ABSTRACT

THE RELATIONSHIP OF SOME LINEAR AND PHYSICAL MEASUREMENTS TO BEEF CARCASS COMPOSITION

by Deloran M. Allen

Eighty steer carcasses were selected for chilled carcass weight and 12th rib fat thickness (average of three measurements). Two weight groups (500 to 550 lb. and 700 to 750 lb.) of 40 carcasses each and four fat thickness ranges of 10 carcasses each (0.26 to 0.50 in., 0.51 to 0.75 in., 0.76 to 1.00 in. and 1.01 to 1.25 in.) were selected within each weight group. The carcasses were subjectively scored for each grade factor and some linear measurements of fat and muscle were recorded. External fat thickness probes were made 4, 8 and 12 in. off the dorsal midline of the left side of each carcass, perpendicular to the anterior edge of the 5th, 8th and 11th thoracic vertebrae, the 1st, 4th and 6th lumbar vertebrae and the 3rd and 5th sacral vertebrae.

The left side of each carcass was cut into wholesale cuts and physically separated into muscle, fat and bone with the exception of the round, from which the rump was removed and then the two parts were individually physically separated; and the rib which was cut into the 6-7-8, 9-10-11 and 12th rib sections and each section was physically separated. The right side of each carcass was cut into boneless, closely trimmed (approximately 0.3 in.) retail cuts by wholesale cut.

In most instances, highly significant ($P < .01$) correlations were found between the fat probes and separable components, retail and fat trim yields. As high as 96% of the variation in carcass separable fat, external fat trim from the round, loin, rib and chuck and total retail fat trim could be accounted for in either pounds or percent of these variables by combinations of fat thickness, probes and carcass weight.

Percent separable muscle and fat from the 9-10-11 rib section and the wholesale flank showed the highest and most consistent relationships to percent carcass separable muscle and fat of any of the wholesale cuts. The ease of separation and low economic value of the flank provided a more rapid yet accurate cut than those presently used for prediction of carcass composition. Eighty-eight percent of the variation in percent carcass separable muscle, 94% of the variation in percent carcass separable fat and 83% of the variation in percent carcass separable bone could be accounted for by a combination of flank separable components and objective carcass measurements.

Percent retail yield of the flank was also highly related ($P < .01$) to percent boned, trimmed round, loin, rib and chuck and total carcass retail yield (0.81 and 0.88, respectively) and was included in prediction equations to estimate both of these carcass yields.

Low, non-significant correlation coefficients were found between *l. dorsi* muscle potassium and sodium and *l. dorsi* muscle weight, area and total carcass separable muscle (range, 0.00 to 0.30). Means of the organoleptic analyses were not consistent with compositional data.

# THE RELATIONSHIP OF SOME LINEAR AND PHYSICAL MEASUREMENTS TO BEEF CARCASS COMPOSITION

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# INTRODUCTION

Consumer research studies have repeatedly shown that the American consumer selects beef primarily for maximum quantity of muscle with a minimum amount of fat and/or bone. Today's retailer reflects consumer demand for well muscled, trim retail cuts in his purchases of carcass beef. Additionally, retail cut yield grade is an optional feature in the present U. S. Department of Agriculture beef grade specifications. Thus, the producer must market cattle with a high quantity of inherent muscling and a minimum of trimable fat to provide the retail cuts demanded by today's beef industry and consumer. Beef carcasses commensurate with these specifications should have at least minimum U. S. D. A. Choice quality, external fat thickness between 0.25 and 0.5 in. and yield a minimum of 65% boneless trimmed retail cuts. Such cattle exist today, but many beef carcasses have excessive fat or deficient muscling and combinations of these two factors.

Objective, yet practical, methods are needed to accurately identify and measure carcass quantitative and qualitative differences. When such methods become available, it is anticipated they would be applicable for characterizing these same differences in live cattle; thus, providing more objective criteria for selection of breeding stock to meet today's consumer demand.

The most accurate methods to date for measuring carcass quantitative differences necessitate destruction of at least a portion of the carcass (physical separation and chemical analyses). Non-destructive methods

currently used involve various combinations of objective and subjective criteria, but none accurately measures quantitative differences and/or value. Breidenstein (1962) reported as much as a $13.54 per hundredweight difference in value within the same carcass grade. Previous beef carcass composition studies have consistently indicated that degree of fatness has a very marked effect upon yield of boneless, trimmed retail cuts. Yet fat thickness as conventionally measured at the 12th rib has repeatedly been found to account for less than 40% of the variation in total carcass fat. Likewise, indices of muscling such as area of longissimus dorsi as well as other muscles account for less than 40% of the variation in yield of boneless, trimmed retail cuts.

Thus, this study was initiated in an attempt to more accurately predict total physically separable fat and muscle as well as yield of boneless, trimmed retail cuts using a rather comprehensive number of objective measurements. The specific objectives of this study were: 1. To develop a repeatable, accurate and practical method for measuring total separable fat and muscle in beef carcasses. 2. To study the variation in percent trimmed wholesale round, loin, rib and chuck from steer carcasses of approximately the same weight and degree of fatness. 3. To study the variation in actual boneless, trimmed retail yield among steer carcasses of approximately the same weight and degree of fatness from estimations by several existing regression equations. 4. To develop a regression equation in an attempt to more accurately account for the total variation in boneless, trimmed retail yield.

# REVIEW OF LITERATURE

## Early Beef Cattle Evaluation Studies

Research studies during the last half-century have revealed the tremendous variability in production traits and carcass characteristics which exists within the beef cattle population.

The investigations of Lawes and Gilbert (1860) and Henry and Sanborn (1883-1890) were among the first reported studies of carcass composition following the growing and fattening period. Trowbridge et al. (1918) conducted an exhaustive study of the chemical composition of gains made by three year old steers during the fattening process to determine what changes take place in the form of the animal. They observed a marked increase in fat during the fattening period.

Robert Bakewell is credited with being the first great improver of cattle. He developed a low-set, blocky, quick-maturing type of cattle through selection. As quoted by Ensminger (1955), "His objective was to breed cattle that would yield the greatest quantity of good beef rather than to obtain great size."

In the ensuing years, "beef-type" cattle have become identified with selection for increased quantity of muscle relative to other cattle types.

Wilson and Curtis (1893) reported limited data comparing performance traits and carcass qualities of beef- and dairy-type steers. Dairy- and beef-type steers had approximately equal gains and percent of high priced cuts. These workers concluded, however, that the carcasses from the

dairy-type steers were deficient in conformation or shape of the high priced cuts, as well as having less marbling. Moreover, they reported excessive internal fat in the carcasses from some of the dairy-type steers.

Knapp and Nordskog (1946a, b), using data from the U. S. Range Livestock Experiment Station, presented the first known heritability estimates of quantitative traits in beef cattle. Heritability estimates have been determined for most of the economically important performance traits in beef cattle (Black and Knapp, 1936; Black, 1938; Knapp et al., 1941; Knapp and Black, 1942; Knapp and Clark, 1950; Warwick, 1958; Carter and Kincaid, 1959; Shelby et al., 1960; Gregory et al., 1961). These early studies were primarily concerned with production traits and type studies (Knox and Koger, 1946). More recently, other traits such as length of calving interval, maternal ability, dressing percent, l. dorsi muscle area, tenderness, and other carcass quantitative and qualitative characteristics have been studied. Heritability has been established for many of these traits (Knapp and Clark, 1950; Clark, 1954; Warwick, 1958; Gregory et al., 1961).

## Growth

The recent emphasis upon dietary weight control as well as the controversial incrimination of animal fats in cardiovascular diseases has precipitated much interest in body composition studies. Before attempting to study composition, a knowledge of animal body growth and development is necessary.

Meek (1901), Brody and Ragsdale (1924) and Lush (1928) were among the early workers who studied post-natal growth. They studied external body measurements and live weight and concluded that the latter increased at a faster rate than any other single body measurement. In addition, they found that linear skeletal measurements such as measurements of the skull and height measurements over the shoulder and rump increased at a slower rate than did measurements of fat and muscle mass. These workers determined that the skeleton was better developed at birth than were muscle and fat masses which constitute the greatest proportion of total body mass at normal slaughter weight. The conclusions of these early workers were supported by the findings of Hammond (1932), McMeekan (1941), Wallace (1948) and Palsson and Verges (1952) resulting from complete dissection of swine and sheep carcasses. These latter workers concluded that a primary growth wave occurs from the cranium to the facial parts of the head and posteriorally to the lumbar region. A secondary growth wave starts in the metacarpals and metatarsals and continues down toward the digits and upward along the limbs to the lumbar region. These findings led to the measurement of area of the l. dorsi muscle in the middle of the back as an index of muscling. Palsson (1939) reported that muscle development could most accurately be determined from the cross-sectional area of the l. dorsi muscle at the last rib, since this area of the animal body is the last to reach full development.

