field of producing leaner swine carcasses. To bring about a change from the type of swine existing in America today to a more desirable "meat type" animal would require a considerable period of time if accomplished through a genetic change alone.

This leaves the alternatives of changing the fat-lean ratio of the swine population through the use of physiological changes or through the alteration of the feeding practices employed. It is with two of these methods, namely delayed castration and restricted feeding, that the following reported research deals.

II. OBJECT OF STUDY

In altering the present swine population to meet the market demand for a "meat-type" hog, two methods have shown promise. These are delayed castration, as indicated by the work of Soule (1950), and restricted feeding. This research problem was designed to investigate these methods and to compare the effects on animal behavior, carcass characteristics and feed efficiency.

III. REVIEW OF LITERATURE

For centuries the practice of castrating male animals used for the production of meat or for work has been carried out by civilized man. Castration of the male horse provided a more tractable animal; the male ox, an animal that fattened more readily, was more docile, and more easily managed; the male hog, a quieter individual without the objectionable boar odor and flavor in the meat; and the male sheep, an animal that again fattened more readily.

Bugbee and Simond (1926) reported a drop of 44 percent in basal metabolism of a male dog (reported as calories per hour per square meter) after castration, however, the normal female control used showed a similar drop of 35.4 percent during the same period. These data, therefore, failed to prove that castration reduces the basal metabolism rate. It therefore appears that lowering of the basal metabolism rate is not the factor responsible for the increased fattening ability or docility of castrated animals.

Korenchevsky (1934), in an experiment using 222 male albino rats, found that most castrated rats showed an increase in fat deposition, however, his findings were not statistically significant. Holt et al. (1936) found that castrated female rats gained and maintained greater body weight than the control females. The castrated females also ate more total feed but required less per gram of body weight. Again, no significant difference between castrated males and normal males was found. Rubinstein, Abarbanel, and Kurland (1939) did find that castration of the immature male rat depressed somatic growth as determined by body weight and length. Body length evidenced the greatest amount of inhibition.

Weight and food intake curves of male and female rats castrated prior to puberty were found to be similar to those of normal rats by Sandberg et al. (1939). Castration after the onset of puberty produced curves similar to those of normal animals up to about thirty weeks of age at which time the growth curve of the castrates flattened out and at forty weeks of age the normal rats were found to weigh ten percent more than the castrates. It was noted that the female rats castrated after puberty required a lower amount of feed to produce the same weight increase than did the controls.

Since it was concluded that castration of the male rat produced a depression in growth, it became logical to assume that the artificial administration of one of the male sex hormones to a castrated animal would stimulate growth. Work reported by Turner et al. (1941) indicated that this hypothesis might be false since they found no effect upon skeletal maturation or body growth when testosterone propionate was administered to castrated male rats. Rubinstein and Soloman (1940), however, found that injection of 0.05 mgs. testosterone propionate intraperitoneally six days per week for 53 days beginning at 26 days of age increased the body length and weight of castrated male albino rats over the control castrates. They also stated that doses larger than that reported produced a depression rather than a stimulation of growth.

The preceding results could in no way be considered conclusive since Simpson et al. (1944) reported that testosterone propionate caused no increase in body weight nor in skeletal growth when administered to hypophysectomized male rats. If however, pituitary growth hormone was injected simultaneously with the testosterone an increase in body weight and skeletal dimensions was found. The administration of testosterone propionate to female rats produced no significant effects.

The same variability in results found in work concerning delayed castration and administration of testosterone in rats was found when this work was transferred to large animals. Hunt (1938) in three trials using 75 ram lambs and 70 wethers, found that at one year of age wethers averaged one grade higher than rams at slaughter, had a lower percent lean in the rib cut, had plumper legs and shoulders, and had a higher dressing percent than the rams. These three trials were conducted first on pasture with the lambs creep fed and finished in dry lot, second in dry lot from weaning, and third on pasture and finished on dry lot with the rams and wethers fed separately.

O'Mary <u>et al</u>. (1952) reported that the subcutaneous implantation of testosterone propionate into wether and ewe lambs produced no significant effect on average daily gain, weight of internal and external fat, nor weight of internal muscle and fat combined. The carcasses of the testosterone treated lambs evidenced a significantly higher bone and connective tissue content than the control lambs. Andrews, Beeson, and Harper (1949) reported the administration of testosterone to wether lambs appeared to improve carcass quality and increase feed efficiency over the controls.

Burris <u>et al</u>. (1952) reported that testosterone propionate increased the rate of gain of heifer calves 0.5 pounds per day and steer calves 0.1 pounds per day over the controls. Testosterone treated females required 120 pounds less T.D.N. per 100 pounds gain than normal females and steers 30 pounds less than normal steers. The control calves were found to have a slightly higher dressing percentage and 0.8 percent higher percentage

of rear quarter than the treated calves. Andrews, Beeson, and Johnson (1950) found opposite results regarding the feed efficiency of testosterone treated steers. The steers implanted subcutaneously with 100 mg. testosterone were found not only to gain slower but required more feed per 100 pounds gain than the controls. No differences in the carcass grade were found.

Since the experiment reported herein was in part concerned with the effects of delayed castration of swine, the author used as the basic source of information a thesis by Soule (1950) concerning research conducted at this station. He found that normal barrows, testosterone treated barrows and 100 pound castrates had a significantly higher dressing percent than 140 to 180 pound castrates and boars. The normal barrows, testosterone treated barrows and 100 pound castrates were, however, significantly shorter in body length, had significantly thicker backfat and higher live weight cut out. The boars were found to be significantly longer in body, have less backfat, a higher percent lean area in the rough loin, and a higher live weight cut out than all other lots. Boars and 180 pound castrates were found to possess a significantly longer leg length, higher percent lean area of the rough loin and a higher percent live weight cut out than the other lots. Significant correlation coefficients of $+.8186 \pm .0738$ were found between percent lean area of the rough loin and live weight cut out and $+.8550 \pm .0602$ between the percent lean and carcass cut out.

Woehling et al. (1951), using 43 pound feeder pigs implanted with 15 mg. testosterone at the start of the experiment and again 12 weeks later, and similar size pigs implanted with 12 mg. stilbesterol at the beginning of the experiment, reported no differences in carcass characteristics or rate and efficiency of gain. Sleeth *et al.* (1953) also reported no effect upon carcass quality or feed efficiency when testosterone, estradiol, or a combination of these two hormones were administered to feeder pigs. It may be concluded from the evidence presented that increased muscular development can be obtained in swine by delaying the castration of the male till a weight of approximately 140 pounds is reached. The administration of hormones to barrows appeared to have little effect and hence could not be expected to replace the procedure of delaying castration. Since the procedure of delayed castration possessed some serious management problems, it seemed logical that an alternative method, that of alteration of the plane of nutrition, be investigated to see what it had to offer toward a solution of the problem of producing a leaner swine carcass.

In order to more thoroughly understand the effect which a limited plane of nutrition will have upon the carcass, the progressive order in which fat is deposited in the various areas of the swine carcass must be understood. Hammond and Murray (1937), studying twelve English breeds and cross-breds, found the following order of subcutaneous fat deposition: shoulder, rump, and loin. The rate of increase of backfat deposition appeared to slow down as the weight of the sides increased, however, this increase still maintained a faster rate than the rate of increase of the weight of sides. These British workers also found that castrated males and females had a thicker backfat than entire males and females and that entire females had more fat than entire males, but castrated females had less fat than castrated males. They also found that in all the breeds studied, body weight was more of a determinant of dressing percent than the breed of the animal.

Bennet and Coles (1946), studying the carcasses of 220 Yorkshire barrows and 181 gilts, found female carcasses to be significantly longer, heavier in the shoulder, lighter middled, heavier hammed, and to have significantly larger lean areas of loin muscle than the barrows. The following highly significant correlation coefficients were established: between 70 day weight and rate of gain +.317 for barrows and +.161 for gilts, length of side and thickness of shoulder fat -.456 for males and -.231 for females, and length of middle and percent ham -.752 for males and -.677 for females. In the case of the correlation of percent middle to shoulder a positive correlation was found for males and a negative correlation for females. The opposite was true in the case of the correlation of thickness of shoulder fat to area of loin in that a positive correlation was found for females and a negative correlation for males.

In a comparison of boars and barrows as to the live body measurements of length, heart and flank girth, depth of body back of the shoulders, width of the loin and height at the shoulders, Winters et al. (1942), found boars to be significantly heavier at 12 weeks and barrows at 24 weeks of age. No differences were found at 8 and 16 weeks. At 20 weeks one breed of boars was significantly taller and one breed of boars was significantly deeper than the comparable barrows. Differences were attributed to skeletal growth and deposition of fat, the former favoring the boars and the latter the barrows.

McMeekan (1939) reported that bone developed first, followed by muscle, and lastly fat, in the development of the swine carcass. He found that a high nutritional plane (up to 16 weeks of age) followed by a low plane of nutrition produced the most desirable bacon carcass. A low-high plane, on the other hand, produced the fattest pigs with the poorest muscle development. The increase in muscle content in the high-low pigs was due to an increase in muscle fiber size; the number of muscle fibers remained the same. It was evident that the rapidly growing pig produced a higher proportion of lean and fat to bone than the slow growing pig.

Previous to this, McMeekan (1938) reported that pigs receiving a high-high and a low-high nutritional plane were similar to each other. A similarity also existed between the high-low and low-low animals as regards to carcass characteristics. He stated "tissue response to varying growth rate of the body as a whole is differential and dependent upon the individual growth relationship of the tissues." Crampton (1940) could find no significant relationship between rate of gain and leanness or length of carcass. Crampton and Ashton (1945) did find a significant correlation of -.87, however, between daily gain and area of lean eye. This, in effect, confirmed McMeekan's conclusions. Since growth of a pig up to four months of age is largely bone and muscle, regardless of ration, full feed during this period would encourage the greatest growth of these tissues. Curtailment of feed during the fattening period would cut down the amount of fat in the carcass.

Winters et al. (1941) found results similar to McMeekan. They reported that a low-low plane of nutrition (that is a low plane of nutrition during the growing period up to approximately 12 weeks of age, followed by a low plane of nutrition during the fattening period) produced the leanest carcasses as well as the most efficient gains. There were no differences between the high-low and high-high nutritional levels as far as

efficiency was concerned. The high-low was leaner than either the high-high or the low-high and was slightly higher in cut out. No difference in carcass length was encountered between any of the treatments.

Brugman (1950) found the distinct opposite results in that his low-high animals showed the highest primal cut out and produced the leanest carcasses. The wealth of evidence in contradiction of these results leaves some doubt as to their validity.

A more complete report published by McMeekan (1940) presented the following table representing the growth ratio of the animals subjected to the various nutrition planes:

Plane of Nutrition	Wt. at Weaning 8 Wks. of age	Wt. at 16 wks. of age	Days to reach 200 lbs.
High-High	45 lbs.	100 lbs.	180 days
High-Low	45 lbs.	100 lbs.	240 days
Low-High	25 lbs.	50 lbs.	240 days
Low-Low	25 lbs.	50 lbs.	300 days

In order to reduce the variation due to genetic differences, McMeekan used closely inbred animals descended from full brother-sister matings. These experiments were conducted entirely with barrows. McMeekan's experiments established the fact that a relatively anterior to posterior gradient is evidenced in the earliness of development of the organs.

Canadian swine producers have been particularly interested in producing a lean carcass suitable for the manufacture of Wiltshire sides for export. Since barley is extensively grown in Canada, it has been used to a great extent to replace corn in the fattening rations of swine. Ashton

(1950), reported that barley produced less fat, more lean, and firmer flesh than corn. A cross-section of the bacon rasher showed a lean percent of 39.8 where barley was fed, compared with 30.0 percent in the case of corn. The percentage of muscle and fat appeared to be very well balanced. A mixture of oats and barley produced a carcass not quite equal to barley alone, and oats alone produced an extremely lean carcass; one averaging 43.8 percent lean in the bacon rasher. Wheat tended to have the reverse effect upon the hog carcass by producing a greater fattening rate and decreasing the proportion of lean tissue. Wheat fed hogs showed an average of 34.0 percent lean in the bacon rasher. Apparently, environment had some effect upon carcass production since leaner carcasses were produced during the winter months than during the summer months. Ashton (1950) also observed that an actual negative relationship between the amount of fat and muscle size was indicated.

In reporting on work at McDonald College, Ashton (1950) described the results of restricting feed at 110 pounds weight to 80 percent of full feed. Upon slaughter at 200 pounds it appeared that this restriction produced a larger eye muscle, a higher proportion of lean, and improved the carcass grade over the full fed hogs. The limited fed animals were found to gain slower, however. Ashton pointed out that the main drawback to this method of limiting the feed was that the larger, more aggressive animals would tend to be full fed while the weaker animals would be pushed back from the feed trough and actually face starvation.

Limiting the feed by addition of 25 percent oat hulls to oat groats reduced the rate of gain from 1.75 to 1.52 pounds per day. This feeding practice reduced back fat depth from 1.64 to 1.53 inches and increased the area of the eye muscle by 0.3 square inches. The number of grade A carcasses under the Canadian grading system was doubled. Wheat plus 50 percent alfalfa; oats and wheat; and an oats, wheat, alfalfa mixture all tended to increase the length of the feeding period and also increased the area of eye muscle, the percentage of grade A carcasses and reduced the depth of shoulder fat.

A considerable amount of work relating to the effects of different rations and limiting of rations upon the production of pork carcasses has been done by Canadian workers. In 1942, Crampton reported that where fish meal, milk powder plus yeast alone and in combination were fed with a basal protein supplement of tankage and linseed oil meal the type of protein had no effect on the carcass quality. Incidental to this study he found that gilts showed 13 percent larger eye muscle and a 4.6 percent greater area of lean in the bacon rasher than barrows. The gilt carcasses at 200 pounds did, however, appear softer and showed a higher percent fat moisture.

Crampton and Ashton (1945) reported that barley fed with wheat resulted in faster gains, greater backfat depth, decreased area of lean and decreased percent of lean area in the bacon rasher. It appeared that castrated male pigs suffered the adverse effects of high wheat levels more acutely than the female pigs. Crampton and Ashton (1946) presented data to further bear out the conclusions of Crampton (1941) that the type of protein had no effect on carcass quality. In this trial tankage was used as the source of animal protein. It was compared to various levels of wheat germ fed with linseed oil meal. The basal ration fed was number two barley plus a mineral mixture and cod liver oil. The growing ration contained 16 percent protein and the fattening ration 13 percent.

Self vs. hand feeding has long been a topic of discussion among swine producers. Crampton (1937) found self fed hogs to average 7/8 inch shorter than hand fed and to average 409 pounds of food per 100 pounds gain as compared to 383 pounds for the hand fed pigs. The hand fed pigs did require seven days longer to reach market weight than the self fed group. Since the hand fed animals received only what they would readily consume in a relatively short period of time they were limited fed to a certain extent.

In a recent report by Robison et al. (1952), limited feeding on pasture produced a higher primal cut out, higher percent lean cuts, less backfat and higher value per 100 pounds of carcass cuts over full self feeding and full hand feeding. In comparing ground oats and barley to ground shelled corn and hulled oats, the more fibrous feeds produced the superior carcass. Ground oats produced a carcass lower in backfat thickness, higher in percent lean cuts and higher value per 100 pounds of carcass cuts. The animals fed the less bulky ground barley were superior in primal cut yield.

Merkel et al. (1953) reported that the addition of ground alfalfa hay and ground corn cobs to a 75 percent T.D.N. ration in order to lower to 69 percent T.D.N. gave approximately the same results as limited hand feeding (75 percent of full feed) in cost per hundred weight of gain, cut out value and U.S.D.A. carcass grade.

IV. EXPERIMENTAL PROCEDURE

A. Feeding Period Procedure

EXPERIMENT I

Twenty-four October boar pigs were started on experiment December 12, 1951 at an average weight of 35 pounds. At that time the pigs were weighed and divided at random among four lots. Purebred Chester White pigs from closely related sows sired by related boars were used. Care was taken to insure uniform distribution of animals from the same litter throughout the four lots. Two lots (1 and 2) were castrated at this time. All lots were placed on self-feeders containing a 16 percent protein ration consisting of:

750	lbs.	Corn
120	lbs.	Soy Bean Oil Meal
50	lbs.	Meat Scraps
50	lbs.	Alfalfa Meal
14	lbs.	Pura Phos
15	lbs.	Salt
1	lb.	Trace Mineral Mixture
20	lbs.	Fish Solubles
2.5	lbs.	Aurofac
1	lb.	249C (Riboflavin, Pantothenic Acid, Niacin)
.5	lb.	A & D Vitamin Feed Supplement per 1020 pounds of mix.

The pigs were continued on this feeding program until a weight of approximately 100 pounds was reached (February 6). Throughout the experiment, all pigs were weighed at two week intervals. Water was provided ad libitum

At 100 pounds average weight, the ration was adjusted to provide 13.5 percent protein by increasing the corn to 820 pounds and reducing the fish solubles to 10 pounds, soy bean oil meal to 60 pounds, and meat scraps to 30 pounds per 1010 pounds of mixed feed. The amounts of all other ingredients remained the same. Lots 1, 3 and 4 were self-fed this adjusted ration for the remainder of the experiment. Lot 2 animals were fed 75 percent of the average feed consumed per animal by Lot 1 during the preceding two week period. Records were kept of the feed consumed by each lot from which feed efficiency was calculated.

