FEEDLOT PERFORMANCE AND CARCASS CHARACTERISTICS OF FAT AND LEAN LITTERS SLAUGHTERED AT THREE LIVE WEIGHTS

By

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CHAPTER I

INTRODUCTION

Today the majority of market hogs in the United States are marketed at approximately 220 lb live weight. In recent years, there has been an interest in marketing heavier hogs. By marketing animals heavier than the conventional 220 lbs, the swine producer could increase the total pounds of product per litter. This would reduce the number of animals required to produce the same total pounds of market weight. However, whether or not a producer should carry hogs to heavier weights will depend on the decrease, if any, in feed efficiency to heavy weights, and if there is differential pricing for hogs above 220 pounds.

The packer-buyer could also benefit from slaughtering heavier animals by reducing the number of animals slaughtered to produce the same total amount of wholesale product. The magnitude of the reduction, however, will depend on the differences in carcass composition of heavy hogs and 200 lb hogs.

This study evaluated 200 backcross barrows and gilts, of three-quarters Duroc, Hampshire or Yorkshire breeding, for feedlot performance and carcass characteristics. One-third of the animals were slaughtered at each of the three live weights of 220, 250 and 280 lb to compare the feedlot performance and carcass characteristics of heavy hogs to 220 lb hogs. One-half of the litters at each of the three slaughter weights were considered to be fat litters and one-half were considered lean litters on the basis of a live animal backfat probe taken at 150 pounds. This allowed the differences between fatter and leaner litters measured at three slaughter weights to be evaluated for feedlot performance traits and carcass characteristics.

CHAPTER II

REVIEW OF LITERATURE

This literature review is concerned with previous research done in the areas of a) growth performance of swine with different degrees of fatness, and fed to different end weights, and b) the effect of degree of fatness or slaughter weight on carcass characteristics.

Growth Performance

Davey, et al. (1969) utilized the data on 384 barrows and gilts produced after 10 and 8 generations of selection for high and low backfat thickness in two lines of Durocs and two lines of Yorkshires, respectively. The reported backfat thickness for the high and low Duroc lines was 2.06 and 1.04 in, respectively. The corresponding value for the Yorkshire lines were 1.47 and .92 in, respectively. They found that the high fat lines gained slower ($P < .01$) than the low fat lines (1.20 and 1.34 lb per day, respectively). The feed to gain ratios were similar for the high and low lines (3.62 and 3.58 lb feed per pound of gain, respectively).

Hetzer and Miller (1972) evaluated the correlated response of average daily gain to selection for high and low backfat thickness. They utilized the data from 4775 boars, barrows and gilts, representing two lines of Durocs and two lines of Yorkshires through 13 and 11 generations of selection, respectively. They reported a significant ($P<.01$) phenotypic correlation between backfat thickness and daily gain of .13 for the Duroc lines. Although non-significant, the correlation for the Yorkshire lines (.04) was positive.

Bereskin, et al. (1975) evaluated the feedlot performance of 128 purebred Duroc and Yorkshire pigs, which had been produced from lines selected for 17 and 15 generations, respectively, for either high or low backfat thickness. They found similar gains of 1.54 and 1.52 lb per day for the high- and low-fat lines, respectively. However, they reported significantly higher average daily feed consumption ($P<.01$) and lower gain to feed ratio ($P<.05$) for the high-fat line. The values reported for feed consumptions and gain to feed ratios for the high- and low-fat lines were 5.45 and 4.43 lb of feed per day and .28 and .34 lb of gain per pound of feed, respectively.

Wallace, et al. (1959) evaluated 128 pigs slaughtered at four weights (150, 180, 210 and 240 lb). They reported that gains tended to increase (1.44, 1.48, 1.53 and 1.52 lb per day, respectively) as slaughter weight increased. Required feed per pound of gain was also reported to increase (3.17, 3.24, 3.33 and 3.41 lb, respectively) with slaughter weight. McCampbell and Baird (1961) also reported increasing feed to gain ratios with increasing slaughter weights. They used 48 purebred Poland China pigs starting at 37 lb and carried to slaughter weights of 170, 190, 210 and 230 pounds. Feed requirements were reported to be 3.40, 3.61, 3.64 and 3.74 lb per pound of gain, respectively. However, they reported that gain decreased (1.56, 1.47, 1.43 and 1.43 lb per day, respectively) as slaughter weight increased.

Buck (1963) collected performance data on 360 purebred Large White pigs slaughtered at either 150, 200 or 260 pounds. He reported that the gains to 150 lb were 1.44 lb per day, whereas the gains to 200 and 260 lb were similar (1.51 and 1.54 lb per day, respectively). Braude, et al. (1963), who reported the same average daily gains of 1.54 lb per day for pigs slaughtered at 200 or 260 pounds. They also reported increased feed to gain ratios as slaughter weight increased from 200 to 260 lb (3.59 and 3.88 lb feed per pound of gain, respectively). Skitsko and Bowland (1970) evaluated 144 pigs slaughtered at 150, 200 or 250 pounds. They also found lower gains to 150 lb (1.41 lb per day) and similar gains for pigs taken to 200 and 250 lb (1.48 and 1.46 lb per day, respectively). As slaughter weights increased, feed to gain ratios also increased (2.89, 3.08 and 3.47 lb feed per pound of gain, respectively). Richmond and Berg (1971) also found that as slaughter weights of 150, 200 and 250 lb were obtained, feed to gain ratios increased (3.01, 3.06 and 3.38 lb feed per pound of gain, respectively), and average daily gains increased significantly (1.04, 1.18 and 1.21 lb, $P<.05$, respectively).

Carr (1975) evaluated 100 barrows (70 Hampshires and 30 Yorkshires) taken to slaughter weights of 100, 150, 200, 250 and 300 pounds. He found average daily gains from 65 lb to slaughter weight increased up to weights between 150 to 200 lb and then decreased. The average daily gains for the Hampshire were 1.38, 1.76, 1.69, 1.60 and 1.41 lb for the respective slaughter weights. The corresponding values for the Yorkshires were 1.42, 1.88, 1.88, 1.61 and 1.49 pounds.

Carcass Characteristics

Davey, et al. (1969) evaluated the carcasses produced from 127 barrows and gilts, as described previously, for total lean, fat and bone composition. Both the high and low fat lines had carcass weights of 140.7 pounds. They found that the high fat line had significantly ($P<.01$) less lean, more fat and less bone than the low fat line. The total pounds of lean, fat and bone for the high- and low-fat lines were 49.4, 73.6 and 12.6 lb and 60.9, 59.1 and 15.2 lb, respectively.

Hetzer and Miller (1973) analyzed carcass traits on 35 Duroc and 35 Yorkshire pigs. The Durocs were from the sixteenth generation and the Yorkshire were from the fourteenth generation of selection for high and low backfat thickness. Each breed had a high-fat, low-fat and control line. The carcass backfat thickness for the Duroc high- and low-fat lines was 3.14 and 1.22 in, respectively, and 2.44 and 1.26 in for the Yorkshires high and low lines, respectively. They reported significantly ($P<.05$) lower percent lean cuts, shorter carcass length and smaller loin-eye areas for the high-fat lines when compared to the low-fat lines.

Bereskin and Davey (1976) evaluated the carcasses of 128 purebred Duroc and Yorkshire pigs. The pigs were produced from lines selected for 17 and 15 generations for either high or low backfat thickness. They found significantly ($P<.05$) smaller loin-eye areas, shorter carcass lengths and a lower percentage of lean cuts in the high-fat lines. The carcass backfat thickness was 3.16 and 1.32 for the Duroc high and low lines, respectively, and 2.62 and 1.14 for the Yorkshire high and low lines, respectively.

Wallace, et al. (1959), as described previously, evaluated pigs slaughtered at 150, 180, 210 and 240 pounds. They found carcass backfats (1.12 to 1.51 in) and loin-eye areas (3.43 to 4.47 sq in) increased as slaughter weight increased. Percent lean cuts decreased from 53.77 to 49.33% as slaughter weight increased. McCampbell and Baird (1961) also found percent lean cuts decreased as market weight increased. The percent lean cuts decreased from 37.52 to 35.08% as weight increased from 170 to 230 pounds. Loin-eye areas were reported to increase slightly from 4.24 to 4.43 square inches.

Cuthbertson and Pomeroy (1962) found in carcasses weighing 110, 150 and 203 pounds that percent muscle decreased (50.34, 47.81 and 43.53%, respectively) and that percent fat increased (30.95, 35.03 and 41.37%, respectively) as carcass weight increased. When Buck (1963) evaluated the carcasses of Large White pigs, as described earlier, slaughtered at 150, 200 and 260 lb, he also found that percent lean decreased and percent fat increased as slaughter weight increased. The values for percent lean and fat for the three weights were 56.0 and 32.2, 53.1 and 36.2, and 49.9 and 40.5%, respectively. He also reported loin-eye areas (3.10, 3.67 and 4.42 sq in, respectively) increased with weight. Braude, et al. (1963) also found as live weight increased from 200 to 260 lb there was a decrease in percent lean from 45.3 to 42.4% and an increase in percent fat from 38.7 to 42.3 percent. Loin-eye areas (3.97 and 4.32 sq in) and carcass backfats (1.47 and 1.75 in) increased as the respective weights of 200 and 260 lb were obtained.

Moser (1970) evaluated 60 Yorkshire barrows slaughtered at 100, 150, 200, 250 and 300 pounds. Carcass backfat increased from .70 to 1.61 in as slaughter weight increased from 100 to 300 pounds. Percent lean cuts of carcass decreased from 61.6 to 53.3% and percent fat-free lean of carcass decreased from 57.8 to 48.8% as weight increased. Percent fat of carcass (from 28.4 to 43.1%) and loin-eye areas (from 2.49 to 5.52 sq in) both increased as higher slaughter weights were reached.

Skitsko and Bowland (1970) found as slaughter weights of 150, 200 and 250 lb were obtained, carcass backfats (1.06, 1.26 and 1.54 in) and loin-eye areas (3.66, 4.43 and 5.10 sq in) increased significantly ($P<.05$). However, the authors stated that the loin-eye area to backfat thickness ratio was not significantly altered, which was indicative of similar lean to fat ratios in lighter and heavier carcasses.

Richmond and Berg (1971) evaluated carcasses from pigs slaughtered at 150, 200 and 250 lb for percent lean, fat and bone of carcass. They found percent lean (55.7, 53.5 and 48.7%, respectively) and bone (10.5, 9.9 and 9.2%, respectively) decreased and percent fat (33.8, 36.7 and 42.1%) increased significantly ($P<.05$) as slaughter weight increased. The authors also stated that from 150 to 200 lb, fat deposition paralled that of muscle, but from 200 to 250 lb fat deposition exceeded muscle growth in absolute amount.