Luitingh (1962) observed from dissection studies of cattle that the cut, "the loin" was not the latest developing part of the animal. This

agrees with the findings of Butterfield (1963b) who concluded from his studies with beef cattle that muscles along the spine were constant in their rate of development when compared with the rate of development of total carcass lean. In an extensive dissection study, he determined the rate of proportional increase in muscle groups in different breeds of cattle using as a control the proportion of these muscle groups from pre-natal, but near full-term calves. He classified the different muscles as early developing, late developing, very late developing and average developing muscles. Muscles which he classified as early developing were those muscles which at birth had a weight-relation to total carcass muscle that was greater than the same weight-relation in the mature animal. These were the intrinsic muscles of the forelimb and the distal intrinsic muscles of the hind limb. Late developing muscles were those which had a weight-relation to total carcass muscle at birth that was less than that in the mature animal. Late developing muscles were abdominal muscles and poximal muscles of the hind limb. Very late developing muscles were those which had a weight-relation to total carcass muscle at birth that was less than that in the mature animal and which do not increase relative to total muscle until late in life. The intrinsic muscles of the neck and thorax and muscles of the neck and thorax which are attached to the thoracic limb were classified as very late developing. Average developing muscles were those whose weight-relation to that of total carcass muscle did not change during post-natal life and included only those muscles surrounding the spinal column.

## Fattening

Hankins and Titus (1939) stated that in young growing animals weight gains are composed largely of protein and water; whereas, those of the mature or nearly mature animal consist primarily of fat. These workers reported that one of the best known and most obvious changes which accompanies growth and fattening is the increase in the ratio of carcass weight to the weight of the entire body (dressing percent). Warner et al. (1934) reported that as the hog grows and fattens, the percent ham, loin, shoulder and head decrease. They also reported an increase in the percent bacon and fat trim. Hankins and Titus (1939) found that in beef, the percent rib, short loin, plate and flank increased as the animal fattened and the percent round, sirloin and foreshank decreased. The chuck and rump showed very little change.

## Physical Methods for Estimating Carcass Composition

Physical Separation Studies. Physical separation data of entire beef carcasses are limited because such studies are laborious, time consuming and involve economic loss of product. However, physical separation of wholesale cuts or parts thereof has been used rather extensively to measure beef carcass composition.

9-10-11 Rib Section Separation. The most widely used method of estimating beef carcass composition is physical separation of the 9-10-11 rib section as described by Hankins and Howe (1946). They reported correlation coefficients between the percent separable muscle, fat and bone from

the 9-10-11 rib section with the same components from the entire carcass of 0.85, 0.93 and 0.83, respectively. The conclusions of these workers were supported by the findings of Crown and Damon (1959) who reported correlation coefficients of 0.94, 0.98 and 0.73 for muscle, fat and bone, respectively, between these components in the 9-10-11 rib section and the same components in the carcass.

12th Rib Separation. Crown and Damon (1959) also reported correlation coefficients between the percent separable carcass muscle, fat and bone and the same separable components of the 12th rib section of 0.82, 0.96 and 0.75, respectively. They suggested using the 12th rib section to predict carcass composition for greater economy of time and labor since results were comparable to those from the 9-10-11 rib section.

Round, Chuck and Foreshank Separation. Cole et al. (1960) reported high relationships between separable muscle of the round, chuck and foreshank and total separable muscle of the carcass (0.95, 0.93, and 0.81, respectively). Separable muscle of these wholesale cuts was associated with 90, 87 and 66%, respectively, of the variation in total separable muscle of the carcass. These workers suggested the use of either the round or foreshank as an index of carcass muscling due to their high predictive value and relative ease of separation.

Flank Separation. Hankins and Howe (1946), Hedrick et al. (1963) and Miller et al. (1965) reported that retail yield or separable muscle and fat of the flank is highly related to total beef carcass muscle and

fat. Hankins and Howe (1946) reported that the correlation between percent separable fat in the flank with percent ether extract in the carcass was high (0.95). Miller et al. (1965) reported that the percent yield of muscle from the wholesale flank showed the second highest relation to percent total carcass retail yield, the round being the most highly related. These workers concluded that yield of muscle from the flank was relatively constant but that it was a fat depot and the amount of fat in the flank was highly related to total fat trim or total separable fat.

Relationship of Individual and Groups of Muscles to Carcass Composition. The relationship between several individual muscles and total carcass muscle has been shown to be quite high by several workers (Orme et al., 1960; Dumont et al., 1961; Butterfield, 1963a; and Miller et al., 1965). These workers reported a high correlation between l. dorsi muscle weight and total separable carcass muscle (approximately 0.90). Weight of the biceps femoris muscle was reported by Orme et al. (1960) and Butterfield (1963b) to be highly correlated to total carcass muscle (0.96). Orme et al. (1960) also reported high correlation coefficients between total separable carcass muscle and the semimembranosus plus adductor (0.92), semitendinosus (0.83), quadriceps muscle group (0.93), psoas major (0.82), triceps brachii (0.84) and infraspinatus (0.80) muscles.

Relationship of Individual and Groups of Bones to Carcass Composition. Orme et al. (1959) reported that live weight, chilled carcass weight, primal cut weight and estimated carcass muscle (from 9-10-11 rib physical

separation) in almost all instances were significantly and positively related to measures (weight and linear measurements) of the fore and hind cannon bones. These workers found that when the effects of live weight were removed, width and circumference measurements of the hind and fore cannons were associated with 15 to 25% of the existing variation in area of *l. dorsi* muscle. These same workers concluded that even though cannon bone measurements and radiographs of the lumbar vertebrae are related to muscling, these relations are too low to be of any predictive value. Henderson *et al.* (1966) reported significant correlations ($P < .01$) between total carcass bone and percent separable muscle (0.77), and percent separable muscle from the four major wholesale cuts (0.73).

Butterfield (1963a) observed high correlations between the weight of various bones and total carcass bone weight in beef steers. He reported correlation coefficients between total bone weight and weight of the scapula (0.96), humerus (0.99), radius and ulna (0.97), radius and ulna plus carpus (0.98), or coxae (0.97), femur (0.98), tibia (0.97) and the tibia plus tarsus (0.96). Orme (1963) reported highly significant correlations ($P < .01$) between total lamb carcass muscle weight and weight of the following bones: radius and ulna, metacarpal, metatarsal, tibia and the femur. He also reported highly significant correlations ($P < .01$) between these same bones and total carcass bone weight ($r = 0.80$) as well as between weight of bones from various wholesale cuts of lamb and total carcass bone weight (total carcass bone with leg-bone 0.90, loin-bone 0.52, rack-bone 0.69, shoulder-bone 0.82 and foreshank bone 0.84).

Relationship of Linear Measurements to Carcass Composition. White and Green (1952) reported that various live animal measurements were highly correlated with weights of major beef cuts (0.5 to 0.6) and linear measurements of the live animal were of value for estimating weight of various wholesale cuts. Cook et al. (1951), Green et al. (1955), Dawson et al. (1955), Tallis et al. (1957) and Orme (1958) reported similar results. Orme (1958) and Allen (1963) reported simple correlation coefficients (0.3 to 0.8) between live animal measurements and weight of various wholesale cuts. Orme (1958) reported that when the effect of live weight was held constant, most of these relationships were markedly reduced. Cole et al. (1962) reported that carcass weight, carcass length and l. dorsi muscle area were related to total carcass separable muscle (r = 0.75, 0.23 and 0.39, respectively). With carcass weight held constant, Cole et al. (1960) stated that l. dorsi muscle area accounted for 5% of the variation in pounds of separable lean in the carcass.

Specific Gravity. Pearson (1965) stated that the major problem in determining specific gravity is that of accurately measuring volume. He stated that this could be done by one of two methods: 1) gaseous displacement and 2) water displacement. Morales et al. (1945) reported data for guinea pigs which provided the basic information for the calculation of equations giving the density of the fat-free body. Brown et al. (1951) and Whiteman et al. (1951) used the underwater specific gravity method for estimating the composition of carcasses and cuts from farm animals. Gnaedinger et al. (1963) using the helium dilution technique

for determining specific gravity of market weight pigs, obtained poor agreement between this value and chemical analysis.

## Chemical Methods for Estimating Carcass Composition

Research workers have used various chemical methods for the determination of body composition. Among these are the antipyrene (Brodie et al., 1949) and tritium (Pace et al., 1947) methods. Moore (1946) presents an excellent discussion of the principles involved in the isotope dilution techniques for measuring total body water.