Upon reaching a weight of 130 pounds, the pigs in Lot 3 were castrated. One pig in this lot had been removed on February 6 because of illness. When an average weight of 170 pounds was reached the pigs in Lot 4 were castrated. One animal from this lot had been removed from experiment on April 16 because of illness and the data from another pig were not used since this animal was a cryptorchid and could not be completely castrated. The designation of the lots was as follows: Lot 1, Normal Castrates - Full Self Fed; Lot 2, Normal Castrates - Limited, Hand Fed 75 percent of Lot 1; Lot 3, Castrated 130 pounds - Full Self Fed; Lot 4, Castrated 170 pounds - Full Self Fed.

EXPERIMENT II

Fifteen May and June gilts and fifteen barrows (castrated at the age of six weeks) averaging 33 pounds were weighed and divided at random among three lots (5 barrows and 5 gilts per lot). Since these pigs were from litters out of related purebred Chester White sows by related boars, care was taken to divide littermates among the three lots. The feeding procedure up to 100 pounds average weight was the same as in Experiment I. Throughout the second experiment all pigs were weighed weekly. Records were kept of the feed consumed by each lot from which feed efficiency was calculated.

The basal rations were the same as those fed in Experiment I. The Lot 1 animals were self-fed throughout the experiment.

At an average weight of 100 pounds, the Lot 2 pigs were hand fed 75 percent per pig of the feed consumed per pig by Lot 1 during the preceding week. The Lot 3 pigs remained on a self-feeder containing a mixture of 70 percent basal ration and 30 percent finely ground corn cobs. This mixture was calculated to supply the same amount of TDN that the Lot 2 limited hand fed animals received. The designation of these lots was: Lot 1 - Full Fed - Self Fed; Lot 2 - Limited Fed - Hand Fed 75 percent of Lot 1; Lot 3 - Self Fed 70 percent basal, 30 percent corn cobs.

B. Cutting and Slaughter Procedure

EXPERIMENT I AND II

The animals were taken off feed between 220 and 230 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 obtained which was used as a basis for calculating live weight cut out, live weight percent lean cuts, dressing percent, and percent shrink. All hogs were slaughtered packer style and chilled for 48 hours at which time a chilled carcass weight was taken. All carcass measurements were made and recorded in millimeters. The length of the body was measured from the junction of the last cervical and first thoracic vertebra to the anterior edge of the symphysis pubis. The leg length was measured from the anterior edge of the symphysis pubis to the coronary band. Backfat measurements were taken over the first rib at the juction of the last cervical and first thoracic vertebra; over the seventh thoracic vertebra; over the last rib at the junction of the last thoracic and first lumbar vertebra; 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 jowl, breast flap, neck bones, clear plate, and forefoot one-half inch above the knee were removed from the 2-1/2 rib shoulder. The resulting 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 shank (at the hock) were removed. A skinned ham was made, leaving about 3/8 inch of fat on the skinned portion. This cut was then 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 at the blade end. At this time, tracings were made of the cross-sectional area of the right rough loin between the last two ribs. A planimeter was used to determine the area of lean and fat from this tracing and the percent of each was calculated. A chop containing 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 fatback was removed from the loin leaving about a 3/8 inch covering of fat on the loin. This cut, the trimmed loin, was weighed as the third primal cut. The spare ribs were lifted from the belly which was trimmed "barrow style" 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 lean cuts.

Analyses of variance and t-tests were calculated for carcass measurements, primal cut yields, dressing percent, lean cut yields, loin index and percent lean area of the rough loin, according to the methods of Snedecor (1946). The harmonic mean method was used in the case of Experiment II because of unequal subclass numbers. Correlation coefficients between percent lean area of the rough loin and both the carcass and liveweight cutouts were determined. Feed efficiency for each lot in both experiments was calculated. Statistical formulae used are shown in Table I.

TABLE 1

FORMULAE USED IN STATISTICAL ANALYSIS

Analysis of Variance: (Snedecor, 1946)

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

$$\frac{(SX)}{N_1} + \frac{(SX_2)^2}{N_2} - - - \frac{(SX_X)^2}{N_X} - C.T. = \text{Between sum of squares}$$

Corrected harmonic mean

Corrected error mean square = Error mean square $\left[1/I. \; (1/n + 1/n_2 + 1/n_X) \right]$

t - test

$$\delta m_1 = \sqrt{\frac{\text{error variance}}{n}}$$

$$\delta(m_1 - m_2) = m_1 \sqrt{1/n + 1/n}$$

$(\delta m_1 - m_2)$ (table for t) = Significant level between means.

Correlation Analysis (Snedecor, 1946)

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

$$\delta r = \frac{1 - (r_{xy})^2}{\sqrt{n - 2}}$$

$$\delta e = \sqrt{\frac{SY^2 - ASY - bSXY}{N - 2}}$$

$$Y \quad \bar{Y} + r \frac{Y}{X} (x - \bar{X}) = \text{regression equation}$$

$$\delta_X = \sqrt{\frac{SX^2 - \frac{(SX)^2}{N}}{N - 1}}$$

$$\delta_Y = \sqrt{\frac{SY^2 - \frac{(SY)^2}{N}}{N - 1}}$$

V. RESULTS AND DISCUSSION

EXPERIMENT I

A. Feed Consumption

All animals in the experiment were fed by lots and hence no statistical analysis of the feed efficiency could be calculated. Lot 1, the full fed normal castrates (controls) consumed 533 pounds of feed per 100 pounds of gain. Lot 2, the restricted fed normal castrates, consumed 413 pounds of feed per 100 pounds of gain or 22.5 percent less than Lot 1 required. Lot 3, the full fed 130 pound castrates, consumed 466 pounds of feed per 100 pounds gain or [illegible] percent less than Lot 1. Lot 4, the full fed 170 pound castrates, consumed 417 pounds per 100 pounds of gain or 21.8 percent less than Lot 1.

From these data it would appear that the restricted fed normal castrates and the full fed 170 pound castrates had a decided advantage over the full fed 130 pound castrates and the full fed normal castrates, the control lot. The full fed 130 pound castrates had a slight advantage over the control lot.

The feed savings of almost one-fourth encountered in Lots 2 and 4 represent a considerable saving in the cost of production of the meat produced since feed is the largest single item in the production cost of market hogs. See Table 2 for feed consumption data.

B. Daily Gain

Table 3 presents the results of the analysis of variance of the average daily gain. Lot 2, the restricted fed lot, was found to be slower gaining with 1.[illegible] pounds per day as compared to Lot 1 (1.59 pounds per

TABLE 2

FEED EFFICIENCY

	Total Pig Days	Total Feed lbs.	Total Gain lbs.	Avg. Da. Feed lbs.	Feed per 100 lbs. Gain
Lot 1	715	6034	1132	8.44	533
2	872	4708	1141	5.40	413
3	624	4673	958	7.49	488
4	501	3165	759	6.32	417

TABLE 3

ANALYSIS OF VARIANCE OF

AVERAGE DAILY GAIN (LBS.)

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	46.93 - 46.44	=	.49	20		
Between	25.54 + 11.83 + 9.33 - 46.44	=	.26	3	.086	6.14**
Error		=	.23	17	.014	

Lot No.	1	2	3	4
$\bar{X}$	1.59	1.32**	1.54	1.53

F to be significant @ 5% = 3.20*, @ 1% = 5.18**

t - test

Difference to be significant between lot 1 and 2 = .014 (1/6 + 1/6) Xt =

(.068) (2.110) = .14 @ 5%

(.068) (2.898) = .20 @ 1%

Difference to be significant between lot 2 and 3 = .014 (1/6 + 1/5) Xt =

(.071) (2.110) = .15 @ 5%

(.071) (2.898) = .21 @ 1%

Difference to be significant between lot 2 and 4 = .014 (1/6 + 1/4) Xt =

(.076) (2.110) = .16 @ 5%

(.076) (2.898) = .38 @ 1%

Lot 2 significantly slower in rate of gain at the 1% level than lots 1, 3, and 4. See Appendix FI.

day), Lot 3 (1.54 pounds per day) and Lot 4 (1.53 pounds per day). The differences between Lot 2 and the other lots were large enough to be significant at the one percent level. It is conceivable to expect that any economic loss encountered due the reduced rate of gain of the restricted fed hogs would be offset by the increased feed efficiency. If both feed efficiency and rate of gain are considered together, however, the 170 pound castrates (Lot 4) would have theadvantage since they were almost as high in efficiency as Lot 2, and almost as high in rate of gain as Lot 1. Lot 1 showed the fastest rate of gain with Lot 3 0.05 and Lot 4 0.[illegible] pounds per day slower in rate of gain.

C. Carcass Measurements

An analysis of variance of carcass measurements shows no significant difference for body length, Table 4; leg length, Table 5; nor average backfat thickness, Table 6. Although no significant differences exist, the delayed castrates, as well as the restricted fed animals, did exhibit greater body and leg length and less backfat thickness than did the control lot. The restricted fed lot was found to have the greatest leg and body length, possibly due to the fact that the slower rate of gain resulted in a more mature animal at slaughter. In average backfat thickness, the 170 pound castrates and the restricted fed hogs were nearly identical with 42.06 mm. and 42.08 mm. respectively. The 130 pound castrates were the next fattest with 45.75 mm. of backfat, followed by the controls, the fattest lot with 49.29 mm.

These results generally bear out those of Soule (1950) although he was able to demonstrate significantly greater body length in his 140 and

TABLE 4

ANALYSIS OF VARIANCE OF

BODY LENGTH (mm.)

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	10714349.0 - 10707144.0	= 7205.0	20		
Between	6122136.3 + 2541245.0 +				
	2044900.0 - 10707144.0	= 1737.3	3	579.01	1.80
Error		= 5467.7	17	321.63	

Lot No.	1	2	3	4
$\bar{X}$	702.17	726.17	713.00	715.00

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix GI

TABLE 5

ANALYSIS OF VARIANCE OF

LEG LENGTH (mm.)

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 5719723.0 - 5712771.9 =	6951.1	20		
Between	= 3288408.3 + 1355121.8 + 1071225.0 - 5712771.9 =	1983.2	3	661.07	2.26
Error	=	4967.9	17	292.23	

Lot No.	1	2	3	4
$\bar{X}$	510.8	533.8	520.6	517.5

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix HI

TABLE 6

ANALYSIS OF VARIANCE OF

AVERAGE BACKFAT THICKNESS (mm.)

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 43992.94 - 42998.81	= 994.13	20		
Between	= 25204.05 + 10927.81 + 7077.01 - 42998.81	= 210.06	3	70.02	1.52
Error		= 784.07	17	46.12	

Lot No.	1	2	3	4
$\bar{X}$	49.29	42.08	46.75	42.06

F to be significant @ 5% = 3.20, @ 1% = 5.18

No significant difference exists.

See Appendix JI

180 pound castrates over the normal castrates, and significantly greater leg length in his 180 pound castrates over the normal castrates. He also reported that the 180 and 140 pound castrates had significantly less backfat than the normal castrates.

Hammond and Murray (1937), studying various breeds of bacon pigs, found castrated animals produced thicker backfat measurements than their entire counterparts.

D. Slaughter and Cutting Data

An analysis of variance of dressing percent is presented in Table 7. The lack of significant differences can probably be attributed in part to the variable amount of fill which the hogs possessed at the time of slaughter. This was true in spite of a uniform 24 hour shrink period during which time the animals were allowed access to fresh water. Since Lot 1 was the fattest lot, it would be logical to expect that these hogs would have the highest dressing percent. This was not the case, however, for Lot 1 had the lowest dressing percent of the full fed lots; 73.03 percent as compared to Lot 3 with 75.38 percent, and lot 4 with 74.01 percent. Of all the Lots, Lot 2, had the lowest dressing percent, 72.84 percent which would be expected since this was the thinnest lot.

Neither the live weight primal cut out (Table 8) nor the carcass primal cut out (Table 9) yielded significant differences when treated statistically. This conflicted with the results of Soule (1950) who found 180 and 140 pound castrates to have a significantly higher primal cut out than normal castrates.

Similarly, no significant differences were found in live weight and carcass percent lean cuts, Tables 10 and 11, although in the case of car-

TABLE 7

ANALYSIS OF VARIANCE OF DRESSING PERCENT

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 114201.00 - 114139.20	= 61.80	20		
Between	= 63837.20 + 28412.23 + 21911.40 - 114139.20	= 21.63	3	7.21	3.06
Error		= 40.17	17	2.36	

Lot No.	1	2	3	4
$\bar{X}$	73.03	72.84	75.38	74.01

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix KI

TABLE 8

ANALYSIS OF VARIANCE OF

LIVE WEIGHT PRIMAL CUT OUTS

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 46762.71 - 46708.21	= 54.50	20		
Between	= 26426.31 11359.28				
	8928.58 - 46708.21	= 5.96	3	1.99	.70
Error		= 48.54	17	2.86	

Lot No.	1	2	3	4
$\bar{X}$	46.88	46.97	47.66	47.24

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix LI

TABLE 9

ANALYSIS OF VARIANCE OF

CARCASS PRIMAL CUT OUT

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	85557.17 - 85469.03	=	88.14	20		
Between	49251.70 + 19988.90 +					
	16233.31 - 85469.03	=	4.88	3	1.63	.33
Error		=	83.26	17	4.90	

Lot No.	1	2	3	4
$\bar{X}$	63.62	64.51	63.23	63.70

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix MI

TABLE 10

ANALYSIS OF VARIANCE OF

LIVE WEIGHT PERCENT LEAN CUTS

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 26468.10 - 26409.19	= 48.21	20		
Between	= 14800.94 + 6543.51 + 5073.00 - 26409.19	= 8.26	3	2.75	.92
Error		= 50.65	17	2.98	

Lot No.	1	2	3	4
$\bar{X}$	34.53	35.71	36.18	35.61

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix NI

TABLE 11

ANALYSIS OF VARIANCE OF

CARCASS PERCENT LEAN CUTS

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total = 48443.71 - 48353.28	=	90.43	20		
Between = 27597.15 + 11511.36 +					
9259.25 - 48353.28	=	14.48	3	4.83	1.08
Error	=	75.95	17	4.47	

Lot No.	1	2	3	4
$\bar{X}$	46.85	49.04	47.98	48.11

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix OI

cass percent lean cuts, the restricted fed lot and the 130 and 170 pound castrates did produce a greater yield.

The analysis of variance of percent lean area of the rough loin is presented in Table 12. Pictorial representations of a representative last rib chop for each lot are presented in Figure 1. While no significant differences were found to exist, the restricted fed animals as well as the 130 and 170 pound castrates were superior to the controls in that they exhibited a greater percent lean area. In effect, this bore out the results of Soule (1950) who found 180 pound castrates to have a significantly higher percent lean area than normal castrates.

An analysis of variance of the loin index, Table 13, failed to show any significant differences. This would be logical to expect since this index represents a ratio of fat to lean, and, as already stated, the ratio of fat to lean on an area basis did not show any significance.

A correlation coefficient (Table 14) between percent lean area of the rough loin and live weight primal cut out of $+.352 \pm .201$ failed to show significance. This contradicts the results of Soule (1950) who found a significant correlation coefficient of $+.8186 \pm .0738$.

The correlation coefficient between percent lean area of rough loin and carcass primal cut out of $+.466 \pm .180$ was found to be significant at the 5 percent level, (Table 15). A scatter diagram representing this correlation is shown in Figure 2. This agrees with Soule's findings of a significant correlation coefficient of $+.8550 \pm .0602$ for similar data.