Carr (1975), as mentioned previously, analyzed carcass traits on 70 Hampshire and 30 Yorkshire barrows slaughtered at either 100, 150, 200, 250 or 300 pounds. He found backfat thicknesses for the Hampshires increased from .62 to 1.41 in and from .62 to 1.28 in for the Yorkshires as weight increased from 100 to 300 pounds. Loin-eye area increased from 3.14 to 5.77 sq in in the Hampshires and from 2.62 to 6.18 sq in in the Yorkshires. Percent fat-free lean of carcass tended to decrease and percent fat increased in both the Hampshires and Yorkshires as weight increased. In the Hampshires, percent fat-free lean decreased from 57.4 to 45.1% and percent fat increased from 24.6 to 42.9% as weight increased from 100 to 300 pounds. In the Yorkshires, percent fat-free lean decreased from 56.0 to 49.8% and percent fat increased from 25.4 to 36.8 percent.

Summary of Literature Review

The data available indicates that pigs with higher degrees of fatness tend to have similar average daily gains and higher daily feed consumptions than leaner type pigs. Also, pigs with higher levels of fatness may have lower feed efficiencies. However, the results from previous research are not consistent in the reported differences in rate of gain and efficiency between fat and lean type pigs.

As live weight increases, there is a tendency for similar gains to weights around 250 pounds. Gains to weights beyond 250 lbs tended to decrease slightly. However, the reports in the literature are not consistent in the trends for gains to heavy weights. In general, average daily feed consumption and feed efficiency decrease as weight increases. This indicates higher feed costs for pigs carried to heavier weights.

The carcasses of pigs with higher levels of fatness tended to have shorter carcass lengths and smaller loin-eye areas than leaner type pigs. Fat pigs tended to have less percent lean, more percent fat and less percent lean cuts of carcass.

When pigs are carried to heavier weights, carcass length, loin-eye area and carcass backfat tend to increase linearly with increasing weight. The literature suggests that heavier pigs have lower percent lean and higher percent fat than lighter weight pigs. Percent lean cuts had a tendency to decrease as weight increased.

At the time of this study, the data on differences between fat and lean pigs came primarily from swine selected for high and low backfat thickness for many generations. Thus, differences in feedlot performance traits and carcass characteristics would include any correlated responses of these traits to this type of selection, as well as differences due to degree of fatness.

In recent years, there has been much emphasis on improving rate of gain and feed efficiency. This has directly effected feedlot performance traits and may have indirectly altered the carcass characteristics of modern type pigs. Also, many of the reports in the literature dealing with weight differences involved data on European swine used to evaluate differences between bacon-type hogs (usually marketed at 200 lb) and heavy market hogs (usually marketed at 260 lb).

To justify the marketing of heavier pigs, more studies of this nature should be conducted to determine if the efficiency of growth to heavy weights is economically feasible to the swine producer. Also, increased information on the composition of growth in modern type hogs is needed to determine if the slaughter of heavier hogs would economically benefit the packer-buyer.

CHAPTER III

MATERIALS AND METHODS

Feedlot performance records and carcass data were collected on 200 barrows and gilts, representing 36 litters, that were three-quarters of either Duroc, Hampshire or Yorkshire breeding. The litters were produced by backcrossing two-breed cross dams to purebred boars. For example, Duroc boars were mated to Duroc x Hampshire and Duroc x Yorkshire dams. Pigs of three-quarter Hampshire and Yorkshire breeding were produced similarly. The pigs were farrowed in the 1975 fall and 1976 spring farrowing seasons in the Southwest Livestock and Forage Research Station swine facilities.

The pigs were weaned at about six weeks of age and moved to the stations finishing unit when approximately eight weeks old. Each season six litters by each breed of sire, containing at least six pigs per litter, were randomly chosen and fed in litter groups of six pigs per pen. Pigs within litters were selected to keep the sex ratio as equal as possible. The litters were fed in solid concrete floor pens with free access to water and a self-feeder. After allowing an adjustment period of one week in the finishing unit, the pigs were weighed on test.

When each litter averaged 150 lb, a Duncan's Leanmeter probe was used to probe all pigs in the litter for backfat. On the basis of a litter's average backfat probe, within each breed of sire, the litters were sorted into three lean and three fat litters. Within each of the lean and fat groups, the three litters were randomly designated to be taken to slaughter at 220, 250 or 280 pounds.

Individual pig weights were measured every 14 days, and pen feed consumptions every 28 days for the first 112 days of the test. No pigs were removed from the test before the end of the 112 day period. The pigs were then weighed weekly and probed for backfat as they reached 220 pounds. When the pigs obtained their designated off test weights they were removed from test and probed for backfat again. Total feed consumed from the end of the 112 day period to when the pen was emptied was also recorded. Pigs removed from test were transported to the University Meat Laboratory for carcass evaluation.

All pigs were held off feed and water 36 hours prior to slaughter. Shortly before slaughter a final live weight for each pig was recorded. Following slaughter a weight for each side of the carcass was obtained. The right side of each carcass was measured for the length (distance from the first rib to the aitch bone) and average carcass backfat thickness (average of measurements taken at the first and last rib and last lumbar vertebrae). A tracing of the loin-eye at the tenth rib was obtained and a one-inch chop removed from the loin to be scored for marbling, firmness and color. Loin-eye area measurements were obtained by the use of a planimeter on the loin-eye tracing.

Following the slaughter of the pigs produced in the first season (1975 fall), the right half of each carcass was separated into untrimmed rough cuts consisting of the ham, shoulder, loin and thin cuts. These cuts were weighed and separated into separable lean, fat and bone. Both sides of the carcasses from the animals produced in the second season (1976 spring) were separated into closely trimmed lean cuts (shoulder, loin and ham). Percent lean, fat and bone (1975 fall season only) and percent closely trimmed lean cuts (1976 spring season only) of carcass weight were calculated following separation of the carcasses.

Backfat thickness measurements taken at weights near 150 and 220 lb were adjusted to 150 and 220 lb, respectively. The adjustments were made using the conventional adjustment factor (.004 in per pound) in the following formulas:

$$\text{Backfat thickness adj to 150 lb} = \text{Backfat thickness at a weight near 150 lb} + (150 - \text{weight near 150 lb})(.004)$$

and

$$\text{Backfat thickness adj. to 220 lb} = \text{Backfat thickness at a weight near 220 lb} + (220 - \text{weight near 220 lb})(.004)$$

The backfat thickness measured at the time the pigs were removed from test was adjusted to the designated off test weights of those pigs. The coefficients used to adjust this measurement were derived from the regression of backfat thickness on the weight of the pigs when removed from test (off test weight). The formula used for this calculation is shown below:

$$\text{Adj. BFi} = \text{BFi} + \left(\frac{\text{BFi}}{b_0 + (b_1(W))}\right)\left(b_1\right)(\text{DOWi} - W)$$

Where:

i = the designated off test weight group of the pig;

Adj. BFi = the backfat thickness adjusted to either 220, 250 or 280 pounds;

BFi = the backfat thickness measured at weights near 220, 250 or 280 pounds;

bo = the Y - intercept from the regression of backfat thickness on off test weight (.324 in);

b_1 = the regression coefficient of backfat thickness on off test weight (.0037 in per pound);

W = the off test weight of the pig; and

DOWi = the pigs designated off test weight (220, 250 or 280 lb).

Carcass backfat thickness, carcass length, and loin-eye area at the tenth rib were also adjusted for weight. The formula used was similar to the one used to adjust the off test backfat thickness. However, these carcass traits were adjusted to the weight taken shortly before slaughter (slaughter weight). The 220, 250 and 280 lb groups were adjusted to the mean slaughter weight (209, 238 and 264 lb, respectively) for their slaughter group. The formula used for this calculation is shown below:

$$\text{Adj. } Yi = Yi + \left(\frac{Yi}{bo + (b_1(SW))}\right)(b_1)(ASWi - SW)$$

Where:

i = the designated off test weight group of the pig;

Y = the trait being adjusted (carcass backfat, carcass length, and loin-eye area);

bo = the Y-intercept from the regression of the trait on slaughter weight;

b_1 = the regression coefficient of the trait on slaughter weight;

SW = the slaughter weight of the pig; and

ASWi = the mean slaughter weight of the pigs designated slaughter group.

The values of bo and b_1 used to adjust carcass backfat, carcass length and loin-eye area are presented in Table I.

Statistical analyses of data were performed on pen means. Considering just one season, the experimental units (pens) can be visualized in a split-plot design of a 3 x 2 x 3 factorial arrangement of treatments. Main plot treatments are breed and degree of fatness (DOF), which refers to the lean vs fat groups, and the sub-plot treatment is slaughter weight. Assuming that there were true replication (blocks) of treatment within breeds, the sources of variation, degrees of freedom and expected mean squares are as shown in table II. However, there was not true replication and it is readily apparent that some assumptions must be made in order to make tests of significance and to place standard errors on means and differences between means.

TABLE I

COEFFICIENTS USED TO ADJUST CARCASS BACKFAT, CARCASS LENGTH AND LOIN-EYE AREA FOR SLAUGHTER WEIGHT

Trait	Coefficients	
	bo	b_1
Carcass backfat	.679	.002
Carcass length	24.175	.033
Loin-eye area	1.474	.015

First of all, with true replication, the proper error mean square for testing the effects of weight, weight x DOF and breed x weight x DOF is the pooled interactions of blocks with weight, DOF x weight and breed x DOF x weight. Therefore, to test the effects of weight and DOF x weight, the assumption must be made that there is no three-order interaction. This appears reasonable since three-order interactions are seldom large in biological data. Thus, breed x DOF x weight was considered the error term for testing weight and DOF x weight effects.

Second, variation among main-plot units (3 pens of a line within a breed) is estimated, with true replication, by the pooled interaction of blocks with breed, DOF and breed x DOF. Since there is no true replication, the assumption must be made that breed x DOF interactions are unimportant, and DOF effects are tested with the breed x DOF interaction mean square.

For data from both seasons, sums of squares and degrees of freedom were pooled within season(table III), however; the same assumptions must be made. The pooled analyses yields a sub-plot error mean square with 8 degrees of freedom and a main-plot error of 4 degrees of freedom. Season x weight and season x DOF x weight mean squares were in general very small; consequently, sums of squares and degrees of freedom for these sources of variation were pooled with breed x DOF x weight to provide a sub-plot error mean square with 18 degrees of freedom (tables VIII to XI).