Relationship between Muscle Content of Potassium and Sodium and Carcass Composition. Kirton and Pearson (1963a,b) reported that potassium and sodium content of muscle tissue, as determined by flame photometry, was significantly related to carcass composition in sheep and hogs. With a group of 10 lamb carcasses, these workers found that the potassium content of muscle tissue when measured by flame photometry was significantly related to carcass composition but not when measured from $K^{40}$ content. In another group of 20 lots of ground pork and 15 lots of ground lamb, potassium content by both methods studied by these workers gave approximately the same results. However, the flame photometry method was more closely related to % water, fat and protein content of the samples. These workers concluded that a degree of precision at least equal to the flame photometry method was needed in a non-destructive method before it would become useful. Similar conclusions were made by

Kirton et al. (1961) for the $K^{40}$ method of predicting carcass composition in live lambs. Correlations determined by these workers were higher between measured potassium content of muscle and total muscle than between measured sodium content of muscle and total muscle. Kirton and Pearson (1963a) reported a species difference between sheep and swine with the relation between potassium and total muscle being higher in swine than in lambs. Gillett et al. (1965) further reported a significant difference in potassium and sodium content among various muscles of the pig. They also reported a significant difference in potassium and sodium content between the two breeds of swine studied. It was therefore concluded by these workers that due to the variations in potassium and sodium content (especially potassium), constancy does not exist between the muscle-element ratio and this is an important source of error when using this method of estimating composition.

Linear and Multiple Regression Equations for Predicting Carcass Composition. Numerous linear and multiple regression equations for predicting carcass composition have been developed. Hankins and Howe (1946) were among the early workers to develop linear regression equations from the percent separable muscle, fat and bone of the 9-10-11th rib section for predicting beef carcass composition.

Cole et al. (1960) developed regression equations to predict total separable muscle in beef carcasses from the pounds of separable muscle in each of several wholesale cuts (round, sirloin, shortloin, rib, chuck and foreshank).

Butterfield (1963a) calculated multiple regression equations for the estimation of total muscle, fat and bone weight from separable components as well as from some linear measurements.

Orme et al. (1960) developed linear regression, prediction equations for total separable carcass muscle using weights of individual muscles or groups of muscles as predictive factors. The latter authors stated that the fraction of the total sum of squares for separable muscle in the beef carcass associated with the degree of freedom for linear regression ranged from 63 to 91%. They reported that the four heavier muscles seemed to be the best predictors but the four lighter muscles also account for a large fraction of the variation in total carcass muscle.

Cole et al. (1962) developed a "simplified method for predicting pounds of muscle in beef carcasses". They reported that carcass weight was more closely related to total separable muscle than any other single measure and therefore should be included in the prediction equation. When they combined one fat measurement taken at the 12th rib (described by Ramsey et al., 1962) with carcass weight in a regression analysis, they were able to account for over 70% of the variation in total separable carcass muscle.

Kirton and Pearson (1963b) presented regression equations for the prediction of % water, ether-extract, and protein in empty pig carcasses using potassium content of ground samples as predicting factors. They concluded, however, that the accuracy with which composition could be predicted from potassium content was unsatisfactory under the conditions used.

## Beef Carcass Retail Yield Studies

In recent years, numerous studies have been conducted to determine the variability and factors influencing variability of beef carcass retail yield. These have been concerned with quantitative factors as they may be related to carcass value.

Variability of Beef Carcasses Retail Yield. Research data reported by Butler (1957), Cole et al. (1960), Murphy et al. (1960) and Butler et al. (1961) have shown that great variability occurs in the retail yield of beef carcasses. These data indicate that carcass value differences exist within as well as between grades.

Kropf and Graf (1959) reported that total carcass boneless, closely trimmed retail yield varied from a high of 68.71% to a low of 57.63% among U. S. Choice, Good, Commercial (Standard) grade steer, heifer and cow carcasses ranging in weight from 400 to 900 lb.

Breidenstein (1962) found a range of 19% in retail yield and $13.55 per hundredweight value difference among 105 steer sides and both sides of 94 heifer carcasses within the U. S. Good and Choice grades. He eliminated the extremes from the study above, thus leaving a range of 14.4% between the low and high yielding carcasses which still included 95% of the original sample. This represents a value difference between the low and high yielding carcasses of $10.32 per hundredweight or approximately $60.00 for a 600 pound carcass.

Brungardt and Bray (1963) conducted a similar study on 99 left sides of U. S. Choice steers. These were selected at random within three weight

groups (260 to 288 pounds, 300 to 325 pounds and 332 to 360 pounds). The light to heavy weight groups yielded an average percent boneless, trimmed retail cuts from the round, loin, rib and chuck of 50.8%, 49.7% and 48.5%, respectively. The range in percent retail yield was 47.0 to 54.6% in the light weight group, 46.3 to 53.0% in the middle weight group and 45.5 to 51.5% in the heavy weight group. The ranges included only those 22 of the 33 sides in each group closest to the average retail cut-out for the group. The ranges in value per hundredweight were $6.56, $5.52 and $5.25 for the light, middle and heavy weight groups, respectively. While these values were not as large as those reported by Briedenstein (1962), this study included only the four major wholesale cuts of beef and one-third of the extremes were not included in the ranges reported.

Factors Influencing Variability of Retail Yield. Since carcasses are composed of three major tissue components, muscle, fat and bone; the proportion of these three components influences retail yield. Retail cuts as referred to in these studies consist of muscle plus fat trimmed to approximately 0.3 in. Thus, any increase in the amount of fat and/or bone results in a decrease in the percent retail yield.

Influence of Fat upon Retail Yield. Kropf and Graf (1959) reported total carcass fat trim ranged from 10.78 to 27.16% among U. S. Choice, Good and Commercial (Standard) grade steer, heifer and cow carcasses ranging in weight from 400 to 900 lb.

Ramsey et al. (1962) reported that external fat thickness at the 12th rib varied from 0.1 to 1.1 in., kidney fat from 1.8 to 8.9% and

separable fat in the carcass from 14.3 to 42.8% for carcasses within the U. S. Choice, Good and Standard grades. Brungardt and Bray (1963) reported that among carcasses grading U. S. Good and Choice, fat thickness at the 12th rib varied from 0.35 to 1.60 in. and kidney fat from 2.4 to 7.8%. Cole et al. (1962) stated that, holding carcass weight constant, external fat thickness at the 12th rib accounted for 34% of the variation in separable carcass lean.

Lewis et al. (1964) reported correlation coefficients between the third fat measurement over the 12th rib (described by Ramsey et al., 1963) and percent retail cuts and bone-in, closely trimmed retail cuts of -.26 and -.04, respectively. These workers also reported that a number of probes of subcutaneous fat over the rump and clod showed little relationship to the third fat measurement over the 12th rib, yet were negatively but highly significantly correlated with both percent bone-in and boneless, closely trimmed retail cuts. Carpenter et al. (1965) reported that each of several measurements of fat taken on the exposed surface between the 12th and 13th rib in lamb carcasses were significantly related ($P < .01$) to percent fat trim. These same measurements were also highly, negatively correlated with the yield of leg, loin, rack and shoulder. Hedrick et al. (1963) and Miller et al. (1965) reported significant ($P < .01$) negative correlations between fat thickness at the 12th rib, and several other carcass fat thickness measurements and retail yield. The latter workers reported higher correlations between subcutaneous fat thickness measurements and percent retail cuts than with weight of retail cuts. They found

that subcutaneous fat thickness measurements (probes) were nonsignificantly correlated with weight of retail cuts except those measurements and probes over the 11th to 12th thoracic vertebrae which were significant ($P < .05$). All correlations between fat thickness and percent boneless and partially boneless retail cuts were negative and highly significant ($P < .01$). These same workers reported that probes taken in the 11th to 12th thoracic vertebrae area were more closely related to retail yield than fat thickness measurements at the 12th thoracic vertebra. They stated that degree of fatness has a greater influence upon retail yield than *l. dorsi* muscle area and an increase of 0.16 in. in fat thickness at the 12th rib resulted in a 1% decrease in partially boneless retail cuts.

Zinn *et al.* (1963) reported a negative correlation (-.81) between percent fat trim and boneless round, loin, rib and chuck in beef carcasses. With multiple regression analysis, they found that each 1% increase in carcass fat trim, resulted in a corresponding decrease of 0.34% boneless round, loin, rib and chuck. Miller *et al.* (1965) reported negative and significant correlation coefficients ($P < .01$) between fat trim from the right and left sides with retail yield of the round, loin, rib and chuck and with total carcass retail yield. The latter workers concluded that variation in percent fat trim accounted for more of the variation in boneless and partially boneless retail yield of the carcass than any other variable studied. They stated that an increase of approximately 1.10% in fat trim decreased partially boneless retail yield 1%. Butterfield

(1965) reported that when separable fat is increased above 20%, the proportion of expensive muscles in a beef carcass is markedly reduced.

Brungardt and Bray (1963) reported correlations between external fat thickness measurements taken at various points on the carcass and percent retail yield from the round, loin, rib and chuck ranging from -.63 to -.73. Retail yield was also negatively correlated (-.54) with percent kidney and pelvic fat. Percent kidney and pelvic fat were also reported to be negatively correlated to retail yield by Butterfield (1963a).