TABLE 12

ANALYSIS OF VARIANCE OF

PERCENT LEAN AREA OF ROUGH LOIN

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total = 29391.39 - 28868.26	=	523.13	20		
Between = 15401.24 + 7200.25 + 6367.24 - 28868.26	=	100.47	3	33.49	1.35
Error	=	422.66	17	24.86	

Lot No.	1	2	3	4
$\bar{X}$	33.85	37.70	37.95	39.90

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix PI

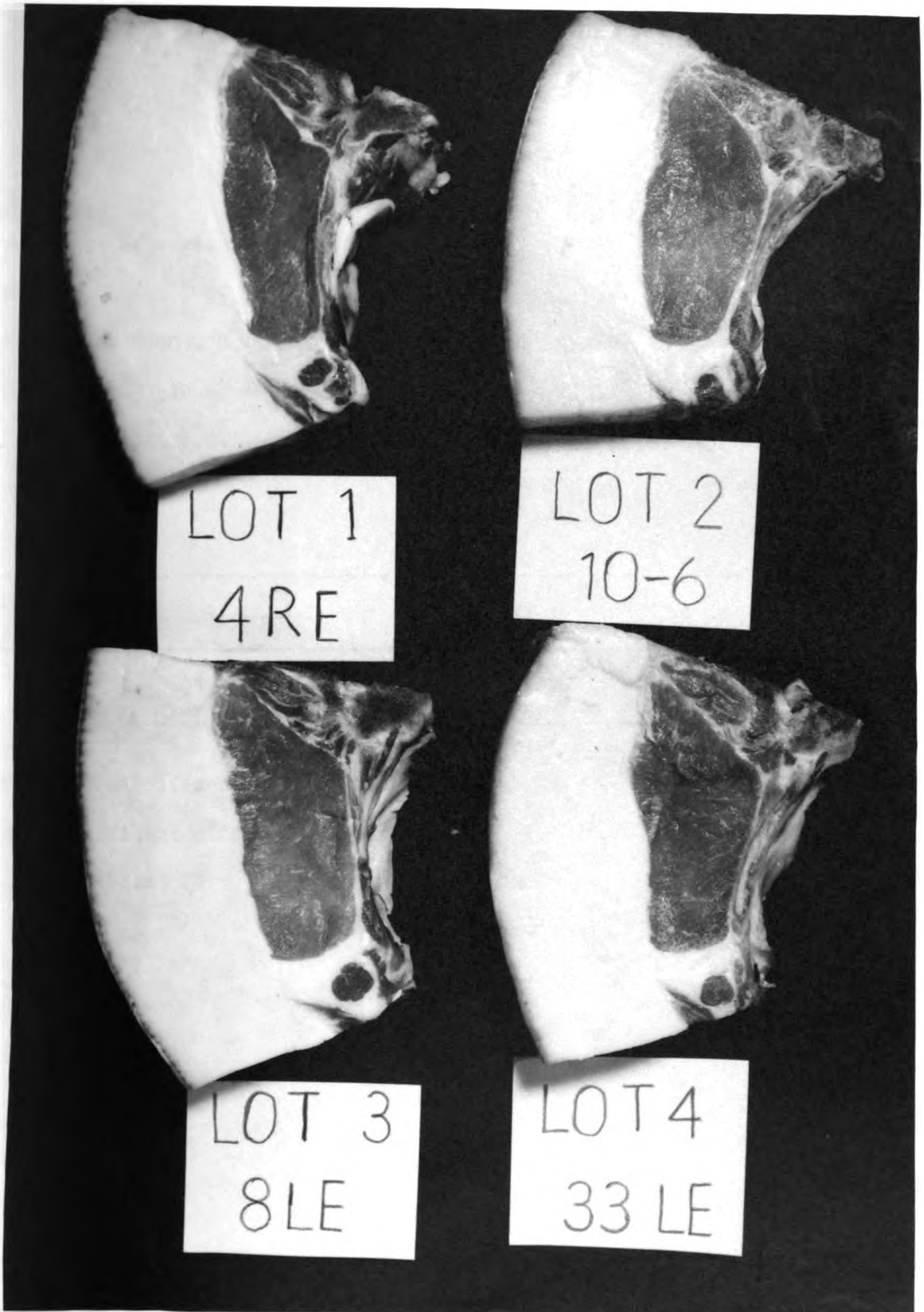

Fig. 1. Cross Section of Rough Loin. Exp. 1. Lot 1 avg. lean area = 33.85%, hog no. 4RE lean area = 33.19%. Lot 2 avg. lean area = 37.70%. hog no. 10-6 lean area = 36.59%. Lot 3 avg. lean area = 37.95%, hog no. 8LE lean area = 38.69%. Lot 4 avg. lean area = 39.90%, hog no. 33LE,

TABLE 13

ANALYSIS OF VARIANCE OF

LOIN INDEX

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 66689.70 - 66526.34	= 163.36	20		
Between	= 37310.44 + 16078.99 +				
	13176.74 - 66526.34	= 39.83	3	13.28	1.83
Error		= 123.53	17	7.27	

Lot No.	1	2	3	4
$\bar{X}$	54.21	47.27	56.71	57.39

F to be significant @ 5% = 3.20, @ 1% = 5.18.

No significant difference exists.

See Appendix QI

TABLE 14

CORRELATION BETWEEN PERCENT LIVE WEIGHT CUT OUT (X)

AND PERCENT LEAN AREA OF ROUGH LOIN (Y)

$$r_{xy} = \frac{36779.82 - 36720.36}{\sqrt{(54.50)\ (523.13)}}$$

$$= \frac{59.46}{\sqrt{28510.59}}$$

$$= \frac{59.46}{168.85}$$

$$= +.352$$

$$\sigma_r = \frac{1 - (.352)^2}{\sqrt{19}}$$

$$= \frac{.8760}{4.358}$$

$$= \pm .201$$

Correlation coef. to be significant @ 19 d.f. = .433 @ 5%, = .549 @ 1%.

Correlation coefficient not significant.

See Appendix RI.

TABLE 15

CORRELATION BETWEEN PERCENT CARCASS CUT OUT (X)

AND PERCENT LEAN AREA OF ROUGH LOIN (Y)

$$r_{xy} = \frac{49772.32 - 49672.35}{\sqrt{(88.14)\ (523.13)}}$$

$$= \frac{99.97}{\sqrt{46108.68}}$$

$$= \frac{99.97}{214.73}$$

$$= + .466^{**}$$

Correlation coef. to be significant at 19 d.f. = .443 @ 5%*, =549 @ 1%**

$$\sigma_r = \frac{1 - (.466)^2}{\sqrt{19}}$$

$$= \frac{.7828}{4.358}$$

$$= \pm\ .180$$

$$\sigma_X = \sqrt{\frac{88.14}{20}} = \sqrt{4.41} = \pm 2.100$$

$$\sigma_Y = \sqrt{\frac{523.13}{20}} = \sqrt{26.16} = \pm 5.115$$

$$Y = 37.08 + .466\ \frac{5.115}{2.100}\ (X - 63.80)$$

$$= 37.08 + 1.135\ (X - 63.80)$$

$$= 37.08 + 1.135X - 72.41$$

$$= -35.33 + 1.135X$$

$$\sigma_e = \sqrt{\frac{29391.39 - (-35.33)\ (778.61 - (1.135)\ (49772.32)}{19}}$$

$$= \sqrt{\frac{408.10}{19}}$$

$$= \sqrt{21.48} = \pm 4.534\%$$

See Appendix SI.

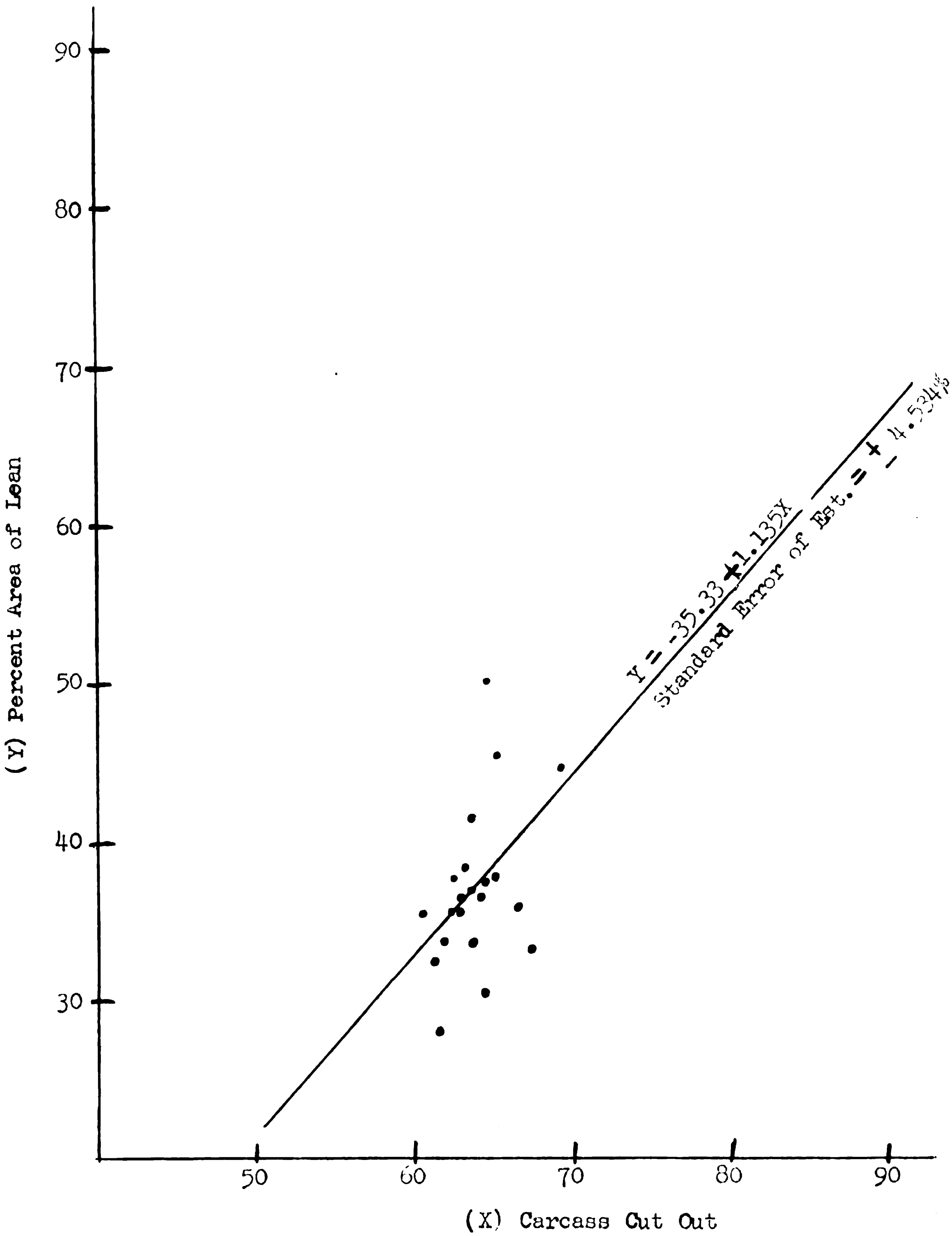

Fig. 2. Scatter diagram correlation between carcass primal cut out and percent lean area of rough loin

EXPERIMENT II

A. Feed Consumption

Since the animals in this experiment were fed by lots, no statistical analysis of the feed efficiency could be calculated. Lot 1, the full self-fed lot, consumed 401 pounds of feed per 100 pounds of gain. This lot was designated as the control lot. Lot 2, the limited hand fed lot, consumed 456 pounds of feed per 100 pounds gain, and lot 3, the lot receiving 70 percent concentrate plus 30 percent ground corn cobs, consumed 491 pounds of feed per 100 pounds of gain. If the feed efficiency for lot 3 was calculated on the basis of total concentrate consumed, the efficiency of this lot would be 379 pounds of feed per 100 pounds of gain, thus showing a marked increase in efficiency over the other two lots. The exact amount of nutrients, if any, derived from the corn cobs could not be determined. The lack of increase in efficiency of the limited hand fed animals over the full fed animals may in part be attributed to two slow gaining, poor doing animals in the limited hand fed lot. From the standpoint of feed efficiency, limited hand feeding appeared to have no advantage over full self-feeding. If ground corn cobs could be provided at a reasonable cost, the feeding of 70 percent concentrate plus 30 percent ground corn cobs in a self feeder might be advantageous, based on the results of this experiment.

This experiment failed to substantiate the results of Experiment I in which the limited fed lot was found to be 22.5 percent more efficient in its conversion of feed into pounds of body weight than the full fed lot. See Table 16 for feed consumption data.

B. Daily Gain

Table 17 presents the results of the statistical analysis of the

TABLE 36

FEED EFFICIENCY

	Total Pig Days		Total Feed Lbs.	Total Gain Lbs.	Avg. Da. Feed Lbs.	Feed Per 100 lbs. Gain
Lot 1	1375		7582	1889	5.51	401
2	1489		7719	1693	5.18	456
3	1597	Concentrate	7201			
		Corn cobs	2121			
		Total	9322	1900	6.59	491

average daily gain. No significant differences were found between the lots although the full fed lot had the highest average rate of gain. This substantiated the results of Experiment I where the restricted lot was enough slower in rate of gain than the full fed lots to be highly significant.

C. Carcass Measurements

The analysis of variance of body length, as measured from the junction of the last cervical and first thoracic vertebrae to the anterior edge of the symphysis pubis, is presented in Table 18. Again, as was the case in Experiment I, no significant differences were found to exist between the various treatments.

The same was found to be true for leg length, as measured from the anterior edge of the symphysis pubis to the coronary band. The analysis of variance for leg length may be found in Table 19.

Although no significant differences were found to exist between the lots for these two measurements, the restricted, hand fed lot was somewhat longer in both body and leg length. The increased carcass length, though not significant, could be explained on the basis of McMeekan's (1939) findings. He found that an animal receiving a high plane of nutrition during the early stages of growth followed by a low plane of nutrition during the fattening period tended to produce a greater amount of muscle and bone and less fat.

The fact that no sex differences were found to exist would conflict with the results reported by Bennet and Coles (1946) in which females were found to produce longer carcasses than males.

The analysis of variance of backfat thickness measurements is presented in Table 20. No significant differences were found to exist although

TABLE 17

ANALYSIS OF VARIANCE OF

AVERAGE DAILY GAIN (LBS.)

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	= 9.71 - 9.55	=	.16	5		
Sex	= 9.60 - 9.55	=	.05	1	.05	.88
Treatments	= 9.63 - 9.55	=	.08	2	.04	.70
SXT		=	.03	2	.015	.26
Error		=		23	.057	

Lot No.	1	2	3
Barrows	1.59	1.17	1.31
Gilts	1.26	1.14	1.10
$\bar{X}$	1.42	1.16	1.20

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

See Appendix FII

TABLE [illegible]

ANALYSIS OF VARIANCE OF

BODY LENGTH (mm.)

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	= 3367061.9 - 3366605.2	=	465.7	5		
Sex	= 3366629.2 - 3366605.2	=	24.0	1	24.00	.34
Treatment	= 3366899.0 - 3366605.2	=	293.8	2	146.90	2.11
SXT		=	148.2	2	74.10	1.06
Error		=		23	69.71	

Lot No.	1	2	3
Barrows	746.4	755.4	739.4
Gilts	737.6	761.8	753.8
$\bar{X}$	742.0	758.6	746.6

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

See Appendix GII

TABLE [illegible]

ANALYSIS OF VARIANCE OF

LEG LENGTH (mm.)

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	= 1778861.6 - 1778445.9	=	415.7	5		
Sex	= 1778446.2 - 1778445.9	=	.3	1	.3	.003
Treatment	= 1778721.0 - 177845.9	=	275.1	2	137.55	1.27
S×T		=	140.3	2	70.15	.65
Error		=		23	108.21	

Lot No.	1	2	3
Barrows	538.6	560.8	534.6
Gilts	541.4	547.2	544.0
$\bar{X}$	540.0	554.0	539.3

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

See Appendix HII

TABLE

ANALYSIS OF VARIANCE OF

AVERAGE BACKFAT THICKNESS (mm.)

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 9799.91 - 9767.93 =	33.98	5		
Sex	= 9773.55 - 9767.93 =	5.62	1	5.62	.78
Treatment	= 9793.10 - 9767.93 =	25.17	2	12.58	1.75
SXT	=	1.19	2	.60	.08
Error	=		23	7.20	

Lot No.	1	2	3
Barrows	43.65	39.05	41.25
Gilts	42.60	37.44	38.10
$\bar{X}$	43.12	38.24	39.66

F to be significant @ 5% = 3.42, @ 1% = 5.66

No significance difference exists.

See Appendix JII

the limited hand fed and the corn cob - concentrate fed lots produced carcasses with a lesser average backfat thickness than did the control, or full fed lot. This is in agreement with the results reported by McMeekan (1939).

D. Slaughter and Cutting Data

There were no significant differences in dressing percent between the lots. The analysis of variance for these data is presented in Table 21.

Similarly, as can be noted in Table 22, no significant differences were found between the lots for the percent live weight primal cut-out. This could perhaps be attributed to the high variability among the animals as to the amount of fill at the time of slaughter. In spite of the fact that the animals were given a uniform shrink period of 24 hours prior to slaughter, it was evident from the variation in the shrink during this 24 hour period that a great deal of variation might exist in the amount of fill at the time of slaughter.

The analysis of variance of percent primal cut out based on the cold carcass weight is presented in Table 23. Lots 2 and 3, the restricted lots, were found to have carcass primal cut outs sufficiently greater than Lot 1 to be highly significant. A high carcass primal cut out is associated with leanness in the carcass and general carcass superiority.

The analysis of variance of percent of live weight in lean cuts (Table 24) showed no significant differences between lots. It was noted, however, that Lot 2 was .91 percent and Lot 3, 1.01 percent higher in percent of lean cuts than the control lot. Highly significant differences were found between the restricted lots and the control lots when the percent of lean cuts was calculated on a carcass basis. Table 25 presents the analysis of variance of these data. This significance could be expected since the percent carcass primal cut out data had already been found to possess similar significance.

TABLE 21

ANALYSIS OF VARIANCE OF

DRESSING PERCENT

Analysis of Variance

Source		D.F.	S.S.	M.Sq.	F.
Total	= 33703.30 - 33697.52 =	5	5.78		
Sex	= 33698.08 - 33697.52 =	1	.56	.56	.81
Treatment	= 33701.07 - 33697.52 =	2	3.55	1.78	2.58
SXT	=	2	1.67	.84	1.22
Error	=	23		.69	

Lot No.	1	2	3
Barrows	75.89	75.16	74.69
Gilts	76.04	73.06	74.81
$\overline{X}$	75.97	74.11	74.75

F to be significant @ 5% = 3.42, @ 1% = 5.66

No significant difference exists.