TABLE II

SOURCES OF VARIATION AND EXPECTED MEAN SQUARES FOR TRAITS ANALYZED ON ONE SEASON ONLY

Source	Degrees of freedom	Expected mean square
Blocks	0	
Breed	2	$\sigma_b^2 + 3\sigma_a^2 + 6\kappa_B^2$
DOF[a]	1	$\sigma_b^2 + 3\sigma_a^2 + 9\kappa_D^2$
Breed x DOF[b]	2	$\sigma_b^2 + 3\sigma_a^2 + 3\kappa_{BD}^2$
Blocks x Breed + Blocks x DOF + Blocks x Breed x DOF	0	$\sigma_b^2 + 3\sigma_{BL}^2$
Weight[c]	2	$\sigma_b^2 + 2\kappa_W^2$
DOF x Weight	2	$\sigma_b^2 + 3\kappa_{DW}^2$
Breed x Weight	4	$\sigma_b^2 + 2\kappa_{BW}^2$
Breed x DOF x Weight[d]	4	$\sigma_b^2 + 1\kappa_{BDW}^2$
Error (Blocks interactions)	0	σ_b^2

[a] DOF refers to the lean vs. fat groups

[b] Breed x DOF mean square was considered as the main-plot error term.

[c] Weight refers to the 200 vs. 250 vs. 280 weight groups.

[d] Breed x DOF x Weight mean square was considered as the sub-plot error term.

TABLE III

SOURCES OF VARIATION AND EXPECTED MEAN SQUARES FOR TRAITS ANALYZED OVER BOTH SEASONS

Source	Degrees of freedom	Expected mean square
Season	1	
Breed (season)	4	$\sigma_b^2 + 3\sigma_a^2 + 6\kappa_B^2$
DOF[a]	1	$\sigma_b^2 + 3\sigma_a^2 + 9\kappa_D^2$
Seaxon x DOF	1	$\sigma_b^2 + 3\sigma_a^2 + 9\kappa_{SD}^2$
Breed x DOF (season)[b]	4	$\sigma_b^2 + 3\sigma_a^2 + 3\kappa_{BD}^2$
Weight[c]	2	$\sigma_b^2 + 2\kappa_W^2$
DOF x Weight	2	$\sigma_b^2 + 3\kappa_{DW}^2$
Season x Weight	2	$\sigma_b^2 + 3\kappa_{SW}^2$
Breed x Weight (season)[d]	8	$\sigma_b^2 + 2\kappa_{BW}^2$
Season x DOF x Weight[d]	2	$\sigma_b^2 + 3\kappa_{SDW}^2$
Breed x DOF x Weight (season)[d]	8	$\sigma_b^2 + 1\kappa_{BLW}^2$

[a]DOF refers to the lean vs. fat groups.

[b]Breed x DOF (season) was considered as the error term for the main plot units.

[c]Weight refers to the 220 vs. 250 vs. 280 weight groups.

[d]Breed x Weight (season), Season x DOF x Weight and Breed x DOF x Weight (season) were pooled and considered to be the error term for the sub-plot units.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter is divided into three main sections: 1) Feedlot performance of swine at two levels of fatness fed to 220, 250 and 280 lb live weight; 2) Carcass characteristics of swine at two levels of fatness slaughtered at three weights; and, 3) Conclusions from results.

Degree of fatness was found to be a significant source of variation for the carcass traits of backfat, percent separable lean and percent fat of carcass weight (tables XI and XII). Weight was found to be a significant source of variation for several carcass traits, including carcass length and loin-eye area at the tenth rib. There was little evidence for DOF x weight interaction for carcass traits. Neither degree of fatness nor weight appeared to have a significant effect on feedlot performance traits. However, there was some evidence for DOF x weight interactions for feed efficiency measured over specific age intervals (table X) but not for feed consumption (table IX). Consequently, growth rates over specific age and weight intervals tended to be somewhat different and are discussed in detail below. The analyses of variance tables, showing the sources of variation and mean squares for the traits discussed, can be found in Appendix I.

Feedlot Performance of Lean and Fat Litters Fed To 220, 250 and 280 Pounds

Table IV presents the means for growth performance traits and adjusted backfat probe estimates of pigs from the fat and lean groups fed to three weights. There was .08 in difference in backfat probe at 150 lb between the lean and fat groups. This difference is not as large as would be desired to determine if lean and fat pigs differ for growth and efficiency to various weights. Probe at 150 lb, however, was effective in separating pigs into lean and fat groups. The difference between groups was .07 in at 220 lb and .04 in at the average off test weight. These differences appear small, but at slaughter, the lean group had significantly less fat (3.1%) than the fat group. In addition, there were only three litters that were classified incorrectly based on 150 lb probe and each of these litters were very close to average in both backfat and percent fat in the carcass. Therefore, these results do represent growth patterns for swine of two degrees of fatness, although the difference in composition is perhaps not large enough to clearly define differences in growth to various weights for lean and fat pigs.

The fat pigs tended to gain at a faster rate than the lean pigs, thus spending fewer days reaching their designated slaughter weights. The average daily gains of the lean and fat pigs (1.47 and 1.52 lb per day, respectively) for the total test period, however, were not significantly different at the $P<.05$ level. Davey, et al. (1969) and Hetzer and Miller (1972) also

TABLE IV
MEANS AND STANDARD ERRORS FOR LIVE ANIMAL BACKFAT ESTIMATES AND FEEDLOT PERFORMANCE TRAITS

Item	Lean Group	Fat Group	(S.E.)	220 group	250 group	280 group	(S.E.)	Overall mean
No litters	18	18		12	12	12		36
On test weight (lb)	33.6	34.4		34.7	33.0	34.1		34.0
Off test weight (lb)	250.0	250.5	(±.13)	221.9	250.5	278.3	(±.16)	250.0
Days on test	149.9	146.5		131.5	148.8	164.3		148.2
Average daily gain to 220 lb (lb)	1.44	1.51	(±.031)	1.48	1.46	1.48	(±.035)	1.48
ADG for Total test (lb)	1.47	1.52	(±.024)	1.48	1.47	1.53	(±.038)	1.49
Adjusted back-fat probe at 150 lb (in)	.85	.93	(±.010)	.89	.89	.88	(±.014)	.89
Adjusted backfat probe at 220 lb (in)	1.10	1.17	(±.017)	1.15	1.14	1.11	(±.028)	1.14
Adjusted backfat probe off test (in)	1.24	1.28	(± .017)	1.15	1.26	1.36	(±.033)	1.26

found gains to be similar between pigs from lines selected for high and low backfat.

As slaughter weight was increased from 220 to 280 lb, differences in average daily gains for the total test period were found to be non-significant. Many workers, including Wallace, et al. (1959), McCampbell and Baird (1961), Buck (1963), Braude, et al. (1963) and Skitsko and Bowland (1970), have found gains to be similar for swine carried to weights heavier than 220 pounds. Also, as weight increased, probed backfat (1.15, 1.26 and 1.36 inches, respectively) increased significantly ($P<.05$).

Figure 1 presents the average daily gains of pigs at two levels of fatness compared over specific age intervals. The first interval was from 63 to 91 days, the second interval was from 91 to 119 days of age and continuing age to age intervals to the mean off test age of 210 days. Differences between the fat and lean pigs at each age were non-significant ($P>.05$). However, the fat pigs consistently gained at a faster rate than the lean pigs during the early stages of growth. At an age somewhat older than 175 days the lean pigs gained at a faster rate.

To better illustrate gains of lean and fat pigs, Figure 2 presents average daily gains measured over specific weight intervals. The first interval was from 34 to 70 lb, the second interval was from 70 to 100 lb, and continuing 20 lb intervals to 280 lb. Again, differences at any point measured were non-significant ($P>.05$). The fat line, however, gained at a faster rate to a weight of 190 lb. At weights beyond 190, out to 280

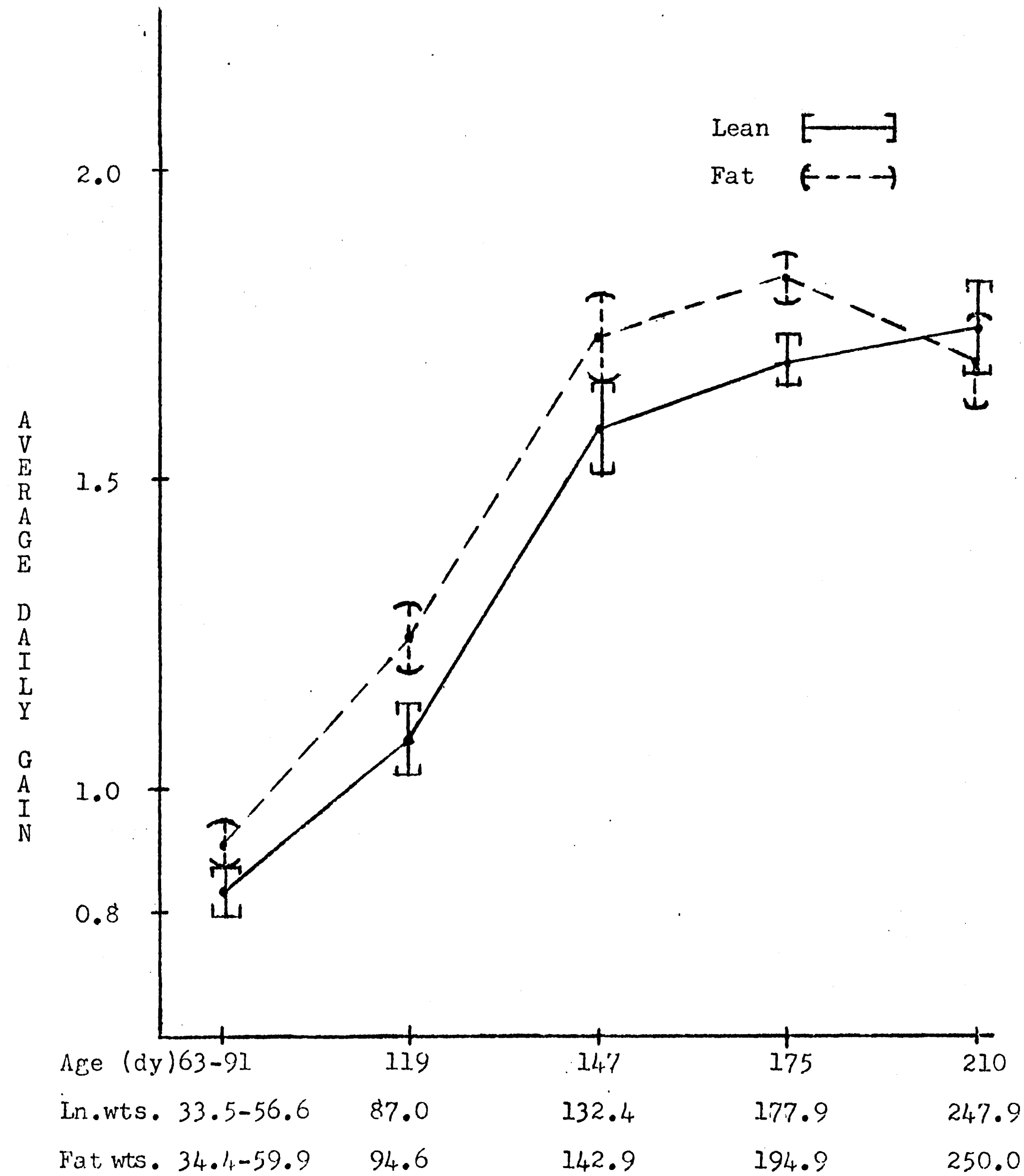

Figure 1. Average Daily Gains and Their Standard Errors Measured Over Specific Age Intervals Beginning At 63 Days of Age