Murphy et al. (1960) reported high negative correlation coefficients between retail yield and a single fat thickness measurement at the 12th rib and with percent kidney knob (-.83 and -.66, respectively). Brown et al. (1962) reported on a study involving 453 steer carcasses. They observed a high negative correlation coefficient between estimated (physical separation of 9-10-11 rib) separable lean and fat (-.84). Breidenstein (1962) reported that for each one pound increase in kidney fat there was a decrease in partially boneless retail yield of 0.37% for steers and 0.44% for heifers. Kropf and Graf (1959) also found more trim fat among heifer carcasses than for the same weight and grade steer carcass.

The above results agree with those of Callow (1947) who reported that fat is the most significant variable in beef carcass composition.

Influence of Carcass Weight Upon Retail Yield. Many research studies have shown that carcass weight is negatively related to retail yield, Cole et al. (1960), Butterfield (1963a), Breidenstein (1962), Cole et al. (1962),

Brungardt and Bray (1963) and Swiger et al. (1964). Kropf and Graf (1962) observed that increased carcass weight had a significant depressing effect upon total carcass retail yield.

Cole et al. (1960) reported that carcass weight was more closely related to total separable muscle (0.77) than any other single variable studied. Butterfield (1963a) also found that carcass weight was more closely related to pounds of separable carcass muscle than any other variable. Swiger et al. (1964) reported that the simple correlation coefficient between carcass weight and percent retail yield was -.48. These workers stated that carcass weight alone accounted for 93% of the variation in retail yield.

Brungardt and Bray (1963) reported that heavier carcasses contained significantly more fat per unit of carcass weight than lighter carcasses. Cole et al. (1962) found that as carcass weight increased, the average percent steaks decreased and the percent waste increased. Breidenstein (1962) reported that a 100 lb. increase in carcass weight resulted in a reduction in retail yield of 1.42%. Murphy et al. (1960) also reported a a negative relationship between carcass weight and retail yield.

Influence of Conformation Upon Retail Yield. Briskey and Bray (1964) reported that although conformation has long been included in grading standards, its inclusion is based upon the supposition that it is related to yield of retail cuts, especially those from the round, rib, loin and chuck. They stated that this trait is related primarily to the shape and fullness of the round, loin, rib and chuck. They concluded that conformation is related to muscle development, i.e., thickness, depth and length,

but that it is also largely influenced by fat deposition both subcutaneous and intermuscular.

Breidenstein (1962) reported no significant relation between conformation score and yield of retail cuts in steers grading primarily U. S. Good and Choice. However, they observed that a one-third increase in conformation score in heifer carcasses was accompanied by an increase of 0.34% in partially boneless retail yield.

Butler (1957) reported data from beef carcasses with a wide range of conformation scores, but the percent of individual wholesale cuts was very similar. This agrees with findings of Wilson and Curtis (1893) and Branaman et al. (1962) comparing retail yield of dairy- and beef-type steers. Brungardt and Bray (1963) reported that while variation in untrimmed wholesale cut yield is small, when the cuts were trimmed to approximately 3/8 in. external fat, the yields of these trimmed wholesale cuts between beef carcasses were markedly different and closely related to boneless, trimmed retail cut yields.

In a study involving 96 carcasses, Zinn et al. (1961) reported significant ($P < .01$) correlations between conformation score and carcass fat thickness at the 12th rib (0.50) and with percent trimable fat (0.69). This agrees with results of Miller et al. (1965) who reported that dressing percent and conformation score were not related to retail yield but slightly related to fat thickness at the 12th rib and to trimable fat. The latter workers concluded that higher conformation scores were due largely to excess fat which was subsequently trimmed off. These data agree with

Hedrick et al. (1963) who concluded that it is difficult for superior muscle development to compensate for excess fat deposition.

In a study involving British, Zebu and dairy breeds of cattle, Cole et al. (1964) reported that Holstein steer carcasses had the highest percent separable muscle in all wholesale cuts, except the chuck and plate. Brahman steer carcasses had the highest percent separable muscle in these two wholesale cuts. Holstein carcasses had the lowest percent total separable carcass fat and were lowest in percent separable fat in all wholesale cuts, except the chuck where Brahman carcasses were lower. These authors found that the British breeds yielded the lowest percent muscle in all wholesale cuts except the foreshank where they yielded a higher percent muscle than Zebu cattle. The British breeds yielded the highest percent total carcass separable fat as well as percent separable fat from all wholesale cuts. These workers concluded from their results, that any effect conformation might exert upon percent yield of separable muscle (wholesale cuts or carcass) was overcome by the depressing effect of fat upon yield of separable muscle.

Kirton (1964) stated that intensive selection of breeding ewes for and against conformation had little influence upon the amount and value of the meat produced by their lambs. He concluded that carcasses with better conformation had less muscle and more fat than carcasses with poor conformation.

Briskey and Bray (1964) stated that it is difficult to determine muscular development in heavily fatted carcasses, since a heavily finished carcass is more likely to be scored higher in conformation than one with

less finish. They stated that from the literature available it seemed safe to conclude that conformation influenced retail yield to a far lesser extent than did degree of fatness, especially external fat.

Influence of l. dorsi Muscle Area Upon Retail Yield. The ease with which this measurement can be obtained has led to extensive use since it is recorded in almost all beef carcass research studies.

Cole et al. (1960), Brungardt and Bray (1963), Butler et al. (1961), Hedrick et al. (1963), Gottsch et al. (1961), Cahill et al. (1961) and Breidenstein (1962) have reported significant, positive, correlation coefficients (0.40 to 0.60) between l. dorsi muscle area and retail yield. However, these same authors showed that on a carcass weight and fat constant basis the correlation coefficients were significantly reduced. Since area of l. dorsi muscle is at least partially a function of weight, this would be expected. Field et al. (1963) reported that although the area of l. dorsi muscle-weight relationship existed, it was a nonlinear relationship in their study. Brungardt and Bray (1963) reported that 20% of the variation in retail yield could be accounted for by differences in area of the l. dorsi muscle. They also reported that with carcass weight, percent kidney fat and a single fat thickness measurement at the 12th rib held constant, the standard partial regression coefficient of boneless, closely trimmed retail yield from the round, loin, rib and chuck on area of the l. dorsi muscle was only 0.16.

Briskey and Bray (1964) concluded that although the influence of area of l. dorsi muscle upon retail yield is small compared to that of fat,

emphasis upon size of this muscle may be justified because it comprises a large proportion of two of the high priced cuts of the beef carcass.

Influence of Bone Upon Retail Yield. Wythe et al. (1961) and Henderson et al. (1966) reported positive relationships between the amount of bone and retail yield.

Wythe et al. (1961) studied the weight, length, and length-weight ratio of the metacarpus, metatarsus, tibia, femur and the radius-ulna in relation to the yield of trimmed retail round, loin, rib and chuck. They observed significant ($P < .01$) and positive relationships between bone measurements and retail yield. Henderson et al. (1966) reported significant correlations ($P < .01$) between percent total carcass bone and percent total retail yield (0.64) and percent total retail yield of the four major wholesale cuts (0.68). Good et al. (1961) reported significant correlation coefficients between circumference of cannon bone and muscling score (-.32), circumference of round (0.30) and l. dorsi area (0.13).

Regression Equations for Measuring Differences in Retail Yield. Murphy et al. (1960) developed a regression equation from data of 169 cattle varying widely in grade and weight. This equation was developed to predict the estimated percentage of boneless, closely trimmed retail cuts from the round, loin, rib and chuck. They compared predicted retail yield with actual retail yield and obtained a correlation of 0.906 with a standard error of the estimate of 1.9%. Palmer et al. (1961) conducted studies with 138 cattle varying in slaughter weight, breeding and quality grade. They reported a correlation coefficient between actual and estimated retail yield (Murphy et al., 1960) of 0.76 which accounted for slightly less than 60% of the total variation in retail cut yield.

Comparison of actual boneless, trimmed retail yields with those estimated by the equation of Murphy et al. (1960) ranges from a low of 35% of the variation in retail yield accounted for to a high of 80%, Briskey and Bray (1964). In a review of the literature, the latter authors stated that the equation of Murphy et al. (1960) probably accounts for 50 to 70% of the variation in the boneless, trimmed retail yield from the four major wholesale cuts.

Brungardt and Bray (1963) developed a regression equation designed to measure variation in percent boneless, trimmed retail yield from the round, loin, rib and chuck. Using this equation, they were able to account for 81% of the variation in boneless, trimmed retail yield.

Kropf and Graf (1959) and Breidenstein (1962) reported marked retail yield differences between steer and heifer carcasses and the latter author developed a separate regression equation for each sex. He was able to account for 72% of the variation in retail yield of steer carcasses but that for heifers, although similar, was slightly less accurate.

## EXPERIMENTAL PROCEDURE

Source of Material: Eighty steer carcasses were purchased from several beef packing companies in central Michigan. Selection was made pre-slaughter to insure procurement of steers of the three major British beef breeds. Carcass selection involved the following two criteria: 1) chilled carcass weight and 2) average fat thickness (12th rib measurement) as described by Naumann (1952).