See Appendix XII

TABLE 22

ANALYSIS OF VARIANCE OF

LIVE WEIGHT PRIMAL CUT OUT

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 14539.50 - 14535.65 =	3.85	5		
Sex	= 14536.23 - 14535.65 =	.58	1	.58	.68
Treatment	= 14537.01 - 14535.65 =	1.36	2	.68	.80
SxT	=	1.91	2	.96	1.13
Error	=		23	.85	

Lot No.	1	2	3
Barrows	48.62	50.35	49.63
Gilts	48.63	48.14	49.95
$\bar{X}$	48.62	49.24	49.79

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

See Appendix LII

TABLE 23

ANALYSIS OF VARIANCE OF

CARCASS PRIMAL CUT OUT

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total =	25957.63 - 25947.58 =	10.05	5		
Sex =	25947.62 - 25947.58 =	.04	1	.04	.04
Treatment =	25956.93 - 25947.58 =	9.35	2	4.68	5.09
TXS	=	.66	2	.33	.36
Error	=		23	.92	

Lot No.	1	2	3
Barrows	74.05	67.00	66.49
Gilts	63.96	65.98	67.09
$\bar{X}$	64.00	66.49**	66.79**

Difference to be significant @ 5% = $\sqrt{.92}$ (t) = (.303) 2.069 = .63

@ 1% = $\sqrt{.92}$ (t) = (.303) 2.807 = .85

F to be significant at 2 and 23 d.f. 1% = 5.66

5% = 3.42

See Appendix MII

TABLE 24

ANALYSIS OF VARIANCE OF

PERCENT OF LIVE WEIGHT IN LEAN CUTS

Analysis of Variance

Source						
Total	= 8382.11 - 8378.35	=	3.76	5		
Sex	= 8378.79 - 8378.35	=	.44	1	.44	.45
Treatment	= 8379.59 - 8378.35	=	1.24	2	.62	.63
SXT		=	2.08	2	1.04	1.06
Error		=		23	.98	

Lot No.	1	2	3
Barrows	36.76	38.72	37.43
Gilts	36.70	36.56	38.04
$\bar{X}$	36.73	37.64	37.74

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

See Appendix NII

TABLE 25

ANALYSIS OF VARIANCE OF

PERCENT OF CARCASS WEIGHT IN LEAN CUTS

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	= 14928.50 - 14920.11	=	8.39	5		
Sex	= 14920.28 - 14920.11	=	.17	1	.17	.59
Treatment	= 14927.14 - 14920.11	=	7.05	2	3.52	12.14**
SXT		=	1.17	2	.58	2.00
Error	-	=		23	.29	

Lot No.	1	2	3
Barrows	48.43	51.53	50.16
Gilts	48.26	50.02	50.80
$\bar{X}$	48.34	50.78**	50.48**

Difference to be significant @ 1% = $\sqrt{.29}$ x t = .538 (2.807) = 1.51

@ 5% = $\sqrt{.29}$ x t = .538 (2.069) = 1.11

See Appendix OII

Table 26 presents the analysis of variance of percent lean area of a cross-section of the rough loin. While Lots 2 and 3, with 44.09 and 42.58 percent respectively, were higher in percent lean area than Lot 1 (38.79 percent), no significant differences were found to exist. This follows similar results encountered in Experiment I. Figure 3 is a photograph of representative rough loin chops. Each of these chops was chosen as being the nearest to the lot mean in percent of lean area.

In calculating the analysis of variance of loin index (Table 27) no significant differences could be demonstrated. However, the two restricted lots were found to have higher values, thereby indicating a more superior carcass, than the control lot.

A correlation coefficient of $+.157 \pm .188$ determined between the percent lean area of the rough loin and the live weight percent primal cut out was not significant (Table 28). This finding was in conflict with that of Soule (1950) who found a highly significant coefficient of $+.8186 \pm .0738$ between similar data.

Figure 4 represents a scatter diagram showing the relationship between carcass primal cut out and the percent lean area of the rough loins. The correlation coefficient was $+.683 \pm .142$, which was highly significant (Table 29). The regression equation was $Y = -70.18 + 1.702X$ and the standard error of estimate for Y was $+ 4.057$ percent.

TABLE 26

ANALYSIS OF VARIANCE OF

PERCENT LEAN AREA OF ROUGH LOIN

Analysis of Variance

Source					
Total	= 10544.69 - 10492.64	= 52.05	5		
Sex	= 10508.81 - 10492.64	= 16.17	1	16.17	3.10
Treatment	= 10522.45 - 10492.64	= 29.81	2	14.90	2.86
SXT		= 6.07	2	3.04	.58
Error		=	23	5.21	

Lot No.	1	2	3
Barrows	37.71	43.30	39.52
Gilts	39.87	44.88	45.63
$\bar{X}$	38.79	44.09	42.58

F to be significant 2 and 23 d.f. = 3.42 @ 5%, 5.66 @ 1%.

No significant difference exists.

See Appendix PII

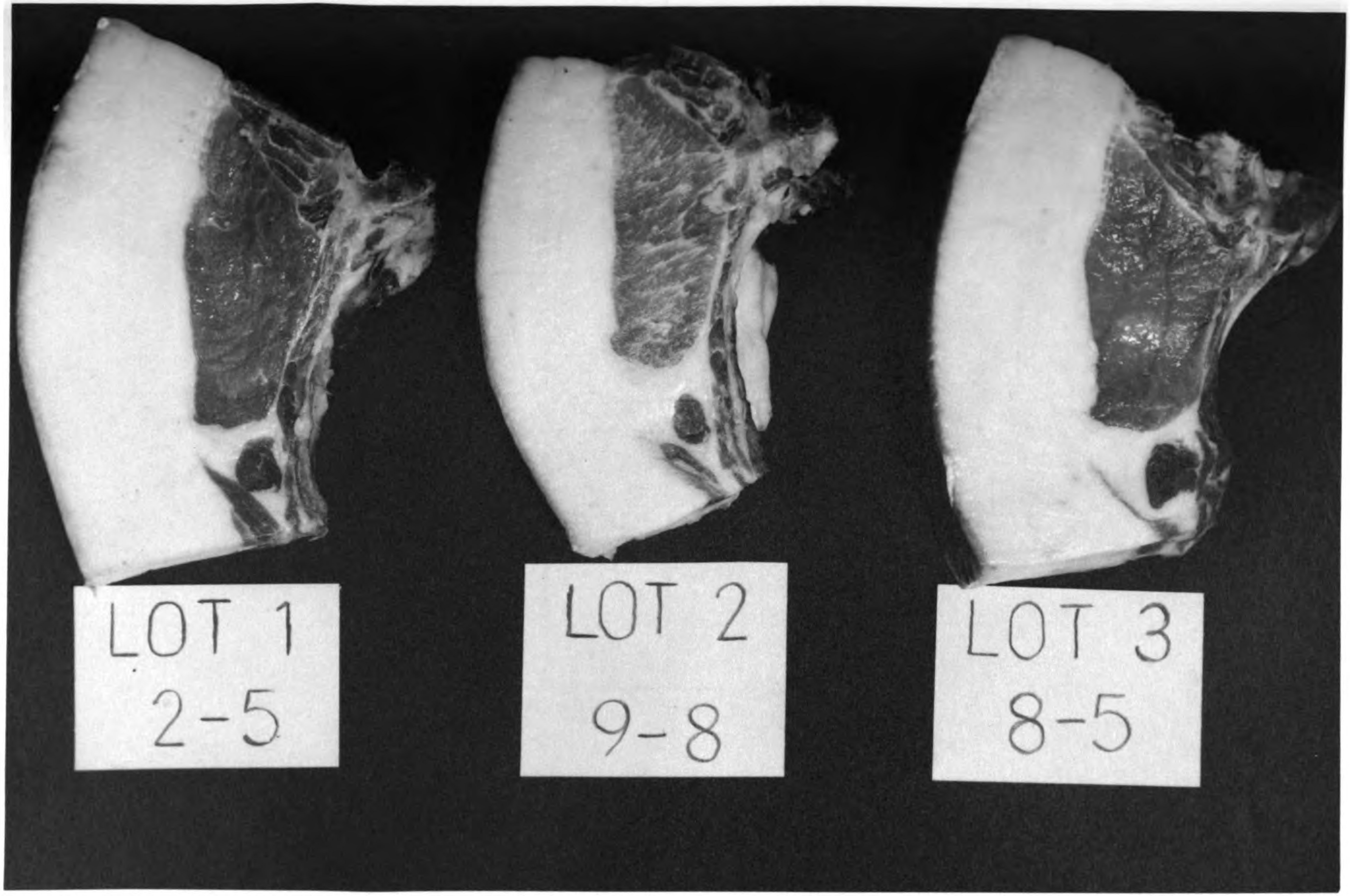

Fig. 3. Cross Section of Rough Loin. Exp. 2. Lot 1 avg. lean area = 38.79%, hog no. 2-5 lean area = 39.64%. Lot 2 avg. lean area = 44.09%, hog no. 9-8 lean area = 44.35%. Lot 3 avg. lean area = 42.58%, hog no. 8-5 lean area = 42.15%.

TABLE 27

ANALYSIS OF VARIANCE OF

LOIN INDEX

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total =	19502.93 - 19479.18	=	23.75	5		
Sex =	19479.66 - 19479.18	=	.48	1	.48	.14
Treatment =	19498.84 - 19479.18	=	19.66	2	9.83	2.94
TXS		=	3.61	2	1.80	.54
Error				23	3.34	

Lot No.	1	2	3
Barrows	55.12	59.19	55.78
Gilts	54.25	59.03	58.50
$\bar{X}$	54.68	59.11	57.14

F to be significant @ 5% = 3.42 , @ 1% = 5.66

No significant difference exists.

See Appendix QII

TABLE 28

CORRELATION BETWEEN LIVE WEIGHT CUT OUT (X)

PERCENT LEAN AREA OF ROUGH LOIN (Y)

$$rxy = \frac{59585.65 - 59537.99}{\sqrt{(111.31)(826.04)}}$$

$$= \frac{47.66}{\sqrt{91946.5124}}$$

$$= \frac{47.66}{303.23}$$

$$= \pm .157$$

$$\sigma_{rxy} = \frac{1 - (.157)^2}{\sqrt{27}}$$

$$= \frac{.9754}{5.196}$$

$$= \pm .188$$

Correlation coefficient to be to be significant at 27 degrees of freedom.

@ 5% = .367, @ 1% = .479

Correlation coefficient not significant.

See Appendix [illegible].

TABLE 29

CORRELATION BETWEEN CARCASS CUT OUT (X) AND

PERCENT LEAN AREA OF ROUGH LOIN (Y)

$$r_{xy} = \frac{79746.64 - 79520.24}{\sqrt{(132.98)\ (826.04)}}$$

$$= \frac{226.40}{\sqrt{109846.80}}$$

$$= \frac{226.40}{331.43}$$

$$= +.683^{**}$$

Correlation coefficient @ 27 d.f. to be significant @ 5% .367, @ 1% .470**

$$\sigma_r = \frac{1 - (.683)^2}{\sqrt{27}}$$

$$= \frac{.7363}{4.196}$$

$$= \pm\ .142$$

$$\sigma_X = \sqrt{\frac{132.98}{28}} \qquad \sigma_Y = \sqrt{\frac{826.04}{28}}$$

$$= \sqrt{4.75} \qquad = \sqrt{29.50}$$

$$= \pm 2.179 \qquad = \pm 5.431$$

$$Y = 41.71 + .683\ \frac{5.431}{2.179}\ (X - 65.74)$$

$$= 41.71 + 1.702\ (X - 65.74)$$

$$= 41.71 + 1.702\ X - 111.89$$

$$= -70.18 + 1.702\ X$$

$$\sigma_e = \sqrt{\frac{51281.38 - (-7018)\ (1209.63) - (1.702)\ (79746.64)}{27}}$$

$$= \sqrt{\frac{444.43}{27}}$$

$$= \sqrt{16.46}$$

$$= \pm\ 4.057\%$$

See Appendix SII.

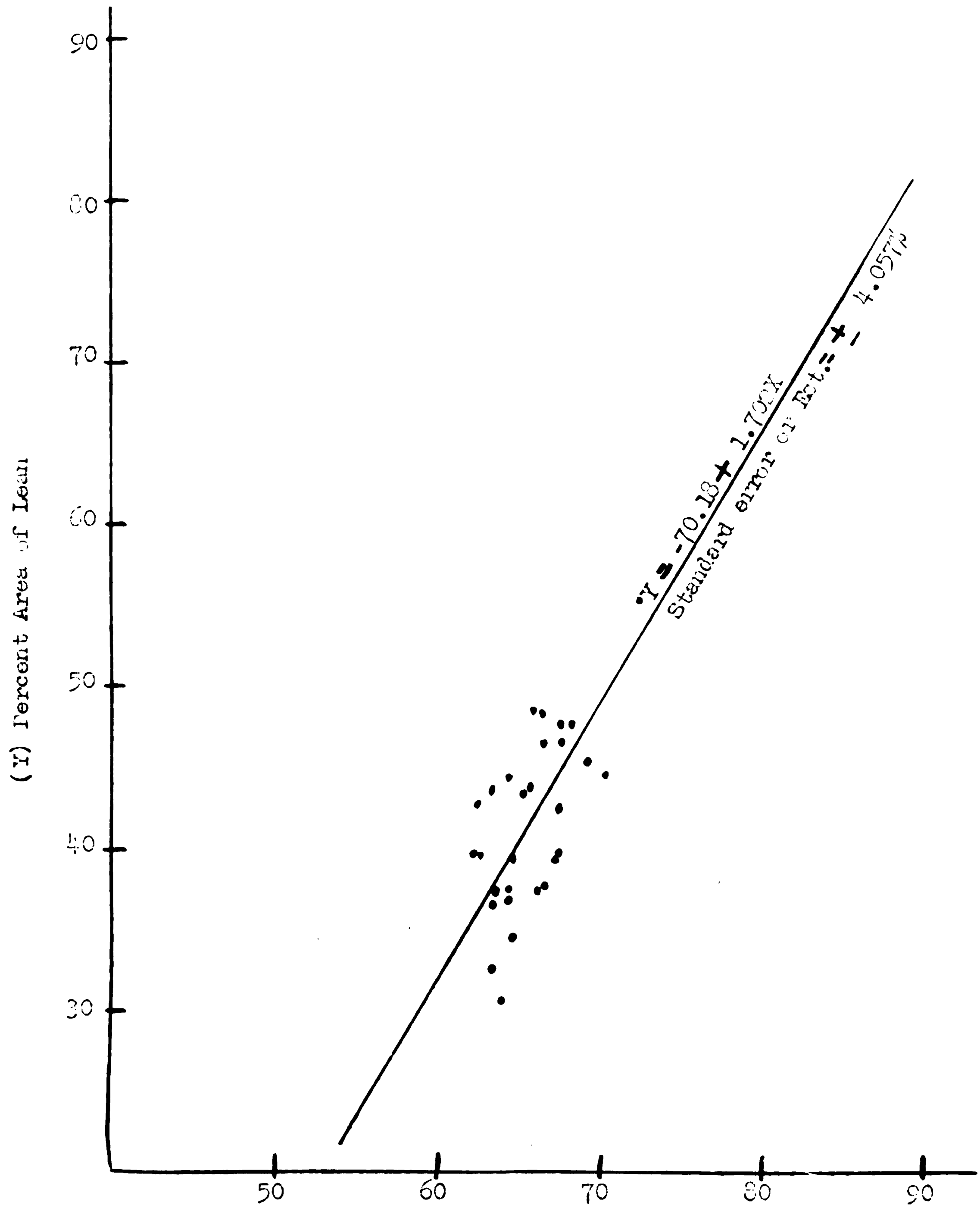

Fig. 4. Scatter diagram correlation between carcass primal cut out and percent lean area of rough loin

VI. SUMMARY AND CONCLUSIONS

1. Restriction of feed intake increased the efficiency of production of pounds of pork when accomplished by limited hand feeding (75 percent of full feed) in Experiment I and by bulking the ration (70 percent concentrate, 30 percent ground corn cobs) in Experiment II. On the basis of the results of this experiment the bulking of the ration with ground corn cobs might prove advantageous if they could be provided at a moderate cost.

2. Restriction of feed intake produced a slower rate of gain; enough slower in Experiment I to produce a highly significant difference.

3. Both restricted feeding and delayed castration had the effect of increasing leanness, primal cut out and lean cut yield, as well as a higher percent lean area of the rough loin cross section. This superiority was found to be significant for the restricted fed lots in Experiment II.

4. Both Experiments I and II failed to present significant differences in body length, leg length, average backfat thickness, and dressing percent.

5. A significant correlation coefficient between percent lean area of the rough loin and carcass percent primal cut out was found. A coefficient of $+ .466 \pm .180$ in the case of Experiment I and $+ .683 \pm .142$ in the case of Experiment II. There was no significant correlation coefficient between percent lean area of the rough loin and live weight percent primal cut out.