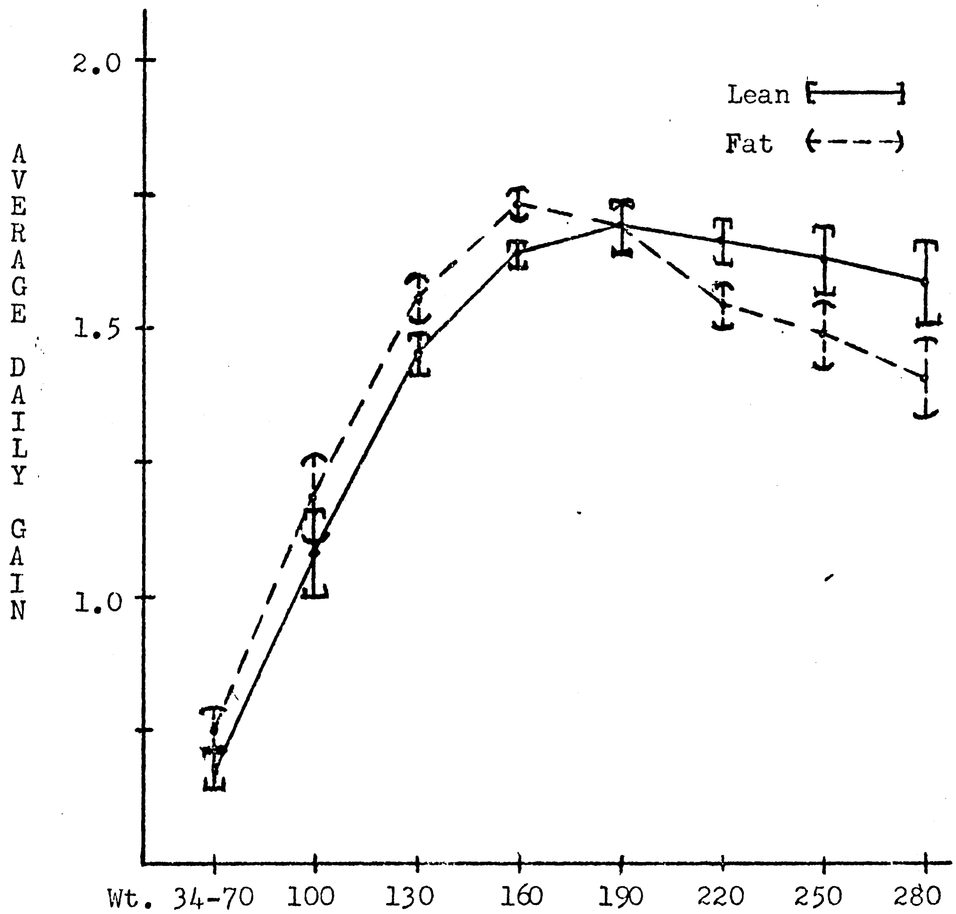

Figure 2. Average Daily Gains and Their Standard Errors Measured Over Specific Weight Intervals Beginning At 34 Pounds

lb, the fat pigs gains tended to decrease at a faster rate than the gains of the lean pigs. It should be noted that at weights beyond 220 lb the number of observations were decreased resulting in larger standard errors.

Average daily feed consumptions, as shown in Figure 3, were measured over specific age intervals corresponding to those described previously. Differences between the fat and lean pigs were non-significant at all points measured (P>.05). However, the fat pigs tended to consume more feed per day than the lean pigs throughout the test period. In addition there was an apparent linear increase in average daily feed consumption as weight increased.

Feed efficiencies (expressed as pounds of gain per pound of feed) measured over the same specific age intervals, as shown in Figure 4, were essentially the same for both the lean and fat pigs. This is in agreement with Davey, et al. (1969), who also found similar feed efficiencies in fat and lean pigs of Duroc and Yorkshire breeding. Gain to feed ratios did, however, have an apparent linear decrease as weight increased.

Table V presents the means for average daily feed consumption and feed efficiencies for the total test period. There was, however, a significant degree of fatness by weight interaction in feed efficiencies for the total test. The feed efficiencies (G/F), for the fat 220, 250 and 280 groups were .323, .313 and .307 lb of gain per pound of feed, respectively. The lean 220, 250 and 280 groups had feed efficiencies of .300, .310 and .312 lb of gain per pound of feed. Differences in feed consumption

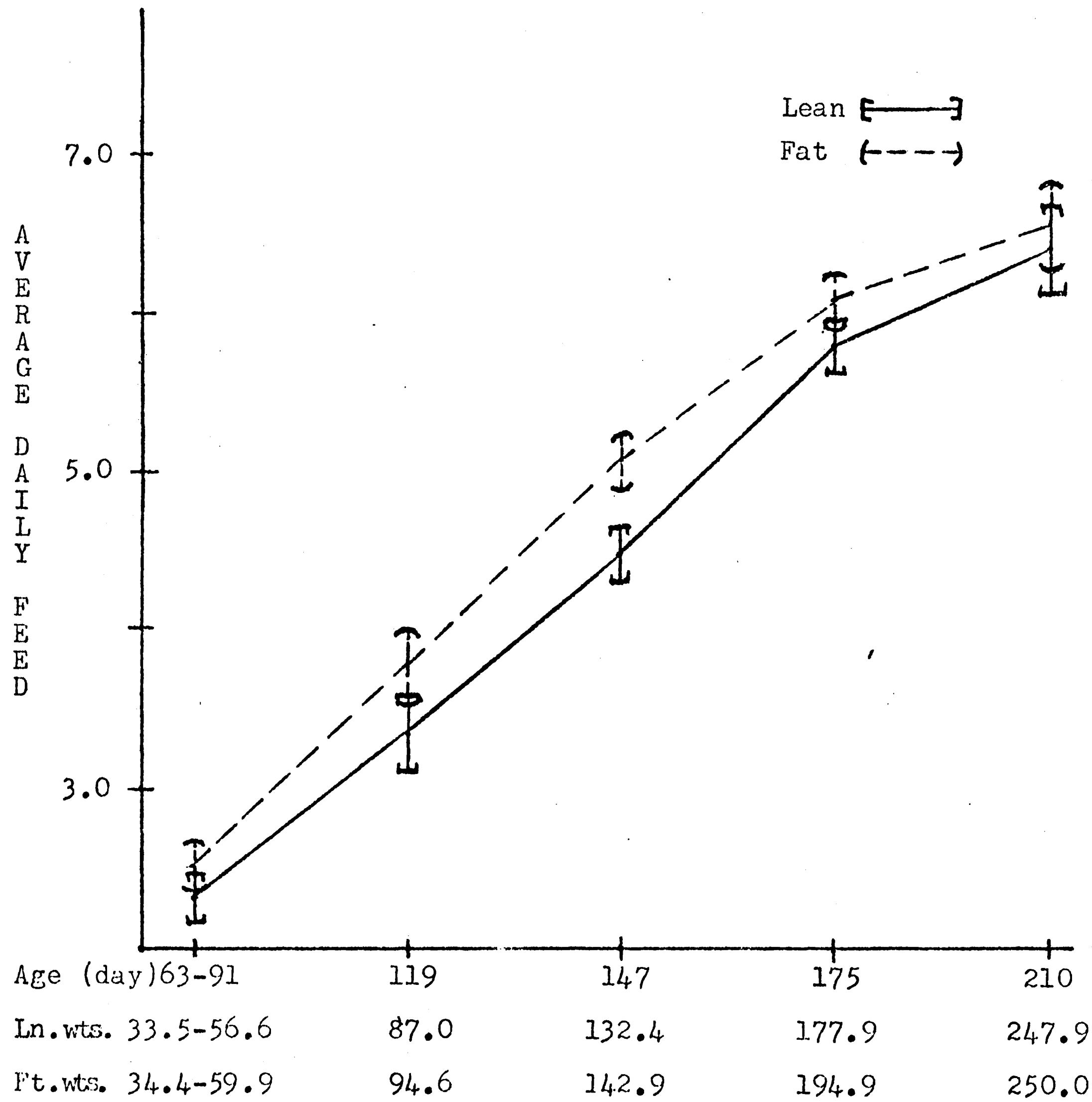

Figure 3. Average Daily Feed Consumptions and Their Standard Errors Measured Over Specific Age Intervals Beginning At 63 Days of Age