Grouping: In an attempt to minimize the effects of carcass weight and fat thickness upon composition and cutability, the carcasses were equally divided into two weight ranges; 500 to 550 pounds and 700 to 750 pounds. The two weight ranges were further subdivided into four fat thickness (av. at 12th rib) ranges: .26 to .50 in., .51 to .75 in., .76 to 1.0 in. and 1.01 to 1.25 in. Ten steers were selected within each of the resulting eight groups as shown in table 1.

Table 1. Distribution of carcasses within weight and fat thickness groups.

| | Average fat thickness (12th rib) | | | |
|---|---|---|---|---|
| Carcass weight | .26" to .50" | .51" to .75" | .76" to 1.0" | 1.01" to 1.25" |
| | Group I | Group II | Group III | Group IV |
| 500 to 550 lb. | 10 carcasses | 10 carcasses | 10 carcasses | 10 carcasses |
| | Group V | Group VI | Group VII | Group VIII |
| 700 to 750 lb. | 10 carcasses | 10 carcasses | 10 carcasses | 10 carcasses |

Slaughtering Procedure. Conventional slaughter procedures were followed except the carcasses were not scribed or the necks pinned.

Subjective Carcass Evaluation. Following selection of the carcasses, each was subjectively scored for the characteristics shown in table 2. Conformation was scored with a conscious effort to evaluate degree of muscling irrespective of quantity of fat.

## Linear Carcass Measurements

Linear Fat Measurements at the 12th Rib. The fat thickness measurements obtained at the 12th rib are shown in Figure 1. In addition to average fat thickness as previously described (av. of A, B and C), four other fat thickness measurements were taken at the 12th rib (D, E, F and G). The site for measurement D was determined by extending a perpendicular from the ventral tip of line W-X to the fat seam over the *l. dorsi* muscle. A perpendicular line was drawn to the outer edge of the subcutaneous fat from the point at which the previous perpendicular bisected the fat seam. Measurement of the latter perpendicular was recorded as fat measurement D. Line Y-Z which is the same length as line W-X, was drawn from the point where the perpendicular of measurement D bisected the fat seam to the fat seam at point Z. Measurements E, F and G were made from perpendiculars drawn from the outer edge of subcutaneous fat to points located on the fat seam at one-fourth, one-half and three-fourths the length of line Y-Z.

Fat Probes. Probes of subcutaneous fat were made on the left side of each carcass at the sites shown in Figure 2. The following vertebrae

Table 2. Characteristics and scores used in the subjective carcass evaluation.

| Characteristic | Score |
|---|---|
| Carcass conformation | _____[a] |
| Hindquarter conformation | _____[a] |
| Forequarter conformation | _____[a] |
| Round conformation | _____[a] |
| Maturity score | _____[b] |
| Marbling score | _____[c] |
| Final grade | _____[a] |
| Estimated kidney knob weight | _____[d] |

| Characteristic | Score | | |
|---|---|---|---|
| | Low | Av. | High |
| [a]Conformation and/or grade | | | |
| U.S. Standard | 1 | 2 | 3 |
| U.S. Good | 4 | 5 | 6 |
| U.S. Choice | 7 | 8 | 9 |
| U.S. Prime | 10 | 11 | 12 |
| [b]Maturity | - | Av. | + |
| A | 1 | 2 | 3 |
| B | 4 | 5 | 6 |
| C | 7 | 8 | 9 |
| [c]Marbling | - | Av. | + |
| Devoid | 1 | 2 | 3 |
| Practically devoid | 4 | 5 | 6 |
| Traces | 7 | 8 | 9 |
| Slight | 10 | 11 | 12 |
| Small | 13 | 14 | 15 |
| Modest | 16 | 17 | 18 |
| Moderate | 19 | 20 | 21 |
| Slightly abundant | 22 | 23 | 24 |
| Moderately abundant | 25 | 26 | 27 |
| Abundant | 28 | 29 | 30 |

[d]Weight in lb.

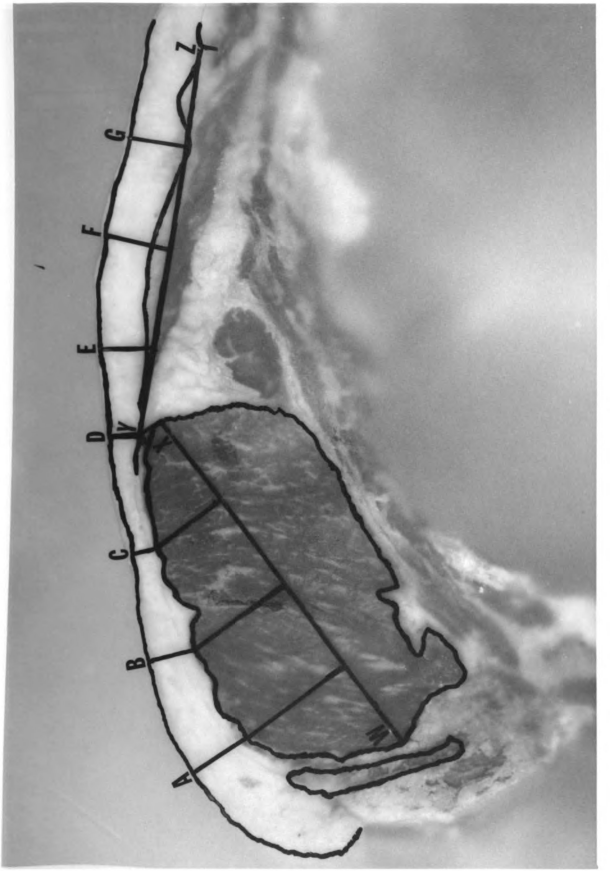


Figure 1. Illustration showing fat thickness measurements taken at the 12th rib.

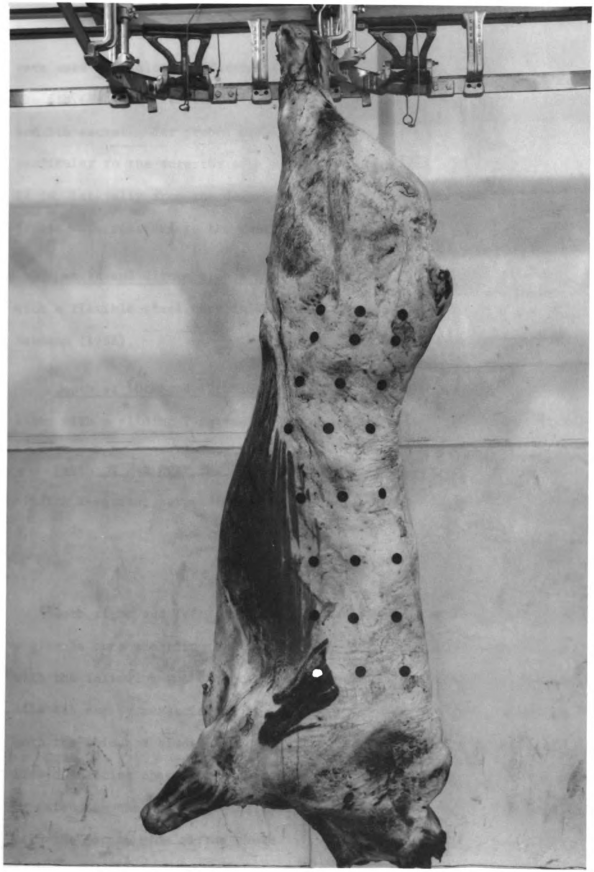

Figure 2. Illustration showing the pattern of the fat probes taken 4, 8 and 12 in. from the midline on the carcass.

were used as skeletal reference points for the location of these sites: The 5th, 8th and 11th thoracic, the 1st, 4th and 6th lumbar and the 3rd and 5th sacral. Fat probes were made with a scalpel and metal ruler perpendicular to the anterior edge of these reference vertebrae, 4, 8, and 12 in. laterally from the dorsal tip of the vertebral cartilage. All probes were recorded to the nearest mm.

Length and Circumference of Round. These measurements were made with a flexible steel tape in accordance with the procedures described by Naumann (1952).

Depth at 10th and 12th Thoracic Vertebrae. These measurements were taken with a sliding T-square as described by MacLeod (1964).

Depth of Fat over the Brisket. This measurement was taken, with a sliding T-square, perpendicular to the first sternebra as shown in Figure 3.

## Cutting Procedure

Both right and left side of each carcass were cut into conventional wholesale cuts according to the procedure described by Wellington (1953), with the following two exceptions. The plate was removed from the wholesale rib cut by measuring 10 in. ventrally from the spinal column, at both the loin and blade ends of the rib, and removing the plate along a line connecting these two points. The brisket was removed from the chuck, by extending the cut where the foreshank was removed, on a line parallel with the dorsal side of the chuck.