APPENDIX AI

FEED DATA

	Hog No.	Init. Wt. Lbs.	Final Wt. Lbs.	Total Gain Lbs.	Total Pig Days	Avg. Daily Gain Lbs.	Total Feed Lbs.	Feed/ 100 lbs. Gain Lbs.
Lot 1	13-2	51	221	170	102	1.67		
	13-7	40	227	187	117	1.60		
	11-2	35	234	199	131	1.52		
	2LE	23	221	198	131	1.51		
	4RE	23	218	195	124	1.57		
	5-6	37	220	183	110	1.66		
Total		209.0	1341.0	1132.0	715.0		6034	533
Avg.		34.8	223.5	188.7	119.2	1.58		
Lot 2	10-6	51	222	171	131	1.31		
	1-15	41	227	186	131	1.42		
	14-1	35	232	197	152	1.30		
	12-2	27	220	193	166	1.16		
	5LE	25	234	209	161	1.30		
	6RE	35	220	185	131	1.41		
Total		214.0	1355.0	1141.0	872.0		4708	413
Avg.		35.7	225.8	190.2	145.3	1.31		
Lot 3	11-5	50	227	177	119	1.49		
	13-8	44	229	185	124	1.49		
	3-8	22	223	201	138	1.46		
	6LE	28	227	199	119	1.67		
	8LE	34	230	196	124	1.58		
Total		168.0	1135.0	958.0	624.0		4673	488
Avg.		33.6	227.2	191.6	124.8	1.54		
Lot 4	11-1	45	219	174	131	1.33		
	11-4	30	221	191	139	1.37		
	16-1	28	227	199	119	1.67		
	33LE	30	225	195	112	1.74		
Total		133.0	892.0	759.0	501.0		3165	417
Avg.		33.2	223.0	189.8	125.2	1.51		

APPENDIX A II

FEED DATA

	Hog No.	Init. Wt. Lbs.	Final Wt. Lbs.	Total Gain Lbs.	Total Pig Days	Avg. Dy. Gain Lbs.	Total Feed Lbs.	Feed Per 100 Lbs. Gain
Lot 1	51	44	221	177	112	1.58		
	21	22	223	201	159	1.26		
Barrows	82	39	224	185	105	1.76		
	54	46	229	183	96	1.91		
	101	44	222	178	124	1.44		
Total		195.0	1119.0	924.0	596.0			
Avg.		39.0	223.8	184.8	119.2	1.55		
Lot 1	32	27	221	194	196	.99		
	94	25	223	198	140	1.41		
Gilts	66	32	220	188	154	1.22		
	1017	34	220	186	130	1.43		
	25	22	221	199	159	1.25		
Total		140.0	1105.0	965.0	779.0			
Avg.		28.0	221.0	193.0	155.8	1.24		
Lot Total		335.0	2224.0	1889.0	1375.0		7582	
Lot Avg.		33.5	222.4	188.9	137.5	1.37		401
Lot 2	41	39	226	187	210	.89		
	53	35	220	185	159	1.16		
Barrows	42	24	220	196	175	1.12		
	81	44	220	176	124	1.42		
	4	35	222	187	147	1.27		
Total		177.0	1108.0	931.0	815.0			
Avg.		35.4	221.6	186.2	163.0	1.14		
Lot 2	710	30	224	194	196	.99		
	109	37	220	183	161	1.14		
Gilts	98	28	220	192	161	1.19		
	56	30	223	193	156	1.24		
Total		125.0	887.0	762.0	674.0			
Avg.		31.2	221.[illegible]	190.5	134.8	1.13		
Lot Total		302.0	1995.0	1693.0	1489.0		7719	
Lot Avg.		33.6	221.7	188.1	165.4	1.14		456
Lot 3	104	36	225	187	147	1.27		
	31	43	220	177	130	1.36		
Barrows	52	39	222	183	128	1.43		
	43	26	222	196	161	1.22		
	85	39	226	187	147	1.27		
Total		183.0	1113.0	930.0	713.0			
Avg.		36.6	222.6	186.0	142.6	1.30		
Lot 3	712	25	224	199	196	1.02		
	114	26	221	195	161	1.21		
Gilts	95	32	219	187	163	1.15		
	106	30	224	194	182	1.07		
	96	28	223	195	182	1.07	Conc.	
Total		141.0	1111.0	970.0	884.0		7201	
Avg.		28.2	222.2	194.0	176.8	1.10	Corn Cobs	
Lot Total		324.0	2224.0	1900.0	1597.0		2121	
Lot Avg.		32.4	222.4	190.0	159.7	1.18	Total	
							[illegible]	[illegible]

APPENDIX BI

DRESSING DATA

	Hog No.	Feed Lot Wt. Lbs.	Slaughter Wt. Lbs.	Shrink Lbs.	Shrink %	Cold Carcass Wt. Lbs.	Dressing Percent
Lot 1	13-2	221	205	16	7.24	152.5	74.39
	13-7	227	215	12	5.29	152.0	70.70
	11-2	234	220	14	5.98	161.0	73.18
	2LE	221	210	11	4.98	153.5	73.10
	4RE	218	206	12	5.50	155.0	75.24
	5-6	220	208	12	5.45	157.5	71.59
Total		1341.0	1264.0	77.0	34.44	931.0	438.20
Avg.		223.5	210.7	12.8	5.74	155.2	73.03
Lot 2	10-6	222	213	9	4.05	155.0	72.77
	1-15	227	220	7	3.08	154.0	70.00
	14-1	232	218	14	6.03	162.5	74.54
	12-2	220	203	17	7.73	147.0	72.41
	5LE	235	219	16	6.81	166.0	75.80
	6RE	220	212	8	3.64	151.0	71.22
Total		1356.0	1258.0	71.0	31.34	935.5	437.04
Avg.		226.0	214.2	11.8	5.22	155.9	72.84
Lot 3	11-5	227	214	13	5.73	160.5	75.00
	13-8	229	215	14	6.11	162.5	75.58
	3-8	223	202	21	9.42	154.5	76.49
	6LE	227	209	18	7.93	155.0	74.16
	8LE	230	218	12	5.22	165.0	75.68
Total		1136.0	1058.0	78.0	34.41	797.5	376.91
Avg.		227.2	211.6	15.6	6.88	159.5	75.38
Lot 4	11-1	219	207	12	5.48	153.0	73.91
	11-4	221	209	12	5.43	156.0	74.64
	16-1	227	212	15	6.61	156.5	73.82
	33LE	225	209	16	7.11	154.0	73.68
Total		829.0	837.0	55.0	24.63	619.5	296.05
Avg.		223.0	209.2	13.8	61.58	154.9	74.01

APPENDIX BII

DRESSING DATA

	Hog No.	Feed Lot Wt. Lbs.	Slaughter Wt. Lbs.	Shrink Lbs.	Shrink %	Cold Carcass Wt. Lbs.	Dressing Percent
Lot 1	51	221	208	13	5.88	157.0	75.48
	21	223	215	8	3.59	167.5	75.58
Barrows	82	224	211	13	5.80	161.5	76.54
	54	229	218	11	4.80	159.0	72.94
	101	222	211	11	4.95	166.5	78.91
Total		1119.0	1063.0	56.0	25.02	806.5	379.45
Avg.		223.8	212.6	11.2	5.00	161.3	75.89
Lot 1	32	221	211	10	4.52	159.5	75.59
	94	223	209	14	6.28	159.5	76.32
Gilts	66	220	209	11	5.00	162.5	77.75
	1012	220	209	11	5.00	155.0	74.16
	25	221	214	7	3.17	163.5	76.40
Total		1105.0	1052.0	53.0	23.97	800.0	380.22
Avg.		221.0	210.4	10.6	4.79	160.0	76.04
Lot Total		2224.0	2115.0	109.0	48.99	1606.5	759.67
Lot Avg.		222.4	211.5	10.9	4.90	160.6	75.97
Lot 2	41	226	217	9	3.98	163.5	75.35
	53	220	217	3	1.36	159.0	73.27
Barrows	42	220	214	6	2.73	156.0	72.90
	81	220	210	10	4.55	164.5	78.33
	4	222	216	6	2.70	164.0	75.93
Total		1108.0	1074.0	34.0	15.32	807.0	375.78
Avg.		221.6	214.8	6.8	3.06	161.4	75.16
Lot 2	710	224	216	8	3.57	158.5	73.38
	109	220	223	3	1.34	161.0	72.20
Gilts	98	220	217	3	1.34	154.5	71.20
	56	223	216	7	3.14	163.0	75.46
Total		887.0	872.0	21.0	6.71	637.0	292.24
Avg.		221.7	218.0	5.3	1.68	159.3	73.06
Lot Total		1995.0	1946.0	55.0	22.03	1444.0	668.02
Lot Avg.		221.7	216.2	6.1	2.45	160.4	74.11
Lot 3	104	223	212	11	4.93	159.0	75.00
	31	220	203	17	7.73	150.0	73.89
Barrows	52	222	210	12	5.71	150.0	71.43
	43	222	211	11	4.95	161.5	76.54
	85	226	218	8	3.54	166.5	76.38
Total		1113.0	1054.0	59.0	26.86	787.0	373.24
Avg.		222.6	210.8	11.8	5.37	157.4	74.69
Lot 3	712	224	209	15	6.70	154.0	73.68
	114	221	211	10	4.52	158.0	74.88
Gilts	95	219	206	13	5.94	156.5	75.97
	106	224	206	18	8.04	156.0	75.73
	96	223	210	13	5.83	155.0	73.81
Total		1111.0	1042.0	69.0	31.03	779.5	374.07
Avg.		222.2	208.4	13.8	6.21	155.9	74.81
Lot Total		2224.0	2096.0	128.0	57.89	1566.5	747.31
Lot Avg.		222.4	209.6	12.8	5.79	156.6	74.75

APPENDIX CI

CARCASS MEASUREMENT DATA

	Hog No.	Carcass Length mm.	Leg Length mm.	Average Backfat Thickness in mm. 1st Rib	7th Rib	Last Rib	Last Lumbar	Avg.
Lot 1	13-2	686	500	71	55	48	48	55.50
	13-7	723	519	60	51	38	47	49.00
	11-2	702	510	59	47	40	45	47.75
	2LE	717	511	57	46	36	47	46.50
	4RE	690	510	59	48	40	47	48.50
	5-6	695	515	59	48	40	47	48.50
Total		4213.0	3065.0	365.0	295.0	242.0	281.0	295.75
Avg.		702.2	510.8	60.8	49.2	40.3	46.8	49.29
Lot 2	10-6	745	547	50	41	31	39	40.00
	1-15	752	539	45	40	26	32	35.00
	14-1	740	566	50	36	26	31	35.75
	12-2	730	520	55	41	28	42	41.50
	5LE	683	548	58	47	45	51	50.25
	6RE	702	495	61	55	41	43	50.00
Total		4357.0	3215.0	319.0	260.0	197.0	238.0	252.50
Avg.		426.2	535.8	53.2	43.3	32.8	39.7	42.08
Lot 3	11-5	705	507	59	49	37	43	47.00
	13-8	730	540	58	45	37	42	45.50
	3-8	699	513	61	49	35	43	47.00
	6LE	715	529	59	49	37	43	47.00
	8LE	716	514	60	45	40	44	47.25
Total		3565.0	2603.0	297.0	237.0	223.0	215.0	233.75
Avg.		713.0	520.6	59.4	47.4	44.6	43.0	46.75
Lot 4	11-1	710	514	[illegible]	[illegible]	31	41	[illegible]
	11-4	700	505	54	46	38	35	[illegible]
	16-1	731	529	59	43	37	42	45.25
	33LE	719	524	52	38	27	33	37.75
Total		2860.0	2070.0	221.0	167.0	134.0	151.0	[illegible]
Avg.		715.0	517.5	55.3	[illegible]	33.5	[illegible]	[illegible]

APPENDIX CII

CARCASS MEASUREMENT DATA

	Hog No.	Carcass Length mm.	Leg Length mm.	Backfat Thickness in mm. 1st rib	7th rib	last rib	last lumbar	Avg.
Lot 1	51	755	560	52	38	34	38	40.40
	21	761	542	57	40	34	40	42.75
Barrows	82	725	525	59	47	38	48	48.00
	54	757	520	60	44	38	45	46.75
	101	734	546	48	38	34	41	40.25
Total		3732	2693	276	207	178	212	218.25
Avg.		746.4	538.6	55.2	41.4	35.6	42.4	43.65
Lot 1	32	771	577	49	38	27	38	38.24
	94	736	530	62	49	32	38	45.25
Gilts	66	730	544	58	43	32	39	43.00
	1012	713	515	60	48	43	51	50.50
	25	738	541	42	35	35	48	40.00
Total		3688	2707	271	213	170	214	213.00
Avg.		737.6	541.4	54.2	42.6	34.0	42.8	42.60
Lot Total		7420	5400	547	420	348	426	431.20
Lot Avg.		742.0	540.0	54.7	42.0	34.8	42.6	43.12
Lot 2	41	778	620	38	28	22	26	28.50
	53	748	535	49	45	32	38	41.00
Barrows	42	743	540	45	34	30	33	35.50
	81	758	564	55	39	38	44	44.00
	4	740	545	55	45	39	46	46.75
Total		3777	2804	232	191	161	187	195.25
Avg.		755.4	560.8	46.4	38.2	32.2	37.4	39.05
Lot 2	710	783	560	45	33	29	32	34.75
	109	745	542	50	39	25	38	38.00
Gilts	98	752	548	30	39	25	28	35.00
	56	767	539	55	41	32	38	41.50
Total		3047	2189	200	152	111	136	149.75
Avg.		761.8	547.2	50.0	38.0	27.9	34.0	37.44
Lot Total		6824	4993	432	343	272	323	345.00
Lot Avg.		758.6	554.0	48.0	38.1	30.2	35.9	38.24
Lot 3	104	712	500	51	41	35	42	42.24
	31	744	557	50	34	34	32	37.50
Barrows	52	758	528	59	45	37	35	44.00
	43	743	542	58	39	33	35	41.24
	85	740	546	50	40	36	39	41.25
Total		3697	2673	368	199	175	183	206.25
Avg.		739.4	534.6	53.6	39.8	35.0	36.6	41.25
Lot 3	712	770	552	49	36	24	34	35.75
	114	741	527	50	39	34	44	41.75
Gilts	95	759	543	48	35	29	38	37.50
	106	728	523	52	37	34	38	40.25
	96	771	575	46	31	27	38	35.25
Total		3769	2720	245	178	148	191	190.50
Avg.		753.8	544.0	49.0	35.6	29.6	38.2	38.10
Lot Total		7466	5393	513	377	323	374	396.80
Lot Avg.		746.6	539.3	51.3	37.7	32.3	37.4	39.68

APPENDIX DI

LOIN AREA AND WEIGHT DATA

	Hog No.	Total Lean Sq.in.	Total Fat Sq.in.	Total Area Sq.in.	Percent Lean	Wt. Trim Loin Lbs.	Wt. Rough Loin Lbs.	Loin Index
Lot 1	13-2	3.47	4.97	11.44	30.33	20.7	38.8	53.35
	13-7	3.88	7.81	11.69	33.19	22.2	40.7	54.55
	11-2	4.22	6.91	11.13	37.92	20.6	37.5	54.93
	2LE	3.71	7.84	11.55	32.12	20.3	38.9	52.19
	4RE	4.30	8.45	12.75	33.73	20.9	38.3	54.57
	5-6	4.36	7.82	12.18	35.80	20.7	37.2	55.65
Total		23.94	46.80	70.74	203.09	125.4	231.4	325.24
Avg.		3.99	7.80	11.79	33.85	20.9	38.6	54.21
Lot 2	10-6	3.93	6.81	10.74	36.59	21.1	36.3	58.13
	1-15	3.68	4.44	8.12	45.32	21.5	35.8	60.06
	14-1	4.75	5.82	10.57	44.94	26.3	41.9	62.77
	12-2	4.06	7.22	11.28	35.99	23.0	39.3	58.52
	5LE	4.06	10.43	14.49	28.02	23.1	45.6	50.66
	6RE	3.72	6.81	10.53	35.33	19.9	37.5	53.39
Total		24.20	41.53	65.73	226.19	134.9	236.4	343.53
Avg.		4.03	6.92	10.96	37.70	22.5	39.4	57.27
Lot 3	11-5	4.12	7.16	11.28	36.52	21.7	39.4	55.08
	13-8	4.10	7.37	11.47	35.75	22.8	40.6	56.16
	3-8	5.04	7.01	12.05	41.83	22.0	37.7	58.36
	6LE	4.15	7.08	11.23	36.95	22.3	40.0	55.75
	8LE	4.86	7.70	12.56	38.69	23.8	40.9	58.19
Total		22.27	36.32	58.59	189.74	112.6	198.6	283.54
Avg.		4.45	7.26	11.72	37.95	22.5	39.7	56.71
Lot 4	11-1	3.43	6.68	10.11	33.93	19.6	35.9	54.60
	11-4	4.51	4.49	9.00	50.11	21.9	37.6	58.24
	16-1	3.88	6.45	10.33	37.56	20.7	35.9	57.66
	32LE	4.67	7.54	12.16	37.99	22.8	38.8	58.75
Total		16.49	25.16	41.60	159.59	85.0	148.2	229.56
Avg.		4.12	6.29	10.40	39.90	21.2	37.0	57.39