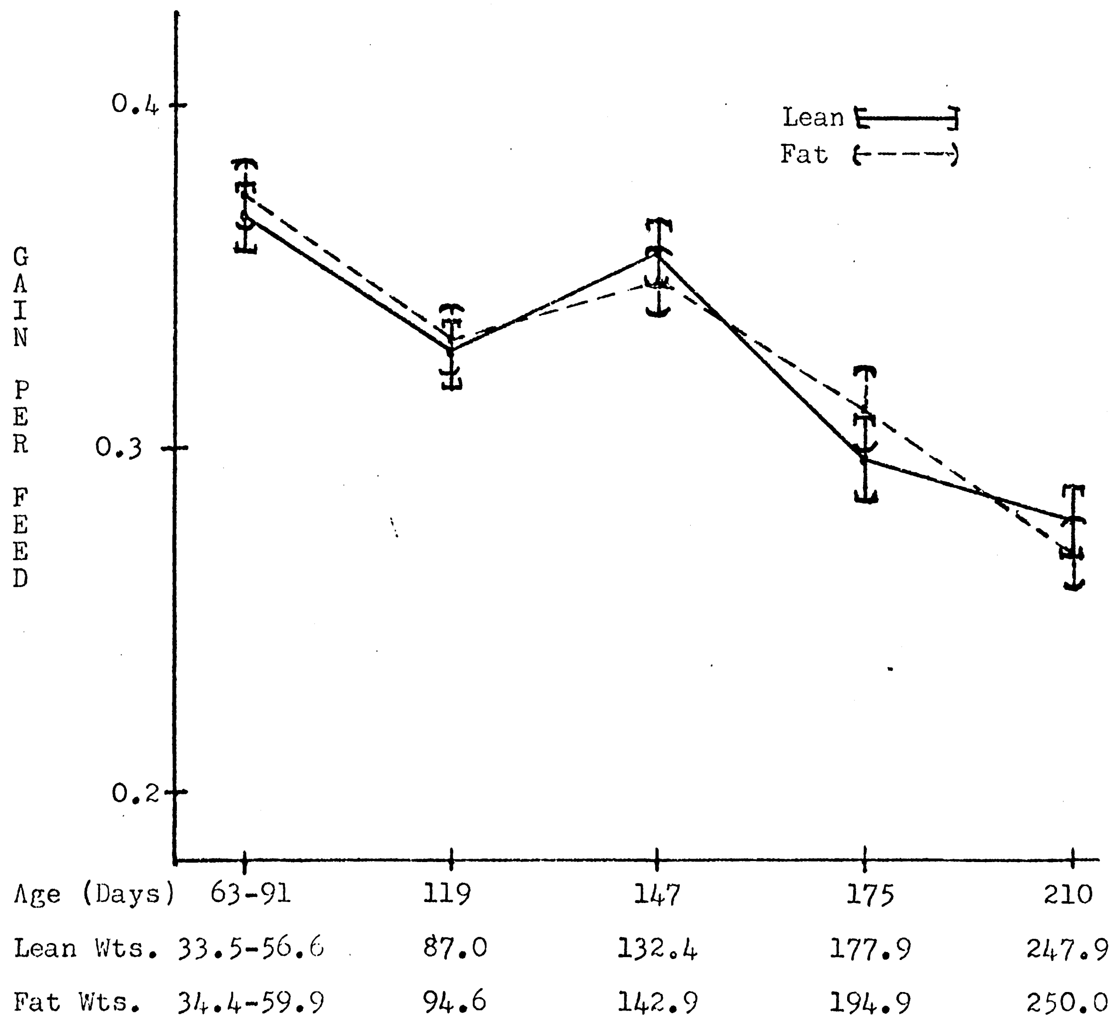

Figure 4. Feed Efficiencies (G/F) and Their Standard Errors Measured Over Specific Age Intervals Beginning At 63 Days of Age

TABLE V

MEAND AND STANDARD ERRORS FOR AVERAGE DAILY FEED CONSUMPTION
AND FEED EFFICIENCIES FOR THE TOTAL TEST

Item	Lean Group	Fat Group	(S.E.)	220 Group	250 Group	280 Group	(S.E.)	Overall mean
Ave. daily consumption for total test (lb)	4.51	4.75	(±.104)	4.54	4.49	4.86	(±.146)	4.63
Feed efficiency for total test (gain/feed)	.307	.314	(±.005)	.312	.311	.309	(±.003)	.311

between the weight groups were non-significant (P>.05). Feed efficiencies did, however, decrease from 0.368 to 0.305 lb of gain per pound of feed (averaged over lean and fat groups) from 63 to 186 lb live weight, respectively. From 186 to 220 lb it required 3.52 pounds of feed per pound of gain, while 3.89 lb of feed was required to produce a pound of gain from 220 lb to 250 or 280 lb live weight. Other workers, Wallace, et al. (1959), McCampbell and Baird (1961) and Skitsko and Bowland (1970), have also found pigs tend to become less efficient as heavier weights were obtained. Feed efficiency of pigs to heavy weights in the present study, however, was better than what has been reported by other workers. From the average of five previous studies, Wallace (1959), McCampbell and Baird (1961), Buck (1963), Braude, et al. (1963) and Skitsko and Bowland (1970), feed efficiencies of 4.67 lb of feed per pound of gain from 204 and 246 lb have been obtained. However, based on average backfat thickness of pigs in previous studies and those in the present study, these pigs were considerably less fat. Growth rates, however, are similar. Perhaps the selection for decreased fatness that has been practiced in the swine industry for several years, has resulted in a leaner pig that grows more efficiently to heavier weights.

Carcass Characteristics of Lean and Fat Slaughtered at Three Live Weights

Means of carcass traits are presented in table VI. The carcasses of fat pigs had virtually the same carcass weights,

TABLE VI

MEANS AND STANDARD ERRORS OF CARCASS TRAITS OF SWINE AT TWO DEGREES OF FATNESS FED TO THREE WEIGHTS

Item	Lean Group	Fat Group	(S.E.)	220 Group	250 Group	280 Group	(S.E.)	Overall mean
No litters	18	18		12	12	12		36
Slaughter weight (lb)	237.3	236.7	(±1.3)	208.6	238.1	264.3	(±1.6)	237.0
Carcass weight (lb)	171.8	172.5		151.1	172.1	193.3		172.2
Dressing %	72.4	72.9		72.5	72.3	73.1		72.7
Adj. carcass backfat (in)	1.11	1.21	(±.01)	1.10	1.17	1.21	(±.03)	1.16
Adj. carcass length (in)	31.9	32.1	(±.10)	30.9	32.2	32.9	(±.19)	32.0
Adj. loin-eye area (in^2)	5.06	5.05	(±.03)	4.60	5.13	5.44	(±.10)	5.06

dressing percentage, length and loin-eye areas as the lean pigs. This is contrary to the reports of Hetzer and Miller (1973) who found smaller loin-eye areas in fat pigs opposed to lean pigs. Their study, however, was done with carcasses produced from offspring at the end of 14 and 16 generations of selection for high and low backfat thickness. Therefore, the difference in degree of fatness between the high and low fat lines was much greater than the difference between the fat and lean group in the present study.

As the slaughter weights of 220, 250 and 280 lb were obtained, there was a linear trend for increase in carcass backfat thickness (1.10, 1.17 and 1.21 in, respectively). The difference in backfat between the 220 and 280 lb groups was significant at the $P<.05$ level. There were significant ($P<.01$) increases in carcass lengths and loin-eye areas (30.9, 32.2 and 32.9 in and 4.60, 5.13 and 5.44 sq in, respectively) as slaughter weight increased. Buck (1963), Braude et al. (1963), Moser (1970), Skitsko and Bowland (1970) and Carr (1975) all reported increases in loin-eye areas as weight at slaughter was increased to weights heavier than 220 lb.

During the first season of this study percent lean, fat and bone composition of the carcasses were obtained. Fat pigs, as shown in table VII, had 2.6% less lean and 3.1% more fat than the lean pigs ($P<.05$). Percent bone was essentially the same in the fat pigs as in the lean pigs.

TABLE VII

MEANS AND STANDARD ERRORS OF PERCENT LEAN, FAT AND BONE AND PERCENT CLOSELY TRIMMED LEAN CUTS OF CARCASS WEIGHT

Item	Lean Group	Fat Group	(S.E.)	220 Group	250 Group	280 Group	(S.E.)	Overall mean
No litters	9	9		6	6	6		18
Percent lean[a]	57.2	54.6	(±.75)	55.6	56.3	55.8	(±.92)	55.9
Percent fat[a]	29.2	32.3	(±.1.06)	31.0	29.9	31.3	(±.1.30)	30.8
Percent bone[a]	13.6	13.2	(±.33)	13.5	13.7	13.0	(±.40)	13.4
Percent closely trimmed lean cuts[b]	57.5	57.6	(±.43)	58.2	58.0	56.4	(±.53)	57.6

[a]Percent separable lean, fat and bone from 1975 fall season.

[b]Percent closely trimmed lean cuts from 1976 spring season.

As the pigs were carried to the weights of 220, 250 and 280 lb the percentage of separable lean was similar (55.6, 56.3 and 55.8%, respectively). Percent fat and bone were also similar (31.0, 29.9 and 31.3% and 13.5, 13.7, and 13.0%), respectively, as slaughter weight increased. Many workers, including Cuthbertson and Pomeroy (1962), Buck (1963), Braude, et al. (1963), Moser (1970), Richmond and Berg (1971) and Carr (1975), have reported decreases in percent lean and increases in percent fat of carcass at heavier slaughter weights. This discrepancy may be due to the extreme meatiness of the pigs utilized in the present study.

In the second season carcasses were evaluated for percent closely trimmed lean cuts of carcass weight. The lean and fat pigs showed no significant differences for percent closely trimmed lean cuts (57.5 and 57.6%, respectively), as shown in table VII. However, there was a tendency for percent closely trimmed lean cuts to decrease as weights of 220, 250 and 280 lb were reached (58.2, 58.0 and 56.4%, respectively). Wallace, et al. (1959) and Shuler, et al. (1970) also reported decreases in percent lean cuts as weight increased.

Phenotypic correlations among all traits were calculated from both the individual pig and litter mean observations. The correlations are presented in Appendix II for the readers own information.

In general, average daily gains during the early stages of growth were moderately correlated (.40 to .68) and average daily gains during later stages of growth were more strongly correlated

(.70 to .85) with daily gain for the total test period. However, the early gains were not highly correlated to the gains during the later stages of growth (-.34 to .50). Daily gains were also lowly correlated (.15 to .40) to the estimates of backfat thickness made during the test.

The backfat probes taken at 150 lb and 220 lb had similar correlations with carcass backfat thickness (.60 and .57, respectively). The correlations of the probe at 150 lb with percent separable lean and fat and percent closely trimmed lean cuts were similar to the correlations of these traits with the probe at 220 lb.

Hetzer, et al. (1956) found probes taken at 150 lb to be significantly correlated to probes taken at 200 and 225 lb. They also found significant correlations between probes at 150 lb and the carcass traits of backfat, percent preferred and fat cuts of carcass and percent lean meat in the ham. These data suggest the determination of fatness in animals at weights of 220 lb or above may be made on the basis of a backfat probe at 150 pounds.