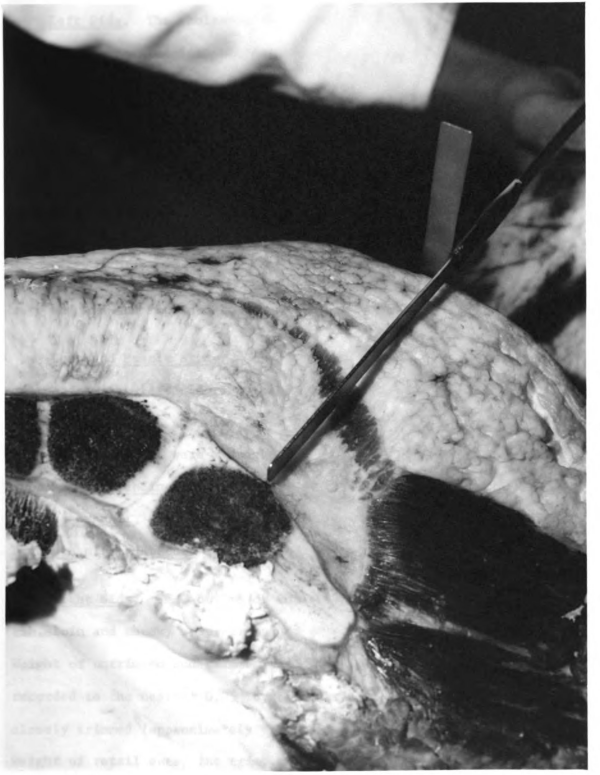

Figure 3. Illustration showing the measurement of fat depth over the brisket.

Left Side. The wholesale cuts from the left side were individually physically separated into the components: muscle, fat and bone with two exceptions. The wholesale round and rib were further sub-divided. The rump was removed from the round according to the procedure described by Wellington (1953), and the wholesale rib was cut into three sub-parts; the 6-7-8 rib section, the 9-10-11 rib section and the 12th rib section following the procedure described by Hankins and Howe (1946). All three rib sections and the rump and rumpless round were then individually separated into muscle, fat and bone. All physically separated components were weighed and recorded to the nearest 0.05 lb.

Bone and Muscle Study. Weights of the following individual and bone groups from the left side were recorded to the nearest 0.05 lb.: radius plus ulna, humerus, scapula, tibia plus fibula and the femur.

Muscle weights were recorded for the following individual and muscle groups: semitendinosus, semimembranosus, biceps femoris, rectus femoris, triceps brachii, supraspinatus, psoas major, longissimus dorsi, semimembranosus plus adductor, and the quadriceps muscles.

Right Side. The four major wholesale cuts from the right side (round, rib, loin and chuck) were trimmed of external fat to approximately0.3 in. Weight of untrimmed and trimmed wholesale cut and fat trim from each was recorded to the nearest 0.05 lb. All wholesale cuts were then cut into closely trimmed (approximately 0.3 in. external fat) boneless retail cuts. Weight of retail cuts, fat trim, and bone from each wholesale cut was recorded to the nearest 0.05 lb.

## Tenderness Studies

The section of the left l. dorsi muscle from the shortloin of each carcass was frozen and stored at approximately -10°F for subsequent chemical and organoleptic analysis. The frozen muscles were removed from the freezer 24 hr. prior to organoleptic analysis and four, 1 1/4 in. steaks were removed from the anterior end of the muscle and numbered 1 through 4 with 1 designated the most anterior steak. Steak number 1 was rewrapped and replaced in the freezer for subsequent chemical analysis. Steaks 2, 3 and 4 were then allowed to thaw overnight at approximately 38°F.

A thermometer was placed in the steak through the dorsal edge of the muscle to the approximate center of the cross-sectional area of the steak. The steaks were cooked in deep fat (lard) at a temperature of 300 ± 2°F. The steaks were removed and allowed to cool for 20 min. Four, one inch cores were removed from each steak parallel to the muscle fibers. The four cores from steak number 2 were used for Warner-Bratzler shear values. One shear value was determined from each core and the four values were averaged and recorded as shear value for each steak. Cores from steaks 3 and 4 were cut into two equal portions perpendicular to the orientation of the muscle fibers and served to a trained, eight-member taste panel. Evaluation of flavor, juiciness and tenderness was scored by the panel on a nine-point hedonic scale with nine designated as most desirable. Position of the cores within each steak was kept constant for each panel member.

## Chemical Analysis

Steak number 1 was removed from the freezer, allowed to thaw overnight at 38°F and then ground to obtain a sample for chemical analysis as outlined by Orme (1958). Percent moisture and protein were determined by procedures as outlined by Benne et al. (1956). Ether extract was determined by the method described by Orme (1958).

Potassium and sodium analysis were determined on each muscle sample using the TCA extraction procedure of Mounib and Evans (1957) as modified by Kirton and Pearson (1963). A Beckman DU spectrophotometer with a model 9220 flame attachment was used for the analysis. Potassium and sodium content of each muscle was calculated by use of a standard curve determined by plotting the percent tramsmittance against the ppm of these electrolytes in standard solutions.

## Statistical Analysis

The statistical procedures followed were described by Snedecor (1956). A 2 x 4 x 10 factorial analysis was calculated to determine treatment and interaction effects on several measures of carcass composition and cutability. The multiple range test of Duncan (1955) was employed to evaluate significance of individual differences. Simple correlation coefficients were calculated on a total, within weight and within weight-fat thickness group basis. Where applicable, multiple correlation coefficients were calculated on a total and within weight group basis.

## RESULTS AND DISCUSSION

The means and standard deviations for the carcass traits which were correlated with all objective and subjective measurements are presented in tables 3, 3a, 4 and 4a. These means are presented for the combined and individual weight groups, within fat thickness ranges and within weight and fat thickness groups.

Effect of Carcass Weight upon Pounds and Percent Carcass Separable Components, Retail and Fat Trim Yields. Carcass weight had a highly significant ($P < .01$) effect upon pounds of all the carcass separable components, retail and fat trim yields (table 3). Carcass weight also had a highly significant ($P < .01$) effect upon percent retail and fat trim yields but not on the percent separable carcass fat, muscle and bone (table 4).

It is interesting to note that the 200 lb. increase in carcass weight from the 500 to 550 lb. weight group to the 700 to 750 lb. weight group resulted in an 88 lb. increase in separable muscle and a 94 lb. increase in total retail yield. Bone accounted for approximately 20 lb. of the total 200 lb. difference in carcass weight. Fat accounted for the remaining portion of this weight difference. Carcasses of the 500 to 550 lb. weight group were obtained from steers weighing approximately 850 lb. alive and those from the 700 to 750 lb. group from 1150 lb. steers. Thus, less than one-third of this live weight difference between these two carcass weight groups was separable muscle or total retail cut yield.

It is also of interest that the percents separable fat, muscle and bone as well as percents retail and fat trim yields between the two carcass weight groups (table 4) are markedly similar.

Table 3. Means and standard deviations of weights of carcass separable components, retail and fat trim yields, L. dorsi muscle area and average 12th rib fat thickness for the combined and individual weight groups and fat thickness ranges.

| Trait | | Combined weight groups | 500-550 lb. | 700-750 lb. | Fat thickness ranges (combined weight groups) 0.26-0.50 | 0.51-0.75 | 0.76-1.00 | 1.01-1.25 |
|---|---|---|---|---|---|---|---|---|
| Separable muscle, lb. | Mean | 159.60 | 137.57[a] | 181.64[b] | 171.35[c] | 161.01[d] | 154.34[d,e] | 151.72[e] |
| | S.D.[1] | 25.19 | 11.12 | 12.89 | 25.24 | 25.97 | 22.02 | 24.51 |
| Separable fat, lb. | Mean | 113.78 | 94.93[a] | 132.63[b] | 94.08[c] | 111.54[d] | 123.01[e] | 126.47[e] |
| | S.D. | 25.29 | 17.05 | 16.61 | 24.11 | 21.75 | 21.77 | 21.40 |
| Separable bone, lb. | Mean | 35.21 | 30.32[a] | 40.11[b] | 38.75[c] | 36.47[c] | 33.19[d] | 32.43[d] |
| | S.D. | 6.35 | 3.78 | 4.26 | 5.28 | 6.08 | 6.28 | 5.98 |
| Retail yield from RLRC[2], lb. | Mean | 158.24 | 138.52[a] | 177.97[b] | 164.14[c] | 160.57[c] | 156.46[c,d] | 151.81[d] |
| | S.D. | 22.46 | 10.31 | 10.82 | 20.03 | 20.94 | 21.78 | 26.34 |
| Total retail yield, lb. | Mean | 192.35 | 168.82[a] | 215.88[b] | 199.63[c] | 195.93[c] | 189.90[c,d] | 183.92[d] |
| | S.D. | 27.24 | 13.72 | 13.38 | 23.16 | 24.67 | 25.95 | 33.41 |
| Total fat trim, lb. | Mean | 62.54 | 49.58[a] | 75.50[b] | 48.27[c] | 57.59[d] | 68.25[e] | 76.04[e] |
| | S.D. | 19.49 | 16.53 | 12.33 | 18.65 | 18.88 | 16.50 | 11.67 |
| External fat trim from RLRC, lb. | Mean | 11.73 | 8.27[a] | 15.19[b] | 6.59[c] | 9.47[c] | 12.96[d] | 17.90[e] |
| | S.D. | 6.68 | 6.04 | 5.44 | 4.74 | 6.67 | 5.28 | 4.01 |
| L. dorsi muscle area, sq. in. | Mean | 10.93 | 10.00 | 11.86 | 11.62 | 10.79 | 10.73 | 10.58 |
| | S.D. | 1.67 | 1.34 | 1.44 | 1.51 | 1.59 | 1.06 | 1.02 |
| Av. 12th rib fat thickness, in. | Mean | 0.75 | 0.74 | 0.77 | 0.42 | 0.64 | 0.86 | 1.08 |
| | S.D. | 0.26 | 0.26 | 0.26 | 0.09 | 0.05 | 0.08 | 0.08 |
| Carcass wt., lb. | Mean | 625.98 | 534.42 | 717.52 | 614.55 | 628.30 | 630.05 | 631.00 |
| | S.D. | 93.85 | 16.51 | 19.44 | 13.24 | 16.96 | 13.22 | 21.87 |