APPENDIX DII

LOIN AREA AND WEIGHT DATA

	Hog No.	Total Lean Sq.in.	Total Fat Sq. in.	Total Area Sq.in.	Percent Lean	Wt. Trim. Loin Lbs.	Wt. Rough Loin Lbs.	Loin Index
Lot 1	51	4.32	6.54	10.86	39.78	23.9	42.0	56.90
	21	4.42	5.92	10.34	42.75	23.2	43.5	53.33
Barrows	82	3.93	8.15	12.08	32.53	21.6	41.3	52.30
	54	3.46	6.05	9.51	36.38	21.2	38.6	54.92
	101	3.94	6.68	10.62	37.10	22.8	39.2	58.16
Total		20.07	33.34	53.41	188.54	112.7	204.6	275.61
Avg.		4.01	6.67	10.68	37.71	22.5	40.9	55.12
Lot 1	32	5.55	5.92	11.47	48.39	23.6	40.3	58.56
	94	3.68	5.76	9.44	37.02	20.3	37.7	53.84
Gilts	66	5.30	6.88	12.18	43.51	24.9	45.4	54.85
	1012	3.56	8.01	11.57	30.77	21.4	43.4	49.31
	25	5.05	7.69	12.74	39.64	22.3	41.0	54.39
Total		23.14	34.26	57.40	199.33	112.5	207.8	271.23
Avg.		4.63	6.85	11.48	39.87	22.5	41.6	54.25
Lot Total		43.21	67.60	113.81	387.87	225.2	412.4	546.84
Lot Avg.		4.32	6.76	11.38	38.79	22.5	41.2	54.68
Lot 2	41	6.75	5.51	12.26	55.06	27.0	38.4	70.31
	53	4.29	6.45	10.74	39.94	20.8	38.3	54.31
Barrows	42	4.75	5.53	10.28	46.21	22.7	37.3	60.36
	81	4.21	6.99	11.20	37.59	24.1	41.9	57.52
	4	4.64	7.66	12.30	37.72	22.4	42.3	52.96
Total		24.64	32.14	56.78	216.52	117.0	198.2	295.96
Avg.		4.93	6.43	11.36	43.30	23.4	39.6	59.19
Lot 2	710	5.70	6.25	11.95	47.70	24.5	38.5	62.64
	109	4.58	5.90	10.48	43.70	[illegible]	39.1	57.80
Gilts	98	4.12	5.17	9.29	44.35	20.7	36.7	[illegible]
	56	4.97	6.39	11.36	43.75	[illegible]	[illegible]	58.29
Total		19.37	23.71	43.08	179.50	92.4	156.5	236.13
Avg.		4.84	5.93	10.77	44.88	23.1	39.1	59.03
Lot Total		44.01	55.85	99.86	396.02	209.4	354.7	532.09
Lot Avg.		4.89	6.21	11.10	44.09	23.3	39.4	59.11
Lot 3	104	3.61	6.19	9.80	36.84	20.5	39.0	52.56
	31	4.57	5.74	10.31	44.33	24.1	39.8	60.55
Barrows	52	3.31	6.13	9.44	35.06	20.8	37.9	54.88
	43	4.70	7.28	11.98	39.23	22.3	40.8	54.66
	85	4.70	6.45	11.15	42.15	23.0	40.9	56.23
Total		20.89	31.79	52.68	197.61	110.7	198.4	278.88
Avg.		4.18	6.36	10.54	39.52	22.1	39.7	55.78
Lot 3	712	5.04	5.33	10.37	48.60	22.5	37.6	59.84
	114	4.44	6.80	11.24	39.50	20.1	38.0	52.89
Gilts	95	4.83	5.63	10.46	46.18	23.1	39.4	58.63
	106	4.86	5.44	10.30	47.18	22.3	37.1	60.11
	96	5.46	6.24	11.70	46.67	23.0	37.7	61.01
Total		24.63	29.44	55.07	228.13	111.0	189.8	292.48
Avg.		4.93	5.89	11.01	45.63	22.2	38.0	58.50
Lot Total		45.52	61.23	107.75	425.74	221.7	388.2	571.36
Lot Avg.		4.55	6.12	10.78	42.58	22.2	38.8	57.44

	Hog No.	Weight of Cuts Lbs. Skinned Ham	Trimmed Belly	Trimmed Shoulder	Trimmed Loin	Tot. Wt. of Cuts	Live Wt. Primal Cut Out	Carcass Primal Cut Out	Total Lean Cuts Lbs.	Lean Cuts % of Carcass Wt.	Lean Cuts % of Live Weight
Lot 1	13-2	25.4	27.4	25.0	20.7	98.5	48.05	64.59	71.1	46.62	34.68
	13-7	28.0	27.0	25.5	22.2	102.7	47.77	67.57	75.7	49.80	35.21
	11-2	28.0	26.6	25.4	20.6	100.6	45.73	62.48	74.0	45.96	33.64
	2LE	26.5	24.1	23.0	20.3	93.9	44.71	61.17	69.8	45.47	33.24
	4RE	26.8	26.9	24.1	20.9	98.7	47.91	63.68	71.8	46.32	34.85
	5-6	28.2	24.1	25.0	20.7	98.0	47.12	62.22	73.9	46.92	35.53
Total		162.9	156.1	148.0	125.4	592.4	281.29	381.71	436.3	281.09	207.15
Avg.		27.2	26.0	24.7	20.9	98.7	46.88	63.62	72.7	46.85	34.53
Lot 2	10-6	28.2	25.6	24.7	21.1	99.6	46.76	64.26	74.0	47.74	34.74
	1-15	28.3	23.2	27.2	21.5	100.2	45.55	65.06	77.0	50.00	35.00
	14-1	31.8	24.4	29.7	26.3	112.2	51.47	69.05	87.8	54.03	40.28
	12-2	28.2	23.4	23.4	23.0	98.0	48.28	66.67	74.6	50.75	36.75
	5LE	29.8	24.4	24.8	23.1	102.1	46.62	61.51	77.7	46.81	35.48
	6RE	24.3	23.7	23.6	19.9	91.5	43.16	60.60	91.5	44.90	31.98
Total		170.6	144.7	153.4	134.9	603.6	281.84	387.05	482.6	294.23	214.23
Avg.		28.4	24.1	25.6	22.5	100.6	46.97	64.51	80.4	29.04	35.71
Lot 3	11-5	28.7	25.1	25.5	21.7	101.0	47.20	62.93	75.9	47.29	35.47
	13-8	29.0	25.3	25.9	22.8	103.0	47.91	63.40	77.7	47.82	36.14
	3-8	28.5	22.4	24.9	22.0	97.8	48.42	63.30	75.4	48.80	37.33
	6LE	27.6	24.7	23.8	22.3	98.4	47.08	63.48	72.8	46.97	34.83
	8LE	30.7	23.1	26.4	23.8	104.0	47.71	63.03	80.9	49.03	37.11
Total		144.5	120.6	126.5	112.6	504.2	238.32	316.14	382.7	239.91	180.83
Avg.		28.9	24.1	25.3	22.5	100.8	47.66	63.23	76.5	47.98	36.18
Lot 4	11-1	26.6	24.4	24.0	19.6	94.6	45.70	61.83	70.2	45.88	33.91
	11-4	27.8	24.3	26.2	21.9	100.2	47.94	64.23	75.9	48.65	36.32
	16-1	28.7	25.2	25.8	20.7	100.4	47.36	64.15	75.2	48.05	35.47
	33LE	28.1	23.4	25.9	22.8	100.2	47.94	65.06	76.8	49.87	36.75
Total		111.2	97.3	102.9	85.0	395.4	188.94	254.82	298.1	192.45	142.45
Avg.		27.8	24.3	25.7	21.2	98.8	47.24	63.70	74.5	48.11	35.61

APPENDIX EI

CUTTING DATA

APPENDIX XII

CUTTING DATA

	Hog No.	Weight of Cuts Lbs. Skinned Ham	Belly Trimmed	Shoulder Trimmed	Loin Trimmed	Total Wt. of Cuts	Live Wt. Primal Cut Out	Carcass Primal Cut Out
Lot 1	51	28.5	23.7	25.5	23.9	101.6	48.05	64.71
	21	27.0	25.1	26.7	23.2	102.0	47.44	62.76
Barrows	82	28.6	26.0	26.4	21.6	102.6	48.63	63.53
	54	28.5	24.1	17.3	21.2	101.1	46.38	[illegible]
	101	31.6	27.1	27.8	22.8	109.3	51.80	65.65
Total		144.2	126.0	123.7	112.7	516.6	243.10	320.23
Avg.		28.8	25.2	24.7	22.5	103.3	48.62	64.05
Lot 1	32	31.3	24.5	25.5	23.6	104.9	49.72	65.77
	94	26.9	28.3	26.3	20.3	101.8	48.71	63.32
Gilts	66	27.2	23.8	27.3	24.9	103.2	49.38	63.51
	1012	28.5	24.5	24.7	21.4	99.1	47.42	63.94
	25	29.8	24.4	26.1	22.3	102.6	47.94	62.75
Total		143.7	125.5	129.9	112.5	511.6	243.17	319.79
Avg.		28.7	25.1	26.0	22.5	102.3	48.63	63.96
Lot Total		287.9	251.5	253.6	225.2	1028.2	486.27	640.02
Lot Avg.		28.8	25.1	25.4	22.5	102.8	48.63	64.00
Lot 2	41	36.3	24.0	30.7	27.0	118.0	54.38	72.17
	53	27.1	24.5	27.1	20.8	99.5	45.85	62.58
Barrows	42	32.0	24.8	28.4	22.7	107.9	50.42	69.17
	81	30.6	25.1	26.5	24.1	106.3	50.62	64.52
	4	31.6	26.4	28.6	22.4	109.0	50.46	66.46
Total		157.6	124.8	141.3	117.0	540.7	251.73	335.00
Avg.		31.5	25.0	28.3	23.4	108.1	50.35	67.00
Lot 2	710	30.1	24.5	28.9	24.5	108.0	50.00	68.14
	109	29.7	25.8	27.7	22.6	105.8	47.44	65.71
Gilts	98	26.9	26.8	25.5	20.7	99.9	46.04	64.66
	56	29.0	24.8	27.6	24.6	106.0	49.07	65.03
Total		115.2	101.9	109.7	92.4	419.7	192.55	363.54
Avg.		28.8	25.5	27.4	23.1	104.9	48.14	65.89
Lot Total		272.8	226.7	251.0	209.4	960.4	444.28	698.54
Lot Avg.		30.3	25.2	27.9	23.3	106.7	49.24	66.49
Lot 3	104	29.7	27.4	25.2	20.5	102.8	48.49	64.65
	31	30.7	24.4	26.5	24.1	105.7	52.07	70.47
Barrows	52	26.8	23.5	26.1	20.8	97.2	46.29	64.80
	43	29.2	24.9	28.4	22.3	104.8	49.67	64.89
	85	31.9	28.4	29.3	23.0	112.6	51.65	67.63
Total		148.3	128.6	135.5	110.7	522.3	248.17	332.44
Avg.		29.7	25.7	27.1	22.1	104.5	49.63	66.49
Lot 3	712	28.6	23.9	26.9	22.5	101.9	48.76	66.17
	114	30.6	25.2	25.8	20.1	101.7	48.20	67.44
Gilts	95	29.6	23.5	28.2	23.1	104.4	50.68	66.71
	106	30.4	24.9	27.6	22.3	105.2	51.07	67.44
	96	30.1	24.3	27.5	23.0	104.9	49.95	67.68
Total		149.3	121.8	136.0	111.0	518.1	248.66	335.44
Avg.		29.9	24.4	27.2	22.2	103.6	49.73	67.09
Lot Total		297.6	250.4	271.5	221.71	104.4	496.83	667.88
Lot Avg.		28.8	25.0	27.2	22.2	104.0	49.68	66.79

APPENDIX EII (Continued)

	Hog No.	Total Lean Cuts - Lbs.	Lean Cuts % of Carcass Wt.	Lean Cuts $ of Live Wt.
Lot 1	51	77.9	49.62	37.45
	21	76.9	47.32	35.77
Barrows	82	76.6	47.43	36.30
	54	77.0	48.43	35.32
	101	82.2	49.37	38.96
Total		390.6	242.17	183.80
Avg.		78.1	48.43	36.76
Lot 1	32	80.4	50.40	38.10
	94	73.5	46.08	35.17
Gilts	66	79.4	48.86	37.99
	1012	74.6	48.13	35.69
	25	78.2	47.83	36.54
Total		386.1	241.30	183.49
Avg.		77.2	48.26	36.70
Lot Total		776.7	483.47	367.29
Lot Avg.		77.7	48.35	36.73
Lot 2	41	94.0	57.49	43.32
	53	75.0	47.17	34.56
Barrows	42	83.1	53.27	38.83
	81	81.2	49.36	38.67
	4	82.6	50.37	38.24
Total		415.9	257.66	193.62
Avg.		83.2	51.53	38.72
Lot 2	710	84.4	53.24	39.07
	109	80.0	49.69	35.87
Gilts	98	73.1	47.31	33.69
	56	81.2	49.82	37.59
Total		318.7	200.06	146.22
Avg.		79.7	50.02	36.56
Lot Total		734.6	457.72	339.84
Lot Avg.		81.6	50.78	35.57
Lot 3	104	75.4	47.42	35.57
	31	81.3	54.20	40.00
Barrows	52	73.7	49.13	35.10
	43	79.9	49.47	37.87
	85	84.2	50.57	38.62
Total		394.5	250.79	187.16
Avg.		78.9	50.16	37.43
Lot 3	712	78.0	50.65	37.32
	114	76.5	48.18	36.26
Gilts	95	80.9	51.69	39.27
	106	80.3	51.47	38.98
	96	80.6	52.00	38.38
Total		396.3	253.99	190.21
Avg.		79.3	50.80	38.04
Lot Total		790.8	504.78	377.37
Lot Avg.		79.1	50.48	37.74

APPENDIX FI

ANALYSIS OF VARIANCE OF

AVERAGE DAILY GAIN (LBS.)

Lot No.	1	2	3	4	
	1.67	1.31	1.49	1.33	
	1.60	1.42	1.49	1.37	
	1.52	1.30	1.46	1.67	
	1.51	1.16	1.67	1.74	
	1.57	1.30	1.58		
	1.66	1.41			
SX	9.53	7.90	7.69	6.11	31.23
$\bar{X}$	1.59	1.32**	1.54	1.53	

$$CT = \frac{(31.23)^2}{21} = 46.44$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total = 46.93 - 46.44	=	.49	20		
Between = 25.54 + 11.83 + 9.33 - 46.44	=	.26	3	.086	6.14**
Error	=	.23	17	.014	

F to be significant @ 5% = 3.20*, @ 1% = 5.18**

A highly significant difference exists.

t - test

Difference to be significant between lot 1 and 2 $= \sqrt{.014\ (1/6 + 1/6)}$ Xt

(.068) (2.110) = .14 @ 5%

(.068) (2.898) = .20 @ 1%

ANALYSIS OF VARIANCE OF

AVERAGE DAILY GAIN (Continued)

Difference to be significant between lot 2 and 3 = $\sqrt{.014\ (1/6 + 1/5)}$ Xt

(.071) (2.110) = .15 @ 5%

(.071) (2.898) = .21 @ 1%

Difference to be significant between lot 2 and 4 = $\sqrt{.014\ (1/6 + 1/4)}$ Xt

(.076) (2.110) = .16 @ 5%

(.076) (2.898) = .38 @ 1%

Lot 2 significantly slower in rate of gain at the 1% level than lots 1, 3, and 4.

APPENDIX FII

ANALYSIS OF VARIANCE OF

AVERAGE DAILY GAINS (LBS.)

Lot	1	2	3	
Barrows	1.58 1.26 1.76 1.91 1.44	.89 1.16 1.12 1.42 1.27	1.27 1.36 1.43 1.22 1.27	
B SX X̄	7.95 1.59	5.86 1.17	6.55 1.31	
Gilts	.99 1.41 1.22 1.43 1.25	.99 1.14 1.19 1.24	1.02 1.21 1.15 1.07 1.07	
SX X̄	6.30 1.26	4.56 1.14	5.52 1.10	36.74

$$CT = \frac{(36.74)^2}{29} = 46.55$$

Analysis of Variance

Total SS = 47.95 - 46.55 = 1.40

Between SS = 42.12 + 5.20 - 46.55 = .77

Error SS = = .63

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	1.40	
Between	5	.77	
Error	23	.63	.274

Corrected Error Mean Square = .274 [1/6 (1/4 + 5/5)] = .274 (.208) = .057

Lot Means

	1	2	3	
Barrows	1.59	1.17	1.31	4.07
Gilts	1.26	1.14	1.10	3.50
SX	2.85	2.31	2.41	7.57
$\bar{X}$	1.42	1.16	1.20	

$$CT = \frac{(7.57)^2}{6} = 9.55$$

Analysis of Variance

Source	S.S.	D.F.	M.Sq.	F.
Total = 9.71 - 9.55 =	.16	5		
Sex = 9.60 - 9.55 =	.05	1	.05	.88
Treatments = 9.63 - 9.55 =	.08	2	.04	.70
SXT =	.03	2	.015	.26
Error =		23	.057	

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

APPENDIX GI

ANALYSIS OF VARIANCE OF

BODY LENGTH (mm.)