Conclusions

When measured over the total test period the fat group tended to have a higher rate of gain than the lean group. The fat group also tended to consume more feed per day, whereas, feed efficiencies between the two groups were similar. During the early stages of growth, up to 160 lb, the fat group tended to gain at a faster rate. At about 160 lb the rates of gain for the fat group began to decrease, while rates of gain for the lean group were still increasing. From 190 lb to the end of the test the rates of gain for the fat group decreased at a more rapid rate than for the lean group. This may suggest that, at weights beyond 160-190 lb, the maintenance requirements for the leaner pigs may not be increasing as rapidly as for the fatter pigs. Also, Dickerson, et al. (1977) reported that maintenance may increase with lean body mass. This would suggest that the leaner pigs had higher maintenance requirements than the fatter pigs, but were more efficient in the utilization of energy above maintenance.

The lean and fat groups had similar carcass lengths and loin-eye areas. As stated earlier, sources in the literature have reported shorter carcass lengths and smaller loin-eye areas in pigs selected for high backfat thickness, for many generations, when compared to pigs selected for low backfat. The small difference in carcass backfat thickness (.10 in, averaged over the weight groups) between the fat and lean groups of the present study, may be a partial explanation of why the results are in disagreement. Also, the animals used in this study were not produced from two distinct lines selected for high and low backfat thickness, and thus are not affected by any correlated responses to this type of selection.

The lean group, however, had a significantly higher percent lean (2.6%, $P<.05$) and less percent fat (3.1%, $P<.05$) of carcass weight than the fat group, when averaged over the three weight groups. This suggests the fat pigs required more feed energy for fat deposition than the lean pigs, during the later stages of growth. Percent closely trimmed lean cuts of carcass were virtually the same for both the lean and fat groups. One explanation for why the fat group had the same percent closely trimmed lean cuts and less percent separable lean could be that the fat group had a higher percent intermuscular and intramuscular fat than the lean line.

As weight increased, daily gains were similar, but daily feed consumptions consistently increased. Gain to feed ratios decreased with increased weight and the feed required to produce a pound of gain increased substantially between the weights of 220 to 250 and 280 lb. This suggests increased maintenance requirements for pigs carried to heavier weights.

As weight increased from 220 to 280 lb, carcass backfat, length and loin-eye area increased significantly ($P<.05$). Percent separable lean, fat and bone, however, were similar at 55.9%, 30.7% and 13.4%, averaged over the fat and lean lines and the three weight groups, respectively for the three weights. Sources in the literature have reported decreases in percent lean and increases in percent fat as weight increased. Perhaps one explanation of this discrepancy is the technique of lean, fat and bone separation utilized in the present study was not sufficient to detect the differences in percent lean and fat of the carcass. Also, the pigs utilized in previous research had much thicker backfat measures than those in the present study. Percent closely trimmed lean cuts of carcass tended to be lower at the 280 lb weight than at the 220 and 250 lb weights.

Percent lean and fat remaining constant and percent closely trimmed lean cuts decreasing as weight increases seems to suggest the areas of fat deposition are altered as weight increases. Also, at the heavier weight a larger proportion of the fat in the lean cut may be trimmed away as external fat.

CHATPER V

SUMMARY

Two hundred barrows and gilts born during the fall 1975 and spring 1976 farrowing seasons in the Southwest Livestock and Forage Research Station swine facilities were slaughtered at 220, 250 or 280 lb live weight. The pigs were a sample of three-quarter Duroc, Hampshire and Yorkshire breeding produced by backcrossing two-breed cross dams to purebred boars. The sample was comprised of 36 litters, of which six litters within each breed of sire were classified as fat litters and six litters classified as lean litters on the basis of litter mean backfat probes taken at 150 lb live weight. The litters within each of the fat and lean groups, within breed of sire, were designated to be slaughtered at either 220, 250 or 280 pounds. All litters were evaluated for feedlot performance traits from nine weeks of age until their designated slaughter weight was obtained. The carcasses from animals produced (18 litters) in the fall 1975 season were evaluated for percent separable lean, fat and bone of carcass. The animals produced (18 litters) in the spring 1976 season were evaluated for percent closely trimmed lean cuts of carcass weight. In addition, standard carcass measurement were taken on all animals in the study.

The fat pigs tended to have higher rates of gain during the

early stages of growth and the lean pigs tended to gain at a faster rate during the later stages of growth. Feed efficiencies and average daily gains for the total test were similar for both the fat and lean groups. The fat group did, however, tend to consume more feed per day, throughout the test, than the lean pigs.

After slaughter and separation of the carcasses, the fat and lean groups were found to have similar carcass lengths, loin-eye areas and percent closely trimmed lean cuts of carcass. The fat group did have significantly ($P<.05$) thicker backfat, lower percent separable lean and higher percent fat of carcass than the lean group.

The three weight groups tended to have similar average daily gains and feed efficiencies for the total test. The 280 pound group did tend to consume more feed per day on test than either the 220 or 250 lb groups. As slaughter weight increased from 220 to 280 lb there was a significant increase in carcass backfat ($P<.05$), carcass length ($P<.01$) and loin-eye area ($P<.01$). Percent separable lean, fat and bone of carcass were similar at each of the three slaughter weights. The 280 lb group tended to have lower percent closely trimmed lean cuts of carcass than the 220 and 250 lb groups which had similar percentages of closely trimmed lean cuts of carcass.

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APPENDIX A

TABLE VIII

SOURCES OF VARIATION AND MEAN SQUARES FOR AVERAGE DAILY GAINS AND ADJUSTED BACKFAT PROBE

		Mean Squares				
Source	d.f.	ADG to 220 lbs	ADG for Total Test	Adj Backfat Probe at 150 lb	Adj Backfat Probe at 220 lb	Adj Backfat Probe at Off Test wt (lb)
Season	1	.0080	.0163	.0210*	.0859**	.1256**
Breed (season)	4	.0057	.0077	.0212**	.0290	.0194
DOF	1	.0409	.0176	.0627**	.0530*	.0174
Season x DOF	1	.0050	.0071	.0023	.0014	.0136
Main Plot Error	4	.0169	.0107	.0017	.0054	.0055
Weight	2	.0029	.0109	.0005	.0074	.1399**
DOF x Weight	2	.0016	.0018	.0041	.0214	.0204
Season x Weight	2	.0077	.0047	.0038	.0090	.0048
Sub-plot Error	18	.0150	.0171	.0023	.0092	.0129

*P<.05 **P<.01

TABLE IX

SOURCES OF VARIATION AND MEAN SQUARES FOR AVERAGE DAILY FEED CONSUMPTIONS MEASURED OVER SPECIFIC AGE INTERVALS

		Mean Squares					
Source	d.f	ADF from 63-91 Days of Age	ADF from 91-119 Days of Age	ADF from 119-147 Days of age	ADF from 147-175 Days of Age	ADF from 175-210 Days of Age	ADF for the total Test Period
Season	1	6.524**	2.790	4.980*	3.799*	5.720	1.564*
Breed (season)	4	.126	.222	1.088	1.510	1.331	.132
DOF	1	.273	1.509	2.658	.538	.173	.520
Season x DOF	1	.013	.578	.229	.146	0.000	.062
Main Plot Error	4	.288	.886	.419	.505	1.589	.193
Weight	2	.019	.147	.012	1.598	1.042	.481
DOF x Weight	2	.055	.400	.112	.410	.411	.218
Season x Weight	2	.364	.094	.507	.242	1.761	.091
Sub-plot Error	18	.172	.303	.517	.508	1.027	.254

*P<.05 **P<.01

TABLE X

SOURCES OF VARIATION AND MEAN SQUARES FOR FEED EFFICIENCY MEASURED OVER SPECIFIC AGE INTERVALS

Source	d.f	G/F from 63-91 Days of Age	G/F from 91-119 Days of Age	G/F from 119-147 Days of Age	G/F from 147-175 Days of Age	G/F from 175-210 Days of Age	G/F for the total Test Period
Season	1	.0241**	.0058	.0128**	.0122	.0113	.0003
Breed (season)	4	.0013	.0139*	.0047*	.0059	.0009	.0007
DOF	1	.0003	.0001	.0007	.0022	.0002	.0005
Season x DOF	1	.0002	.0030	.0005	.0004	.0023	.0002
Main Plot Error	4	.0004	.0012	.0005	.0028	.0031	.0005
Weight	2	.0041*	.0009	.0020	.0001	.0004	.0000
DOF x Weight	2	.0033*	.0008	.0004	.0019	.0018	.0006**
Season x Weight	12	.0014	.0001	.0002	.0021	.0039*	.0005*
Sub-plot Error	18	.0008	.0010	.0008	.0021	.0009	.0001

$^*P<.05$ $^{**}P<.01$

TABLE XI

SOURCES OF VARIATION AND MEAN SQUARES FOR ADJUSTED CARCASS BACKFAT, LENGTH AND LOIN-EYE AREA

		Mean Squares		
Source	d.f	Adj Carcass Backfat	Adj Carcass Length	Adj Loin-eye Area
Season	1	.031**	1.433**	.0550
Breed (season)	4	.045**	.846	.324**
DOF	1	.076**	.291	.0003
Season x DOF	1	.010	.033	.9091**
Main Plot Error	4	.002	.172	.015
Weight	2	.037*	12.429**	2.1678**
DOF x Weight	2	.023	.030	.1259
Season x Weight	2	.013	.276	.0646
Sub-plot Error	18	.011	.414	.1201

*P<.05   **P<.01

TABLE XII

SOURCES OF VARIATION AND MEAN SQUARES FOR PERCENT SEPARABLE LEAN, FAT AND BONE AND PERCENT CLOSELY TRIMMED LEAN CUTS OF CARCASS

		Mean Squares			
Source	d.f.	Percent Lean	Percent Fat	Percent Bone	Percent Closely Trmd Lean Cuts
Breed	2	9.886	8.209	.0001	2.976
DOF	1	30.729*	42.061*	.0005	.090
Breed x DOF	2	4.104	3.178	.0005	2.152
Weight	2	.996	3.026	.0029	6.087
DOF x Weight	2	3.227	7.466	.0040	.156
Breed x Weight	4	1.390	1.408	.0015	3.740
Error	4	5.025	10.073	.0008	1.679

*$P<.05$ **$P<.01$

APPENDIX B

In tables XIII to XV any correlation coefficients with an absolute value greater than .16 is significant at the $P < .05$ level, except the correlations which involve percent lean, fat and bone and percent closely trimmed lean cuts. These coefficients require an absolute value of .20 or greater to be significant.

In tables XVI to XVIII any correlation coefficients with an absolute value greater than .45 is significant at the $P < .05$ level, except the correlations which involve percent lean, fat and bone and percent closely trimmed lean cuts. These coefficients require an absolute value of .87 or greater to be significant.