[1]S.D. = Standard deviation.

[2]RLRC = Round, loin, rib and chuck.

[a,b]Means on the same line having different superscripts are highly significantly ($P < .01$) different due to the effects of carcass weight.

[c,d,e]Means on the same line having different superscripts are highly significantly ($P < .01$) different due to the effects of fat thickness.

Table 3a. Means and standard deviations of weights of carcass separable components, retail and fat trim yields, L. dorsi muscle area and 12th rib fat thickness for the individual fat thickness ranges within each weight group.

| Trait | | 500-550 lb. weight group | | | | 700-750 lb. weight group | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Group I 0.26"-0.50" | Group II 0.51"-0.75" | Group III 0.76"-1.00" | Group IV 1.01"-1.25" | Group V 0.26"-0.50" | Group VI 0.51"-0.75" | Group VII 0.76"-1.00" | Group VIII 1.01"-1.25" |
| Separable muscle, lb. | Mean | 148.98 | 136.92 | 134.68 | 124.70 | 193.72 | 185.10 | 174.00 | 173.74 |
| | S.D.[1] | 10.92 | 6.70 | 6.54 | 10.26 | 10.65 | 9.47 | 11.05 | 9.24 |
| Separable fat, lb. | Mean | 73.48 | 93.36 | 104.87 | 108.00 | 114.69 | 129.72 | 141.14 | 144.94 |
| | S.D. | 12.26 | 9.35 | 9.54 | 10.82 | 11.55 | 13.29 | 13.36 | 9.54 |
| Separable bone, lb. | Mean | 34.60 | 31.40 | 28.06 | 27.22 | 42.91 | 41.58 | 38.32 | 37.63 |
| | S.D. | 3.75 | 2.24 | 1.59 | 1.54 | 2.53 | 3.93 | 4.73 | 3.60 |
| Retail yield from RLRC[2], lb. | Mean | 146.78 | 141.90 | 137.44 | 127.96 | 181.50 | 179.25 | 175.48 | 175.66 |
| | S.D. | 7.55 | 5.26 | 9.74 | 8.21 | 10.99 | 11.07 | 10.11 | 11.52 |
| Total retail yield, lb. | Mean | 179.74 | 174.18 | 167.32 | 154.04 | 219.53 | 217.72 | 212.47 | 213.80 |
| | S.D. | 7.76 | 7.47 | 13.21 | 10.76 | 13.86 | 13.27 | 10.73 | 16.02 |
| Total fat trim, lb. | Mean | 32.02 | 41.90 | 55.96 | 68.44 | 64.52 | 73.29 | 80.54 | 83.64 |
| | S.D. | 6.52 | 6.58 | 13.28 | 8.55 | 10.25 | 12.73 | 7.94 | 9.32 |
| External fat trim from RLRC, lb. | Mean | 2.64 | 4.88 | 9.70 | 15.88 | 10.53 | 14.06 | 16.24 | 19.92 |
| | S.D. | 1.79 | 2.78 | 4.04 | 4.04 | 3.10 | 6.28 | 4.33 | 2.93 |
| L. dorsi muscle area, sq. in. | Mean | 10.08 | 9.92 | 10.08 | 9.93 | 13.17 | 11.66 | 11.38 | 11.22 |
| | S.D. | 1.63 | 1.83 | 0.60 | 1.14 | 1.39 | 1.31 | 1.38 | 0.88 |
| Av. 12th rib fat thickness, in. | Mean | 0.40 | 0.64 | 0.86 | 1.06 | 0.45 | 0.65 | 0.87 | 1.10 |
| | S.D. | 0.09 | 0.04 | 0.07 | 0.06 | 0.09 | 0.06 | 0.09 | 0.10 |
| Carcass wt., lb. | Mean | 520.40 | 532.60 | 546.30 | 538.40 | 708.70 | 724.00 | 713.80 | 723.60 |
| | S.D. | 10.48 | 13.86 | 10.18 | 19.48 | 15.52 | 19.58 | 15.68 | 24.03 |

[1]S.D. = Standard deviation.

[2]RLRC = Round, loin, rib and chuck.

Table 4. Means and standard deviations of percent of carcass separable components, retail and fat trim yields for the combined and individual weight groups and fat thickness ranges.

| Trait | | Combined weight groups | 500-550 lb. | 700-750 lb. | Fat thickness ranges (combined weight groups) 0.26-0.50 | 0.51-0.75 | 0.76-1.00 | 1.01-1.25 |
|---|---|---|---|---|---|---|---|---|
| Separable muscle, % | Mean | 51.22 | 51.67[a] | 50.77[a] | 55.93[c] | 51.53[d] | 49.10[e] | 48.33[e] |
| | S.D.[1] | 4.11 | 4.55 | 3.63 | 3.46 | 2.62 | 2.65 | 2.75 |
| Separable fat, % | Mean | 36.29 | 35.54[a] | 37.04[a] | 30.29[c] | 35.59[d] | 39.01[e] | 40.27[e] |
| | S.D. | 5.21 | 5.86 | 4.42 | 4.44 | 3.22 | 3.38 | 2.92 |
| Separable bone, % | Mean | 11.30 | 11.40[a] | 11.20[a] | 12.70[c] | 11.69[d] | 10.52[e] | 10.30[e] |
| | S.D. | 1.37 | 1.58 | 1.13 | 1.25 | 0.94 | 0.96 | 0.71 |
| Retail yield from RLRC[2], % | Mean | 51.58 | 52.64[a] | 50.53[b] | 54.72[c] | 52.22[d] | 50.64[d,e] | 48.76[e] |
| | S.D. | 3.54 | 4.06 | 2.59 | 3.48 | 2.60 | 3.04 | 2.02 |
| Total retail yield, % | Mean | 62.72 | 64.15[a] | 61.28[b] | 66.60[c] | 63.77[d] | 61.48[d,e] | 59.02[e] |
| | S.D. | 4.57 | 5.37 | 3.04 | 4.36 | 3.49 | 3.71 | 2.95 |
| Total fat trim, % | Mean | 20.11 | 18.78[a] | 21.45[b] | 15.54[c] | 18.32[d] | 21.92[e] | 24.68[f] |
| | S.D. | 5.13 | 6.09 | 3.54 | 4.20 | 3.99 | 3.86 | 3.18 |
| External fat trim from RLRC, % | Mean | 3.72 | 3.13[a] | 4.31[b] | 2.04[c] | 2.91[c] | 4.12[d] | 5.81[e] |
| | S.D. | 2.03 | 2.29 | 1.54 | 1.31 | 1.79 | 1.43 | 1.30 |

[1]S.D. = Standard deviation.

[2]RLRC = Round, loin, rib and chuck.

[a,b]Means on the same line having different superscripts are highly significantly ($P < .01$) different due to the effects of carcass weight.

[c,d,e,f]Means on the sameline having different superscripts are highly significantly ($P < .01$) different due to the effects of fat thickness.