Lot No.	1	2	3	4	
	723	745	705	719	
	695	752	715	731	
	690	702	730	710	
	702	740	716	700	
	717	730	699		
	686	688			
SX	4213	4357	3565	2860	14995
$\bar{X}$	702.17	726.17	713.00	715.00	

$$CT = \frac{(14995)^2}{21} = 10707144.0$$

Analysis of Variance

Source	**S.S.**	**D.F.**	**M.Sq.**	**F.**
Total = 10714349.0 - 10707144.0	= 7205.0	20		
Between = 6122136.3 + 2541845.0 + 2044900.0 - 10707144.0	= 1737.3	3	579.1	1.80
Error	= 5467.7	17	321.63	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX GII

ANALYSIS OF VARIANCE OF

BODY LENGTH (m.)

Lot	1	2	3	
Barrows	755	788	712	
	761	748	744	
	725	743	758	
	757	758	743	
	734	740	740	
SX	3732	3777	3697	11206
$\bar{X}$	746.4	755.4	739.4	
Gilts	771	783	770	
	736	745	741	
	730	752	759	
	713	767	728	
	738		771	
SX	3688	3047	3769	10504
$\bar{X}$	737.6	761.8	753.8	21710

$$CT = \frac{(21710)^2}{29} = 16252555.2$$

Total SS = 16262374 - 16252555.2 = 9818.8

Between SS = 13933613 + 2321052 - 16252555.2 = 2109.8

Error SS = = 7709.0

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	9818.8	
Between	5	2109.8	
Error	23	7709.0	335.17

Corrected error M.Sq. = 335.17 [1/6 (1/4 + 5/5)] = 335.17 (.208) = 69.71

	1	2	3	
Barrows	746.4	755.4	739.4	2241.2
Gilts	737.6	761.8	753.8	2253.2
ΣX	1484.0	1517.2	1493.2	4494.4
$\bar{X}$	742.0	758.6	746.6	

$$CT = \frac{(4494.4)^2}{6} = 3366605.2$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 3367061.9 - 3366605.2 =	465.7	5		
Sex	= 3366629.2 - 3366605.2 =	24.0	1	24.00	.34
Treatment	= 3366899.0 - 3366605.2 =	293.8	2	146.90	2.11
SXT	=	= 148.2	2	74.10	1.06
Error			23	69.71	

F to be significant @ 5% = 3.42* @ 1% = 5.66**

No significant difference exists.

APPENDIX HI

ANALYSIS OF VARIANCE OF

LEG LENGTH (mm.)

Lot No.	1	2	3	4	
	519	547	507	524	
	515	539	529	529	
	510	495	540	514	
	500	566	514	503	
	510	520	513		
	511	548			
SX	3065	3215	2603	2070	10953
X̄	510.8	535.8	520.6	517.5	

$$CT = \frac{(10953)^2}{21} = 5712771.9$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 5719723.0 − 5712771.9	= 6951.1	20		
Between	= 3288408.3 + 1355121.8 + 1071225.0 − 5712771.9	= 1983.2	3	661.07	2.26
Error		= 4967.9	17	292.23	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX HII

ANALYSIS OF VARIANCE OF LEG LENGTH (mm.)

Lot	1	2	3	
Barrows	560	620	500	
	542	535	557	
	525	540	528	
	520	564	542	
	546	545	546	
	2693	2804	2673	8170
$\bar{X}$	538.6	560.8	534.6	
Gilts	577	560	552	
	530	542	527	
	544	548	543	
	515	539	523	
	541		575	
	2707	2189	2720	7616
$\bar{X}$	541.4	547.2	544.0	15786

$$CT = \frac{(15786)^2}{29} = 8593027.4$$

Analysis of Variance

Total SS = 8607060.0 - 8593027.5 = 14032.6

Between SS = 7397164.0 1197930 - 8593027.4 = 2066.6

Error SS = 11966.0

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	14032.6	
Between	5	2066.6	
Error	23	11966.0	520.26

Corrected error M.Sq. = 520.26 [1/6 (1/4   5/5)] = 520.26 (.208) = 108.21

	1	2	3	
Barrows	538.6	560.[illegible]	534.6	1634.0
Gilts	541.4	547.2	544.0	1632.6
SX	1080.0	1108.0	1078.6	3266.6
$\bar{X}$	540.0	554.0	539.3	

$$CT = \frac{(3266.6)^2}{6} = 1778445.9$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 1778861.6 - 1778445.9	= 415.7	5		
Sex	= 1778446.2 - 1778445.9	= .3	1	.3	.003
Treatment	= 1778721.0 - 177845.9	= 275.1	2	137.55	1.27
SXT		= 140.3	2	70.15	.65
Error		=	23	108.21	

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

APPENDIX JI

ANALYSIS OF VARIANCE OF

AVERAGE BACKFAT THICKNESS (mm.)

Lot No.	1	2	3	4	
	49.00	40.00	47.00	37.75	
	48.50	35.00	47.00	45.25	
	48.50	50.00	45.50	42.00	
	55.50	35.75	47.25	43.25	
	47.75	41.50	47.00		
	46.50	50.25			
SX	295.75	252.50	233.75	168.25	950.25
$\bar{X}$	49.29	42.08	46.75	42.06	

$$CT = \frac{(950.25)^2}{21} = 42998.81$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 43992.94 - 42998.81 =	994.13	20		
Between	= 25204.05 + 10927.81 +				
	7077.01 - 42998.81 =	210.06	3	70.02	1.52
Error	=	784.07	17	46.12	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX JII

ANALYSIS OF VARIANCE OF AVERAGE BACKFAT THICKNESS

	1	2	3	
Barrows	40.50	28.50	42.25	
	42.75	41.00	37.50	
	48.00	35.50	44.00	
	46.75	44.00	41.25	
	40.25	46.25	41.25	
SX	218.25	195.25	206.25	619.75
$\bar{X}$	43.65	39.05	41.25	
Gilts	38.25	34.75	35.75	
	45.25	38.00	41.75	
	39.00	35.50	37.50	
	50.50	41.50	40.25	
	40.00		35.25	
SX	213.00	149.75	190.50	553.25
$\bar{X}$	42.60	37.44	38.10	1173.00

$$CT = \frac{(1173)^2}{29} = 47445.83$$

Analysis of Variance

Total SS = 48394.88 - 47445.83 = 949.05

Between SS = 41990.79 + 5607.76 - 47445.83 = 152.72

Error = 796.33

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	949.05	
Between	5	152.72	
Error	23	796.33	34.62

Corrected Error M.Sq. = 34.62 [1/6 (1/4 + 5/5)] = 34.62 (.208) = 7.20

	1	2	3	
Barrows	43.65	39.05	41.25	123.95
Gilts	42.60	37.44	38.10	118.14
SX	86.25	76.49	79.35	242.09
$\bar{X}$	43.12	38.24	39.68	

$$CT = \frac{(242.09)^2}{6} = 9767.93$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 9799.91 - 9767.93 =	31.98	5		
Sex	= 9773.55 - 9767.93 =	5.62	1	5.62	.78
Treatment	= 9793.10 - 9767.93 =	25.17	2	12.58	1.75
SXT	=	1.19	2	.60	.08
Error	=		23	7.20	

F to be significant @ 5% = 3.42 , @ 1% = 5.66

No significant difference exists.

APPENDIX KI

ANALYSIS OF VARIANCE OF DRESSING PERCENT

Lot No.	1	2	3	4	
	70.70	72.77	75.00	73.68	
	71.59	70.00	74.16	73.82	
	75.24	71.22	75.58	73.91	
	74.39	74.54	75.68	74.64	
	73.18	72.71	76.49		
	73.10	75.80			
SX	438.20	437.04	376.91	296.05	1548.20
$\bar{X}$	73.03	72.84	75.38	74.01	

$$CT = \frac{(1548.20)^2}{21} = 114139.20$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 114201.00 - 114139.20 =	61.80	20		
Between	= 63837.20 + 28412.23 +				
	21911.40 - 114139.20 =	21.63	3	7.21	3.06
Error	=	40.17	17	2.36	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX XII

ANALYSIS OF VARIANCE OF DRESSING PERCENT

Lot	1	2	3	
Barrows	75.48	75.35	75.00	
	75.58	73.27	73.89	
	76.54	72.90	71.43	
	72.94	78.33	76.54	
	78.91	75.93	76.38	
SX	379.45	375.78	373.24	1128.47
$\bar{X}$	75.89	75.16	74.69	
Gilts	75.59	73.38	73.68	
	76.32	72.20	74.88	
	77.75	71.20	75.97	
	74.16	75.46	75.73	
	76.40		73.81	
SX	380.22	292.24	374.07	1046.53
$\bar{X}$	76.04	73.06	74.81	2175.00

$$CT = \frac{(2175.00)^2}{29} = \frac{4730625}{29} = 163125.00$$

Analysis of Variance

Total SS = 163227.28 − 163125.00 = 102.28

Between SS $= \frac{708996.62}{5} + \frac{85404.22}{4} - 163125.00 = 26.28$

Error SS = 76.00

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	102.28	
Between	5	26.28	
Error	23	76.00	3.30

Corrected Error M.Sq. = 3.30 [1/6 (1/4 + 5/5)] = 3.30 (.208) = .69

	1	2	3	
Barrows	75.89	75.16	74.69	225.74
Gilts	76.04	73.06	74.81	223.91
SX	151.93	148.22	149.50	449.65
$\bar{X}$	75.97	74.11	74.75	

$$CT = \frac{(449.65)^2}{6} = 33697.52$$

Analysis of Variance

Source		D.F.	S.S.	M.Sq.	F.
Total	33703.30 - 33697.52	5	5.78		
Sex	33698.08 - 33697.52	1	.56	.56	.81
Treatment	33701.07 - 33697.52	2	3.55	1.78	2.58
SXT		2	1.67	.84	1.22
Error		23		.69	

F to be significant @ 5% = 3.42, @ 1% = 5.66

No significant difference exists.

APPENDIX LI

ANALYSIS OF VARIANCE OF

LIVE WEIGHT PRIMAL CUT OUT

Lot No.	1	2	3	4	
	47.77	46.76	47.20	47.94	
	47.12	45.55	47.91	47.36	
	47.91	43.16	47.71	45.70	
	48.05	51.47	48.42	47.94	
	45.73	48.28	47.08		
	44.71	46.62			
SX	281.29	281.84	238.32	188.94	990.39
$\bar{X}$	46.88	46.97	47.66	47.24	

$$CT = \frac{(990.39)^2}{21} = 46708.21$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 46762.71 - 46708.21 =	54.50	20		
Between	= 26426.31 + 11359.28 + 8928.58 - 46708.21 =	5.96	3	1.99	.70
Error	=	48.54	17	2.86	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX LII

ANALYSIS OF VARIANCE OF

LIVE WEIGHT PRIMAL CUT OUT

	1	2	3	
Barrows	48.84	54.38	48.49	
	47.44	45.85	52.07	
	48.63	50.42	46.29	
	46.38	50.62	49.67	
	51.80	50.46	51.65	
SX	243.10	251.73	248.17	743.00
$\bar{X}$	48.62	50.35	49.63	
Gilts	49.72	50.00	48.76	
	48.71	47.44	48.20	
	49.38	46.04	50.68	
	47.42	49.07	51.07	
	47.94		49.95	
SX	243.17	192.55	248.66	648.38
$\bar{X}$	48.63	48.14	49.73	1427.38

$$CT = \frac{(1427.38)^2}{29} \quad \frac{2037413.66}{29} \quad 70255.64$$

Analysis of Variance

Total SS = 70366.95 - 70255.64 = 111.31

Between SS = 61003.48 9268.88 - 70255.64 = 16.72

Error SS = 94.59

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	111.31	
Between	5	16.72	
Error	23	94.59	4.11

Corrected mean $= 4.11 \left[1/6\ (1/4 + 5/5)\right] = 4.11\ (.208) = .85$

	1	2	3	
Barrows	48.62	50.35	49.63	148.60
Gilts	48.63	48.14	49.95	146.72
SX	97.25	98.49	99.58	295.32
$\bar{X}$	48.62	49.24	49.79	

$$CT = \frac{(295.32)^2}{6} = 14535.65$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 14539.50 - 14535.65 =	3.85	5		
Sex	= 14536.23 - 14535.65 =	.58	1	.58	.68
Treatment	= 14537.01 - 14535.65 =	1.36	2	.68	.80
SXT	=	1.91	2	.96	1.13
Error	=		23	.85	

F to be significant @ 5% = 3.42* , @ 1% = 5.66**

No significant difference exists.

APPENDIX XI

ANALYSIS OF VARIANCE OF

CARCASS PRIMAL CUT OUT

Lot No.	1	2	3	4	
	67.57	64.26	62.93	65.06	
	62.22	65.06	63.48	64.15	
	63.68	60.60	63.40	61.38	
	64.59	69.05	63.03	64.23	
	62.48	66.57	63.30		
	61.17	61.51			
SX	381.71	387.05	316.14	254.82	1339.72
$\bar{X}$	63.62	64.51	63.23	63.70	

$$CT = \frac{(1339.72)^2}{21} = 85469.03$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 85557.17 - 85469.03 =	88.14	20		
Between	= 49251.70 + 19988.90 + + 16233.31 - 85469.03 =	4.88	3	1.63	.33
Error	=	83.26	17	4.90	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX XII

ANALYSIS OF VARIANCE OF

CARCASS PRIMAL CUT OUT

	1	2	3	
Barrows	64.71	72.17	64.65	
	62.76	62.58	70.47	
	63.53	69.17	64.80	
	63.58	64.62	64.89	
	65.65	66.46	67.63	
ΣX	320.23	335.00	332.44	987.67
$\bar{X}$	64.05	67.00	66.49	
Gilts	65.77	68.14	66.17	
	63.82	65.71	67.44	
	63.51	64.66	66.71	
	63.94	65.03	67.44	
	62.75		67.68	
ΣX	319.79	263.54	335.44	918.77
$\bar{X}$	63.96	65.89	67.09	1906.44

$$CT = \frac{(1906.44)^2}{29} = 125347.12$$

Analysis of Variance

Total SS = 125480.10 - 125347.12 = 132.98

Between SS = 108014.85 + 17363.33 - 125347.12 = 31.06

Error SS = 101.92

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	132.98	
Between	5	31.06	
Error	23	101.92	4.43

Corrected mean = 4.43 [1/6 (1/4 + 5/5)] = 4.43 (.208) = .92

	1	2	3	
Barrows	64.05	67.00	66.49	197.54
Gilts	63.96	65.98	67.09	197.03
SX	128.01	132.98	133.58	394.57
$\bar{X}$	64.00	66.49**	66.79**	

$$CT = \frac{(394.57)^2}{6} = 25947.58$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 25957.63 - 25947.58	= 10.05	5		
Sex	= 25947.62 - 25947.58	= .04	1	.04	.04
Treatment	= 25956.93 - 25947.58	= 9.35	2	4.68	5.09
TXS		= .66	2	.33	.36
Error		=	23	.92	

Difference to be significant @ 5% = $\sqrt{.92}$ (t) = (.303) 2.069 = .63

@ 1% = $\sqrt{.92}$ (t) = (.303) 2.807 = .85

F to be significant at 2 and 23 d.f. 1% = 5.66

5% = 3.42

APPENDIX II

ANALYSIS OF VARIANCE OF LIVE WEIGHT PERCENT LEAN CUTS

Lot No.	1	2	3	4	
	35.21	35.48	37.11	36.32	
	35.53	36.75	37.33	33.91	
	33.24	31.98	35.47	35.47	
	33.64	35.00	36.14	36.75	
	34.85	40.28	34.83		
	34.68	34.74			
SX	207.15	214.23	180.88	142.45	744.71
$\bar{X}$	34.53	35.71	36.18	35.61	

$$CT = \frac{(744.71)^2}{21} = 26409.19$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 26468.10 - 26409.19 =	58.91	20		
Between	= 14800.94 + 6543.51 + 5073.00 - 26409.19 =	8.26	3	2.75	.92
Error	=	50.65	17	2.98	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX NII

ANALYSIS OF VARIANCE OF

PERCENT OF LIVE WEIGHT IN LEAN CUTS

	1	2	3	
Barrows	37.45	43.32	35.57	
	35.77	34.56	40.00	
	36.30	38.83	37.87	
	35.32	38.67	38.62	
	38.96	38.24	35.10	
SX	183.80	193.62	187.16	564.58
$\bar{X}$	36.76	38.72	37.43	
Gilts	38.10	39.07	36.26	
	35.17	35.87	39.27	
	37.99	37.59	38.98	
	35.69	33.69	38.38	
	36.54		37.32	
SX	183.49	146.22	190.21	519.92
$\bar{X}$	36.70	36.56	38.04	1084.50

$$CT = \frac{(1084.50)^2}{29} = 40556.56$$

Analysis of Variance of

Total SS = 40668.44 - 40556.56 = 111.88

Between SS = 35229.69 5345.07 - CT = 18.20

Error SS = 93.68

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	111.88	
Between	5	18.20	
Error	23	93.68	4.73