TABLE XIII

CORRELATION COEFFICIENTS OF AVERAGE DAILY GAINS FOR SPECIFIC TEST INTERVALS CALCULATED WITH INDIVIDUAL PIG OBSERVATIONS

	ADG (1-14)	ADG (15-28)	ADG (29-42)	ADG (43-56)	ADG (57-70)	ADG (71-84)	ADG (85-98)	ADG (99-112)	ADG (113-126)	ADG (21-28)	ADG (29-56)	ADG (57-84)	ADG (85-112)	ADG (1-42)	ADG (43-84)	ADG (85-126)	ADG (1-56)	ADG (57-112)	ADG (1-70)	ADG (1-84)	ADG (1-98)	ADG (1-112)
ADG (1-14)	1.00																					
ADG (15-28)	.46	1.00																				
ADG (29-42)	.56	.58	1.00																			
ADG (43-56)	.51	.45	.68	1.00																		
ADG (57-70)	.44	.40	.64	.66	1.00																	
ADG (71-84)	.28	.23	.50	.57	.65	1.00																
ADG (85-98)	.17	.21	.40	.46	.53	.56	1.00															
ADG (99-112)	-.05	-.01	.09	.12	.19	.38	.39	1.00														
ADG (113-126)	.05	.06	-.10	.12	.16	.31	.36	.11	1.00													
ADG (21-28)	.80	.90	.66	.56	.48	.29	.23	-.03	.06	1.00												
ADG (29-56)	.58	.55	.90	.93	.71	.59	.47	.12	.03	.66	1.00											
ADG (57-84)	.40	.35	.62	.68	.91	.91	.60	.31	.27	.43	.71	1.00										
ADG (85-112)	.15	.12	.33	.42	.52	.61	.85	.81	.30	.16	.42	.62	1.00									
ADG (1-42)	.80	.85	.86	.66	.59	.41	.32	.02	.001	.95	.82	.55	.24	1.00								
ADG (43-84)	.47	.41	.69	.84	.89	.86	.60	.27	.23	.50	.84	.97	.60	.63	1.00							
ADG (85-126)	.15	.23	.14	.39	.49	.58	.84	.66	.69	.22	.32	.59	.90	.20	.55	1.00						
ADG (1-56)	.74	.78	.87	.83	.67	.50	.39	.06	.05	.89	.93	.64	.33	.96	.76	.30	1.00					
ADG (57-112)	.31	.28	.58	.63	.81	.86	.86	.60	.31	.34	.67	.92	.88	.47	.89	.81	58	1.00				
ADG (1-70)	.70	.72	.86	.84	.83	.59	.47	.11	.09	.83	.93	.78	.42	.92	.86	.37	.97	.70	1.00			
ADG (1-84)	.65	.65	.84	.84	.85	.75	.54	.19	.15	.76	.92	.88	.50	.86	.94	.46	.93	.80	.98	1.00		
ADG (1-98)	.60	.61	.81	.83	.85	.77	.69	.24	.21	.70	.90	.90	.61	.81	.94	.57	.89	.86	.95	.98	1.00	
ADG (1-112)	.56	.55	.77	.80	.84	.83	.78	.41	.22	.64	.87	.92	.72	.77	.95	.65	.85	.92	.92	.96	.98	1.00
ADG (1-126)	.56	.65	.68	.83	.85	.82	.80	.39	.39	.69	.84	.93	.73	.73	.94	.74	.84	.93	.89	.94	.97	.98

TABLE XIV

CORRELATION COEFFICIENTS OF AVERAGE DAILY GAINS WITH FEEDLOT PERFORMANCE AND CARCASS TRAITS CALCULATED WITH INDIVIDUAL PIG OBSERVATIONS

	Marbling	Firmness	Color	ADG to 220 lbs	ADG on Test	Adj. Backfat Probe at 150 lbs.	Adj Backfat Probe at 220 lbs.	Adj Off Test Backfat Probe	Adj Length	Adj Carcass Backfat	Adj LEA	% Lean	% Fat	% Bone	% Clsly trmd Lean Cuts
ADG (1-14)	.01	-.12	.06	.49	.45	.09	-.01	-.07	.10	.06	.10	-.19	.22	-.20	-.07
ADG (15-28)	.02	-.05	.01	.56	.53	.20	.04	.002	-.02	.07	.07	-.20	.24	-.22	-.02
ADG (29-42)	.20	.03	.07	.72	.69	.32	.23	.12	-.04	.22	-.10	-.52	.56	-.37	-.23
ADG (43-56)	.15	.03	.02	.74	.71	.37	.26	.19	-.03	.30	-.21	-.39	.39	-.21	-.31
ADG (57-70)	.20	.09	.02	.74	.72	.39	.31	.29	-.04	.33	-.22	-.51	.53	-.35	-.30
ADG (71-84)	.14	.08	.06	.73	.75	.27	.34	.29	.06	.29	-.21	-.46	.45	-.17	-.24
ADG (85-98)	.19	.10	.05	.70	.72	.31	.33	.29	-.02	.35	-.18	-.49	.51	-.30	-.35
ADG (99-112)	-.02	.14	-.01	.38	.45	.16	.26	.29	.03	.24	-.21	-.18	.10	.19	-.17
ADG (113-126)	-.01	-.01	.00	.27	.43	-.09	-.17	-.13	.29	.09	.09	.05	-.08	.14	.11
ADG (1-28)	.02	-.09	.04	.62	.58	.18	.02	-.03	.03	.08	.10	-.24	.29	-.26	-.05
ADG (29-56)	.19	.03	.05	.80	.76	.38	.27	.18	-.04	.29	.18	-.58	.60	-.37	-.29
ADG (57-84)	.18	.09	.04	.81	.81	.36	.36	.32	.01	.34	-.24	-.56	.56	-.30	-.29
ADG (85-112)	.08	.18	-.01	.67	.72	.33	.39	.36	.01	.37	-.29	-.54	.49	-.11	-.33
ADG (1-42)	.09	-.05	.05	.72	.68	.25	.11	.03	.003	.15	.02	-.41	.46	-.35	-.13
ADG (43-84)	.19	.08	.04	.85	.84	.40	.35	.30	-.001	.35	-.25	-.58	.58	-.31	-.31
ADG (85-126)	.20	.16	-.03	.66	.75	.14	.19	.24	.17	.29	-.27	-.49	.46	.00	-.29
ADG (1-56)	.12	-.03	.05	.79	.75	.32	.18	.09	-.001	.21	-.06	-.46	.50	-.35	-.21
ADG (57-112)	.16	.22	.08	.84	.87	.40	.42	.37	.04	.41	-.31	-.74	.71	-.24	-.34
ADG (1-70)	.16	.01	.04	.84	.80	.37	.23	.16	-.02	.27	-.12	-.52	.56	-.38	-.25
ADG (1-84)	.16	.03	.05	.88	.85	.37	.28	.21	.001	.30	-.15	-.57	.59	-.37	-.26
ADG (1-98)	.19	.05	.06	.92	.90	.39	.32	.25	.004	.34	-.17	-.62	.64	-.39	-.29
ADG (1-112)	.17	.17	.11	.92	.90	.32	.37	.28	.04	.39	-.22	-.73	.72	-.33	-.36
ADG (1-126)	.31	.23	.05	.95	.93	.42	.36	.31	.05	.46	-.29	-.66	.62	-.05	-.49

TABLE XV

CORRELATION COEFFICIENTS OF FEEDLOT PERFORMANCE AND CARCASS TRAITS CALCULATED WITH INDIVIDUAL PIG OBSERVATIONS

	Marbling	Firmness	Color	ADG to 220	Test ADG	Adj BFP 150	Adj BFP 220	Adj Off Tst BFP	Adj Length	Adj Carc BF	Adj LEA	% Lean	% Fat	% Bone	% Clsly Trmd Ln Cts
Marbling	1.00														
Firmness	.67	1.00													
Color	.10	.24	1.00												
ADG to 220	.16	.09	.08	1.00											
Test ADG	.13	.06	.05	.95	1.00										
Adj BFP 150	-.01	.07	.01	.35	.34	1.00									
Adj BFP 220	.07	.22	.02	.39	.36	.57	1.00								
Adj Off Tst BFP	.13	.31	.05	.33	.28	.57	.77	1.00							
Adj Length	.01	-.09	.00	-.04	-.03	-.29	-.36	-.42	1.00						
Adj Carc BF	.01	.17	.09	.40	.38	.60	.56	.60	-.28	1.00					
Adj LEA	-.14	-.16	-.15	-.24	-.20	-.09	-.29	-.33	.06	-.12	1.00				
% Lean	-.04	-.21	-.23	-.65	-.62	-.51	-.68	-.66	.22	-.56	.42	1.00			
% Fat	.05	.14	.14	.67	.66	.57	.74	.70	-.31	.61	-.35	-.96	1.00		
% Bone	-.05	.14	.18	-.39	-.42	-.47	-.54	-.46	.44	-.46	-.02	.36	-.60	1.00	
% Clsly Trmd Ln Ct	-.13	-.17	.07	-.37	-.30	-.52	-.67	-.71	.33	-.62	.26	--	--	--	1.00

TABLE XVI

CORRELATION COEFFICIENTS OF AVERAGE DAILY GAINS CALCULATED WITH LITTER MEAN OBSERVATIONS

	ADG (1-14)	ADG (15-28)	ADG (29-42)	ADG (43-56)	ADG (57-70)	ADG (71-84)	ADG (85-98)	ADG (99-112)	ADG (113-126)	ADG (1-28)	ADG (29-56)	ADG (57-84)	ADG (85-112)	ADG (1-42)	ADG (43-84)	ADG (85-126)	ADG (1-56)	ADG (57-112)	ADG (1-70)	ADG (1-84)	ADG (1-98)	ADG (1-112)	ADG (1-126)
ADG (1-14)	1.00																						
ADG (15-28)	.76	1.00																					
ADG (29-42)	.53	.45	1.00																				
ADG (43-56)	.09	.05	.07	1.00																			
ADG (57-70)	.74	.69	.72	-.04	1.00																		
ADG (71-84)	.52	.52	.52	-.01	.54	1.00																	
ADG (85-98)	.22	.17	.53	.02	.11	.44	1.00																
ADG (99-112)	-.34	-.11	-.30	.39	-.37	.35	.32	1.00															
ADG (113-126)	-.17	-.63	.06	.04	.66	-.24	.50	.00	1.00														
ADG (1-28)	.96	.91	.53	.08	.77	.55	.21	-.26	-.46	1.00													
ADG (29-56)	.45	.36	.78	.68	.50	.38	.40	-.05	.06	.44	1.00												
ADG (57-84)	.73	.70	.72	-.03	.90	.85	.29	-.06	.17	.76	.51	1.00											
ADG (85-112)	-.06	.08	.23	.28	-.10	.68	.87	.74	.74	.00	.35	.30	1.00										
ADG (1-42)	.87	.80	.85	.09	.85	.62	.41	-.31	-.17	.90	.68	.85	.14	1.00									
ADG (43-84)	.72	.67	.70	.36	.83	.79	.28	.08	.17	.74	.74	.92	.37	.83	1.00								
ADG (85-126)	-.01	-.53	.06	-.02	.64	-.08	.41	.16	.98	-.33	.05	.28	.86	-.11	.27	1.00							
ADG (1-56)	.81	.73	.78	.47	.74	.54	.37	-.15	-.16	.82	.87	.74	.22	.92	.87	-.11	1.00						
ADG (57-112)	.64	.60	.72	.21	.59	.91	.77	.31	.32	.67	.74	.89	.71	.76	.87	.45	.78	1.00					
ADG (1-70)	.84	.76	.81	.30	.89	.58	.29	-.25	.10	.86	.78	.86	.10	.95	.91	.13	.96	.74	1.00				
ADG (1-84)	.83	.77	.81	.24	.88	.74	.36	-.11	-.01	.85	.74	.93	.27	.95	.96	.07	.94	.85	.98	1.00			
ADG (1-98)	.79	.72	.84	.22	.81	.77	.55	-.04	.08	.81	.76	.90	.41	.94	.92	.14	.92	.91	.94	.98	1.00		
ADG (1-112)	.78	.73	.83	.31	.74	.84	.65	.11	.09	.81	.88	.95	.52	.89	.96	.17	.93	.95	.90	.96	.99	1.00	
ADG (1-126)	.60	.51	.84	.05	.79	.74	.38	.00	.35	.61	.84	.97	.55	.83	.95	.43	.84	.96	.92	.93	.94	.96	1.00

TABLE XVII

CORRELATION COEFFICIENTS OF AVERAGE DAILY GAINS WITH FEEDLOT PERFORMANCE AND CARCASS TRAITS CALCULATED WITH LITTER MEAN OBSERVATIONS

	Marbling	Firmness	Color	ADG to 220	Test ADG	Adj BFP 150	Adj BFP 220	Adj Off Test BFP	Adj Length	Adj Carc, BF	Adj LEA	G/F Pd. 1	G/F Pd. 2	G/F Pd. 3	G/F Pd. 4	G/F Pd. 5	G/F Tot Tst	% Lean	% Fat	% Bone	% Clsly, Trmd, Wn. Ct.
ADG (1-14)	.24	.10	-.22	.83	.77	-.12	-.06	-.17	.07	.08	-.06	.30	-.26	.32	-.31	.13	.09	-.80	.86	-.96	.27
ADG (15-28)	.36	.30	.23	.73	.71	-.14	-.05	-.18	.44	.01	-.24	.31	-.32	.40	-.41	.14	.34	-.51	.58	-.98	.67
ADG (29-42)	.11	.11	.08	.68	.61	.30	.28	-.01	.42	.30	-.08	-.17	.03	.33	-.38	-.03	.19	-.94	.89	-.73	-.11
ADG (43-56)	.40	.46	.14	.21	.22	.20	.03	.07	.21	.14	-.31	.20	.65	-.35	-.19	.05	.10	.04	.05	-.27	-.28
ADG (57-70)	.21	.12	-.06	.73	.69	.19	.22	.02	.17	.10	-.02	.33	-.29	.45	-.45	-.12	.05	-.95	.94	-.86	.02
ADG (71-84)	.55	.49	.20	.76	.76	.20	.28	.21	.26	.21	-.21	-.11	-.40	.71	-.55	-.06	.17	-.49	.45	-.34	.20
ADG (85-98)	.08	.24	.09	.46	.44	-.13	-.17	-.16	.52	.17	-.35	-.47	-.10	.14	-.27	.12	.21	-.69	.59	-.35	.01
ADG (11-112)	.73	.76	.24	.14	.19	-.20	-.16	.01	.15	-.30	-.47	-.27	.01	.03	-.06	.00	.28	.21	-.30	.44	-.47
ADG (113-126)	.50	.95	-.25	.17	.41	.54	.60	.36	-.38	-.02	.16	.68	.15	-.43	-.03	.55	.30	-.99	.98	-.95	-.98
ADG (1-28)	.30	.19	-.04	.84	.79	-.14	-.06	-.18	.24	.05	-.14	.33	-.30	.37	-.37	.14	.21	-.73	.80	-.91	.51
ADG (29-56)	.33	.37	.03	.63	.58	.34	.22	.03	.44	.30	-.25	-.01	.43	.02	-.39	.01	.21	-.85	.86	-.85	-.23
ADG (57-84)	.42	.33	.07	.85	.82	.22	.28	.12	.24	.17	-.12	.14	-.39	.64	-.56	-.11	.12	-.87	.85	-.75	.11
ADG (85-112)	.58	.72	.23	.54	.58	.34	.38	.38	.35	.27	-.26	-.49	.08	.39	-.44	.06	.44	-.90	.86	-.78	-.59
ADG (1-42)	.24	.17	-.06	.87	.81	.07	.11	-.12	.37	.19	-.13	.11	-.17	.40	-.43	.07	.23	-.97	.97	-.93	.21
ADG (43-84)	.55	.48	.12	.87	.85	.28	.27	.14	.30	.21	-.23	.21	-.11	.47	-.60	-.08	.15	-.70	.72	-.74	.03
ADG (85-126)	.63	.98	-.15	.27	.52	.44	.54	.16	-.39	-.17	.09	.70	.22	-.26	-.10	.40	.35	-.98	.96	-.91	-.84
ADG (1-56)	.37	.34	.00	.85	.80	.14	.11	-.08	.41	.22	-.23	.17	.10	.22	-.45	.09	.24	-.83	.87	-.91	.09
ADG (57-112)	.46	.32	-.09	.96	.94	.35	.41	.07	.46	.38	-.14	-.22	-.13	.65	-.53	-.04	.41	-.85	.90	-.95	-.25
ADG (1-70)	.34	.27	-.02	.86	.81	.17	.16	-.05	.34	.19	-.17	.25	-.05	.32	-.48	.01	.18	-.90	.92	-.92	.06
ADG (1-84)	.42	.36	.03	.91	.87	.19	.20	.02	.35	.21	-.19	.17	-.14	.46	-.54	-.01	.20	-.88	.89	-.88	.10
ADG (1-98)	.40	.37	.05	.92	.88	.14	.14	-.02	.43	.23	-.25	.04	-.15	.44	-.55	.02	.22	-.90	.90	-.86	.09
ADG (1-112)	.42	.25	-.09	.96	.90	.41	.47	.01	.58	.40	-.17	-.03	.01	.68	-.55	-.16	.39	-.56	.63	-.73	-.19
ADG (1-126)	.42	.31	.64	.96	.98	.56	.66	-.38	.20	-.34	-.09	-.29	.08	.34	-.77	-.21	.00	-.75	.81	-.88	.48

TABLE XVIII

CORRELATION COEFFICIENTS OF FEEDLOT PERFORMANCE AND CARCASS TRAITS CALCULATED WITH LITTER MEAN OBSERVATIONS

	Marbling	Firmness	Color	ADG to 220	Test ADG	Adj BFP 150	Adj BFP 220	Adj Off Tst BFP	Adj Length	Adj Carc BF	Adj LEA	G/F Pd 1	G/F Pd 2	G/F Pd 3	G/F Pd 4	G/F Pd 5	G/F Pd Ttl Tst	% Lean	% Fat	% Bone	% Clsly Trmd Ln Ct
Marbling	1.00																				
Firmness	.88	1.00																			
Color	.48	.58	1.00																		
ADG to 220	.43	.36	.05	1.00																	
Test ADG	.41	.36	.10	.98	1.00																
Adj BFP 150	.03	.13	.04	.11	.16	1.00															
Adj BFP 220	-.03	.03	-.03	.16	.18	.91	1.00														
Adj Off Tst BFP	-.02	.06	.07	.03	.12	.84	.86	1.00													
Adj Length	.28	.35	.54	.28	.22	-.16	-.12	-.28	1.00												
Adj Carc BF	-.26	-.20	-.12	.18	.24	.59	.61	.71	.00	1.00											
Adj LEA	-.40	-.34	-.46	-.30	-.31	.13	.09	.07	-.60	.15	1.00										
G/F Pd 1	.12	.03	-.15	.08	.09	.07	.11	.05	-.12	-.06	.01	1.00									
G/F Pd 2	-.19	-.01	-.17	-.19	-.21	.46	.39	.28	.05	.31	-.03	.08	1.00								
G/F Pd 3	.20	.22	.11	.38	.33	.10	.34	.15	.24	.13	.07	.07	-.35	1.00							
G/F Pd 4	-.16	-.35	-.27	-.42	-.47	-.39	-.35	-.47	-.23	-.55	-.08	.06	.03	-.41	1.00						
G/F Pd 5	-.08	-.08	.25	.25	.28	-.23	-.25	-.21	-.01	-.13	-.21	-.36	-.03	-.21	.19	1.00					
G/F Ttl Tst	.19	.19	.36	.37	.35	-.19	-.05	-.27	.50	-.13	-.42	-.06	.05	.25	.21	.58	1.00				
% Lean	.38	.22	.30	-.87	-.84	-.96	-.82	-.59	.29	-.68	-.80	.00	-.28	-.21	.55	-.59	-.26	1.00			
% Fat	-.36	-.19	-.36	.91	.89	.93	.80	.60	-.38	.68	.79	.11	.39	.14	-.54	.67	.34	-.99	1.00		
% Bone	.28	.12	.46	-.96	-.95	-.81	-.71	-.58	.57	-.64	-.72	-.35	-.63	.02	.49	-.81	-.50	.91	-.96	1.00	
% Clsly Trmd Ln Ct	.63	.59	.91	.29	.24	-.89	-.89	-.87	.47	-.74	-.16	-.92	-.68	.27	.38	.94	.71	--	--	--	1.00

VITA - 2

Joe Donnell Neely

Candidate for the Degree of

Master of Science

Thesis: FEEDLOT PERFORMANCE AND CARCASS CHARACTERISTICS OF FAT AND LEAN LITTERS SLAUGHTERED AT THREE LIVE WEIGHTS

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Biographical:

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