Corrected error M.Sq. = 4.73 [1/6 (1/4 5/5)] = 4.73 (.208) = .98

	1	2	3	
Barrows	36.76	38.72	37.43	112.91
Gilts	36.70	36.56	38.04	111.30
SX	73.46	75.28	75.47	224.21
$\bar{X}$	36.73	37.64	37.74	

$$CT = \frac{(224.21)^2}{6} = 8378.35$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 8382.11 - 8378.35 =	3.76	5		
Sex	= 8378.79 - 8378.35 =	.44	1	.44	.45
Treatment	= 8379.59 - 8378.35 =	1.24	2	.62	.63
SXT	=	2.08	2	1.04	1.06
Error	=		23	.98	

F to be significant @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

APPENDIX OI

ANALYSIS OF VARIANCE OF

CARCASS PERCENT LEAN CUTS

Lot No.	1	2	3	4	
	49.80	46.81	49.03	48.65	
	46.92	50.75	48.80	45.88	
	45.47	54.03	47.29	48.05	
	45.96	44.90	47.82	49.87	
	46.32	50.00	46.97		
	46.62	47.74			
SX	281.09	294.23	239.91	192.45	1007.68
$\bar{X}$	46.85	49.04	47.98	48.11	

$$CT = \frac{(1007.68)^2}{21} = 48353.28$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 48443.71 - 48353.28 =	90.43	20		
Between	= 27597.15 + 11511.36 + 9259.25 - 48353.28 =	14.48	3	4.83	1.08
Error	=	75.95	17	4.47	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX OII

ANALYSIS OF VARIANCE OF

PERCENT OF CARCASS WEIGHT IN LEAN CUTS

	1	2	3	
Barrows	49.62	57.49	47.42	
	47.32	47.17	54.20	
	47.43	53.27	49.13	
	48.43	49.36	49.47	
	49.37	50.37	50.57	
SX	242.17	257.66	250.79	750.62
$\bar{X}$	48.43	51.53	50.16	
Gilts	50.40	53.24	50.65	
	46.08	49.69	48.18	
	48.86	47.31	51.69	
	48.13	49.82	51.47	
	47.83		52.00	
SX	241.30	200.06	253.99	695.35
$\bar{X}$	48.26	50.02	50.80	1445.97

$$CT = \frac{(1445.97)^2}{29} = 72097.56$$

Analysis of Variance

Total SS = 72171.51 - 72097.56 = 73.95

Between SS = 62133.44 + 10006.00 - 72097.56 = 41.88

Error SS = 32.07

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	73.95	
Between	5	41.88	
Error	23	32.07	1.39

Corrected error M.Sq. = 1.39 [1/6 (1/4 + 5/5)] = 1.39 (.208) = .29

	1	2	3	
Barrows	48.43	51.53	50.16	150.12
Gilts	48.26	50.02	50.80	149.08
SX	96.69	101.55	100.96	299.20
$\bar{X}$	48.34	50.78**	50.48**	

$$CT = \frac{(299.20)^2}{6} = 14920.11$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 14928.50 - 14920.11 =	8.39	5		
Sex	= 14920.28 - 14920.11 =	.17	1	.17	.59
Treatment	= 14927.14 - 14920.11 =	7.05	2	3.52	12.14**
SXT	=	1.17	2	.58	2.00
Error	=		23	.29	

Difference to be significant @ 1% $= \sqrt{.29} \times t = .538\ (2.807) = 1.51$

@ 5% $= \sqrt{.29} \times t = .538\ (2.069) = 1.11$

APPENDIX PI

ANALYSIS OF VARIANCE OF

PERCENT LEAN AREA OF ROUGH LOIN

Lot No.	1	2	3	4	
	33.19	28.02	38.69	50.11	
	35.80	35.99	41.83	33.93	
	32.12	44.94	36.52	37.56	
	37.92	35.33	35.75	37.99	
	33.73	36.59	36.95		
	30.33	45.32			
SX	203.09	226.19	189.74	159.59	778.61
$\bar{X}$	33.85	37.70	37.95	39.90	

$$CT = \frac{(778.61)^2}{21} = 28868.26$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 29391.39 - 28868.26 =	523.13	20		
Between	= 15401.24 + 7200.25 +				
	6367.24 - 28868.26 =	100.47	3	33.49	1.35
Error	=	422.66	17	24.86	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX PII

ANALYSIS OF VARIANCE OF

PERCENT LEAN AREA OF ROUGH LOIN

	1	2	3	
Barrows	39.78	55.06	35.84	
	42.75	39.94	44.33	
	32.53	46.21	35.06	
	36.38	37.59	39.23	
	37.10	37.72	42.15	
SX	188.54	216.52	197.61	
$\bar{X}$	37.71	43.30	39.52	
Gilts	48.39	47.70	38.60	
	37.02	43.70	39.50	
	43.51	44.35	46.18	
	30.77	43.75	47.18	
	39.64		46.67	
SX	199.33	179.50	228.13	
$\bar{X}$	39.87	44.88	45.63	1209.63

$$CT = \frac{(1209.63)^2}{29} = 50455.34$$

Analysis of Variance

Total SS = 51281.38 - 50455.34 = 826.04

Between SS = 42650.74 + 8055.06 - CT = 250.46

Error SS = 575.58

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	826.04	
Between	5	250.46	
Error	23	575.58	25.03

Corrected Error Mean Sq. = 25.03 [1/6 (1/4 + 5/5)] = 25.03 (.208) = 5.21

	1	2	3	
Barrows	37.71	43.30	39.52	120.53
Gilts	39.87	44.88	45.63	130.38
SX	77.58	88.18	85.15	250.91
$\bar{X}$	38.79	44.09	42.58	

$$CT = \frac{(250.91)^2}{6} = 10492.64$$

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	= 10544.69 - 10492.64	=	52.05	5		
Sex	= 10508.81 - 10492.64	=	16.17	1	16.17	3.10
Treatment	= 10522.45 - 10492.64	=	29.81	2	14.90	2.86
SXT		=	6.07	2	3.04	.58
Error		=		23	5.21	

F at 2 and 23 d.f. = 3.42 @ 5%, 5.66 @ 1%

No significant difference exists.

APPENDIX QI

ANALYSIS OF VARIANCE OF

LOIN INDEX

Lot No.	1	2	3	4	
	54.55	58.13	55.08	58.76	
	55.65	60.06	55.75	57.66	
	54.57	53.49	56.16	54.60	
	53.35	62.77	58.19	58.54	
	54.93	58.52	58.36		
	52.19	50.66			
SX	325.24	343.63	283.54	229.56	1181.97
$\bar{X}$	54.21	57.27	56.71	57.39	

$$CT = \frac{(1181.97)^2}{21} = 66526.34$$

Analysis of Variance

Source		S.S.	D.F.	M.Sq.	F.
Total	= 66689.70 - 66526.34 =	163.36	20		
Between	= 37310.44 + 16078.99 + 13176.74 - 66526.34 =	39.83	3	13.28	1.83
Error	=	123.53	17	7.27	

F to be significant @ 5% = 3.20, @ 1% = 5.18. No significant difference exists.

APPENDIX QII

ANALYSIS OF VARIANCE OF

LOIN INDEX

	1	2	3	
Barrows	56.90	70.31	52.56	
	53.33	54.31	60.55	
	52.30	60.86	54.88	
	54.92	57.52	54.66	
	58.16	52.96	56.23	
ΣX	275.61	295.96	278.88	850.45
$\bar{X}$	55.12	59.19	55.78	
Gilts	58.86	63.64	59.84	
	53.84	57.80	52.89	
	54.83	56.40	58.63	
	49.31	58.29	60.11	
	54.39		61.01	
ΣX	271.23	236.13	292.48	799.84
$\bar{X}$	54.25	59.03	58.50	1650.29

$$CT = \frac{(1650.29)^2}{29} = 93912.31$$

Analysis of Variance

Total SS = 94396.29 - 93912.31 = 483.98

Between SS = 80087.50 + 13939.34 - 93912.31 = 114.53

Error SS = 369.45

APPENDIX (Continued)

Analysis of Variance

Source	D.F.	S.S.	M.Sq.
Total	28	438.98	
Between	5	114.53	
Error	23	369.45	16.06

Corrected error M.Sq. = 16.06 [1/6 (1/4 + 5/5)] = 16.06 (.208) = 3.34

	1	2	3	
Barrows	55.12	59.19	55.78	170.09
Gilts	54.25	59.03	58.50	171.78
SX	109.37	118.22	114.28	341.87
$\bar{X}$	54.68	59.11	57.14	

$$CT = \frac{(341.87)^2}{6} = 19479.18$$

Analysis of Variance

Source			S.S.	D.F.	M.Sq.	F.
Total	= 19502.93 - 19479.18	=	23.75	5		
Sex	= 19479.66 - 19479.18	=	.48	1	.48	.14
Treatment	= 19498.84 - 19479.18	=	19.66	2	9.83	2.94
TXS		=	3.61	2	1.80	.54
Error		=		23	3.34	

F to be significant at @ 5% = 3.42*, @ 1% = 5.66**

No significant difference exists.

APPENDIX RI

CORRELATION BETWEEN PERCENT LIVE WEIGHT CUT OUT (X) AND PERCENT LEAN AREA OF ROUGH LOIN (Y)

X	Y
47.77	33.19
47.12	35.80
44.71	32.12
45.73	37.92
47.92	33.73
48.05	30.33
46.62	28.02
48.28	35.99
51.47	44.94
43.16	35.33
45.55	45.32
46.76	36.59
47.71	38.69
48.42	41.83
47.20	36.52
47.91	35.75
47.08	36.95
47.94	50.11
45.88	33.93
47.36	37.56
47.94	37.99

Sx	=	990.39
Sy	=	778.61
Sx^2	=	46762.71
Sy^2	=	29391.39
Sxy	=	36779.82
$\bar{X}$	=	47.16
$\bar{Y}$	=	37.08
N	=	21
$(SX)^2$	=	98072.35
$(SY)^2$	=	606233.53

$$r_{xy} = \frac{36779.82 - 36720.36}{\sqrt{(54.50)\ (523.13)}}$$

$$= \frac{59.46}{\sqrt{28510.59}}$$

$$= \frac{59.46}{168.85}$$

$$= +.352$$

$$\sigma r = \frac{1 - (.352)^2}{\sqrt{19}}$$

$$= \frac{.8760}{4.358}$$

$$= \pm .201$$

Correlation coef. to be significant @ 19 d.f. = .433 @ 5%, .549 @ 1%.

Correlation coefficient not significant.

APPENDIX RII

CORRELATION BETWEEN LIVE WEIGHT CUT OUT (X) PERCENT LEAN AREA OF ROUGH LOIN (Y)

X	Y
48.85	39.78
47.44	42.75
48.63	32.53
46.38	36.38
51.80	37.10
49.72	48.39
48.71	37.02
49.38	43.51
47.42	30.77
47.94	39.64
54.38	55.06
45.85	39.04
50.42	46.21
50.62	37.59
50.46	37.72
50.00	47.70
47.44	43.70
46.04	44.35
49.07	43.75
48.49	36.84
52.07	44.33

Sx	=	1427.38
Sy	=	1209.63
Sx^2	=	70366.95
Sy^2	=	51281.38
Sxy	=	59685.65
$\bar{X}$	=	49.22
$\bar{Y}$	=	41.71
N	=	29
$(SX)^2$	=	2037413.66
$(SY)^2$	=	1463204.74

APPENDIX (Continued)

46.29	35.06
49.37	39.23
51.65	42.15
48.76	48.60
48.20	39.50
50.68	46.18
51.07	47.18
49.95	46.67
SX 1427.38	SY 1209.63

$$rxy = \frac{59685.65 - 59537.99}{\sqrt{(111.31)\ (826.04)}}$$

$$= \frac{47.66}{\sqrt{91946.5124}}$$

$$= \frac{47.66}{303.23}$$

$$= + .157$$

$$\sigma\ rxy = \frac{1 - (.157)^2}{\sqrt{27}}$$

$$= \frac{.9754}{5.196}$$

$$= \pm .188$$

Correlation coefficient to be at 27 degrees of Freedom significant

@ 5% = .367, @ 1% = .479

Correlation coefficient not significant.

APPENDIX SI

CORRELATION BETWEEN PERCENT CARCASS CUT OUT (X) AND PERCENT LEAN AREA OF ROUGH LOIN (Y)

X	Y
67.57	33.19
62.22	35.80
61.17	32.12
62.48	37.92
63.68	33.73
64.59	30.33
61.61	28.02
66.67	35.99
69.05	44.94
60.60	35.33
65.06	45.32
64.26	36.59
63.03	38.69
63.30	41.83
62.93	36.52
63.40	35.75
63.48	36.95
64.23	50.11
61.83	33.93
64.15	37.56
65.06	37.99

$Sx = 1339.72$

$Sy = 778.61$

$Sx^2 = 85557.17$

$Sy^2 = 29391.39$

$Sxy = 49772.32$

$\bar{X} = 63.80$

$\bar{Y} = 37.08$

$N = 21$

$(SX)^2 = 1794849.68$

$(SY)^2 = 606233.53$

$$rxy = \frac{49772.32 - 49672.35}{\sqrt{(88.14)\ (523.13)}}$$

$$= \frac{99.97}{\sqrt{46108.68}}$$

$$= \frac{99.97}{214.73}$$

$$= +.466^*$$

Correlation coef. to be significant at 19 d.f. = .443@ 5%*, 549 @ 1%**

$$\sigma_r = \frac{1 - (.466)^2}{\sqrt{19}}$$

APPENDIX (Continued)

$$= \frac{.7828}{4.358}$$

$$= \pm .180$$

$$\sigma X = \sqrt{\frac{88.14}{20}}$$

$$= \sqrt{4.41}$$

$$= + 2.100$$

$$\sigma Y = \sqrt{\frac{523.13}{20}}$$

$$= \sqrt{26.16}$$

$$= + 5.115$$

$$Y = 37.08 + .466 \frac{5.115}{2.100} (X - 63.80)$$

$$= 37.08 + 1.135 \quad (X - 63.80)$$

$$= 37.08 + 1.135X - 72.41$$

$$= -35.33 + 1.135X$$

$$\sigma e = \sqrt{\frac{29391.39 - (-35.33)(778.61) - (1.135)(49772.32)}{19}}$$

$$= \sqrt{\frac{408.10}{19}}$$

$$= \sqrt{21.48}$$

$$= 4.534\%$$

APPENDIX SII

CORRELATION BETWEEN CARCASS CUT OUT (X) AND

PERCENT LEAN AREA OF ROUGH LOIN (Y)

X	Y
64.71	39.78
62.76	42.75
63.53	32.53
63.58	36.38
65.65	37.10
65.77	48.39
63.82	37.02
63.51	43.51
63.94	30.77
62.75	39.64
72.17	55.06
62.58	39.94
69.17	46.21
64.52	37.59
66.46	37.72
68.14	47.70
65.71	43.70
64.66	44.35
65.03	43.75
64.65	36.84
70.47	44.33
64.80	35.06
64.89	39.23
67.63	42.15
66.17	48.60
67.44	39.50
66.71	46.78
67.44	47.18
67.68	46.67
Sx 1906.44	Sy 1209.63

SX = 1906.44

SY = 1209.63

SX^2 = 125480.10

SY^2 = 51281.38

SXY = 79746.64

$\bar{X}$ = 65.74

$\bar{Y}$ = 41.71

N = 29

$(SX)^2$ = 3634513.47

$(SY)^2$ = 1463204.74

$$r_{xy} = \frac{79746.64 - 79520.24}{\sqrt{(132.98)\ (826.04)}}$$

$$= \frac{226.40}{\sqrt{109846.80}}$$

APPENDIX (Continued)

$$= \frac{226.40}{331.43}$$

$$= +.683^{**}$$

Correlation coefficient @ 27 d.f. to be significant @ 5% = .367, @1% = .470**

$$\sigma_r = \frac{1-(.683)^2}{\sqrt{27}}$$

$$= \frac{.7363}{4.196}$$

$$= \pm .142$$

$$\sigma_X = \sqrt{\frac{132.98}{28}} \qquad \sigma_Y = \sqrt{\frac{826.04}{28}}$$

$$= \sqrt{4.75} \qquad = \sqrt{29.50}$$

$$= \pm 2.179 \qquad = \pm 5.431$$

$$Y = 41.71 + .683\ \frac{5.431}{2.179}\ (X - 65.74)$$

$$= 41.71 + 1.702\ (X - 65.74)$$

$$= 41.71 + 1.702\ X - 111.89$$

$$- 70.18 + 1.702\ X$$

$$\sigma_e = \sqrt{\frac{51281.38 - (-70.18)(1209.63) - (1.702)(79746.64)}{27}}$$

$$= \sqrt{\frac{444.43}{27}}$$

$$= \sqrt{16.46}$$

$$= \pm 4.057\ \%$$

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