Table 4a. Means and standard deviations of percents of carcass separable components, retail and fat trim yields for the individual fat thickness ranges within each weight group.

| Trait | | 500-550 lb. weight group | | | | 700-750 lb. weight group | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Group I | Group II | Group III | Group IV | Group V | Group VI | Group VII | Group VIII |
| | | 0.26"-0.50" | 0.51"-0.75" | 0.76"-1.00" | 1.01"-1.25" | 0.26"-0.50" | 0.51"-0.75" | 0.76"-1.00" | 1.01"-1.25" |
| Separable muscle, % | Mean | 57.17 | 51.59 | 49.49 | 48.41 | 54.68 | 51.47 | 48.71 | 48.24 |
| | S.D.[1] | 3.66 | 2.61 | 2.61 | 3.46 | 2.90 | 2.76 | 2.77 | 1.99 |
| Separable fat, % | Mean | 28.22 | 35.12 | 38.51 | 40.29 | 32.36 | 36.05 | 39.51 | 40.26 |
| | S.D. | 4.75 | 3.00 | 3.28 | 3.43 | 3.10 | 3.52 | 3.57 | 2.49 |
| Separable bone, % | Mean | 13.28 | 11.83 | 10.31 | 10.17 | 12.11 | 11.55 | 10.72 | 10.44 |
| | S.D. | 1.45 | 0.92 | 0.60 | 0.58 | 0.66 | 0.98 | 1.22 | 0.83 |
| Retail yield from RLRC[2], % | Mean | 57.00[a] | 53.86[b] | 51.40[b,c,d] | 48.28[d] | 52.43[b,c] | 50.58[c,d] | 49.88[c,d] | 49.23[c,d] |
| | S.D. | 2.78 | 1.21 | 3.56 | 1.98 | 2.48 | 2.62 | 2.37 | 2.04 |
| Total retail yield, % | Mean | 69.80[a] | 66.11[b] | 62.57[b,c] | 58.12[d] | 63.41[b,c] | 61.43[c,d] | 60.39[c,d] | 59.91[c,d] |
| | S.D. | 2.88 | 1.90 | 4.73 | 2.79 | 3.03 | 3.16 | 2.00 | 2.98 |
| Total fat trim, % | Mean | 12.42[a] | 15.92[a,b] | 20.92[c,d] | 25.84[e] | 18.67[b,c] | 20.71[c,d] | 22.91[d,e] | 23.51[d,e] |
| | S.D. | 2.43 | 2.55 | 4.91 | 3.11 | 3.11 | 3.78 | 2.28 | 2.95 |
| External fat trim from RLRC, % | Mean | 1.02[a] | 1.86[a,b] | 3.62[c,d] | 6.02[f] | 3.05[b,c] | 3.97[c,d] | 4.62[d,e,f] | 5.60[e,f] |
| | S.D. | 0.69 | 1.06 | 1.49 | 1.62 | 0.92 | 1.78 | 1.25 | 0.91 |

[1]S.D. = Standard deviation.
[2]RLRC = Round, loin, rib and chuck.
[a,b,c,d,e,f]Means on the same line having different superscripts are highly significantly ($P < .01$) different due to the interaction of carcass weight and fat thickness.

Effect of Fat Thickness upon Pounds and Percent Carcass Separable Components, Retail and Fat Trim Yields. Fat thickness had a highly significant ($P < .01$) influence upon pounds (table 3) and percent (table 4) carcass separable components, retail and fat trim yields. These results were as expected since the fatter carcass yielded significantly more separable fat, and fat trim than trimmer carcasses and lower yields of separable muscle, bone and retail cuts.

Even though the range within each of the four fat thicknesses was equal (0.25 in.) variation in yield (pounds and percent) of separable muscle, fat and bone was greater between the first two groups (0.26 to 0.50 in. and 0.51 to 0.75 in.) than between the second and third (0.50 to 0.75 in. and 0.76 to 1.00 in.) and was least between the third and fourth fat thickness ranges (0.76 to 1.00 in. and 1.01 to 1.25 in.). These data provide further evidence that 12th rib fat thickness is not a good indicator of total separable carcass fat. Similar findings were reported by Cole et al. (1962), Ramsey et al. (1962), Brungardt and Bray (1963), Hedrick et al. (1963), Lewis et al. (1964), Butterfield (1965), Carpenter et al. (1965) and Miller et al. (1965).

Carcass Weight and Fat Thickness Interaction upon Pounds and Percent Carcass Separable Components, Retail and Fat Trim Yields. Only the percent retail and fat trim yields (table 4a) were significantly ($P < .01$) effected by carcass weight and fat thickness interaction.

The mean 12th rib fat thickness of the eight carcasses within corresponding groups (I and V, II and VI, III and VII, and IV and VIII) (table

3a) are similar but percents separable muscle and bone were higher, while fat was lower, for the 500 to 550 lb. weight group than the corresponding fat thickness ranges of the 700 to 750 lb. weight group (table 4a). As previously discussed, these separable component (pounds and percent) differences were greatest between the first two fat thickness ranges (I and II, and V and VI) than between the third and fourth fat thickness ranges (III and IV, and VII and VIII). Pounds and percent total retail yield varied more widely within the 500 to 550 lb. weight group (approximately 25 lb. and 11.5%) than in the 700 to 750 lb. weight group (approximately 5.75 lb. and 3.2%) (tables 3a and 4a).

## Relationships between Subjective Carcass Scores and Separable Components, Retail and Fat Trim Yields

Correlation coefficients between subjective carcass scores and carcass separable components, retail and fat trim yields for the combined and individual weight groups appear in tables 5, 6 and 7. In general, correlations between these characteristics were very similar for pounds and percent comparisons.

Low negative correlation coefficients were found between subjective conformation scores and pounds and percents separable muscle and measures of retail beef yield in the combined weight groups and within the two weight groups (range, -.11 to -.38). Significant ($P < .05$) negative correlations were found between percent total carcass separable muscle and percent retail yields with marbling score and carcass grade in the combined weight groups and the 500 to 550 lb. weight group (range, -.39 to -.51).

Table 5. Simple correlation coefficients between subjective carcass scores and carcass separable components, retail and fat trim yields for the combined weight groups.

| Subjective score | Separable muscle | | Separable fat | | Separable bone | | Boned trimmed retail RLRC[1] | | Boned trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Conformation of: | | | | | | | | | | | | | | |
| Carcass | -.12 | -.27 | 0.24 | 0.36 | -.34 | -.56 | -.12 | -.23 | -.13 | -.24 | 0.27 | 0.36 | 0.31 | 0.36 |
| Hindquarter | -.10 | -.25 | 0.22 | 0.33 | -.30 | -.51 | -.07 | -.17 | -.09 | -.18 | 0.22 | 0.29 | 0.24 | 0.27 |
| Forequarter | -.03 | -.29 | 0.32 | 0.39 | -.26 | -.55 | -.05 | -.26 | -.07 | -.31 | 0.36 | 0.42 | 0.41 | 0.44 |
| Round | -.12 | -.21 | 0.18 | 0.30 | -.34 | -.52 | -.09 | -.14 | -.10 | -.14 | 0.19 | 0.26 | 0.21 | 0.24 |
| Carcass: | | | | | | | | | | | | | | |
| Maturity | 0.64 | 0.18 | 0.26 | -.18 | 0.62 | 0.21 | 0.64 | 0.10 | 0.65 | 0.05 | 0.19 | -.09 | 0.08 | -.06 |
| Marbling | 0.09 | -.39 | 0.47 | 0.48 | -.12 | -.58 | 0.10 | -.39 | 0.08 | -.43 | 0.47 | 0.46 | 0.37 | 0.37 |
| Grade | -.06 | -.45 | 0.42 | 0.54 | -.28 | -.67 | -.05 | -.43 | -.06 | -.44 | 0.43 | 0.50 | 0.38 | 0.41 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 6. Simple correlation coefficients between subjective carcass scores and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Subjective score | Separable muscle | | Separable fat | | Separable bone | | Boned trimmed retail RLRC[1] | | Boned trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Conformation of: | | | | | | | | | | | | | | |
| Carcass | -.10 | -.22 | 0.36 | 0.34 | -.54 | -.57 | -.18 | -.22 | -.24 | -.27 | 0.37 | 0.36 | 0.38 | 0.38 |
| Hindquarter | -.09 | -.20 | 0.33 | 0.30 | -.48 | -.52 | -.09 | -.16 | -.14 | -.21 | 0.31 | 0.30 | 0.31 | 0.30 |
| Forequarter | -.14 | -.26 | 0.40 | 0.37 | -.51 | -.55 | -.23 | -.28 | -.27 | -.31 | 0.40 | 0.40 | 0.44 | 0.43 |
| Round | -.05 | -.16 | 0.30 | 0.27 | -.49 | -.52 | -.04 | -.11 | -.09 | -.14 | 0.25 | 0.24 | 0.23 | 0.22 |
| Carcass maturity | 0.14 | 0.15 | -.20 | -.22 | 0.34 | 0.33 | 0.17 | 0.10 | 0.20 | 0.13 | -.10 | -.13 | -.17 | -.18 |
| Marbling | -.30 | -.51 | 0.66 | 0.60 | -.66 | -.74 | -.25 | -.45 | -.30 | -.48 | 0.56 | 0.52 | 0.46 | 0.45 |
| Carcass grade | -.32 | -.51 | 0.66 | 0.62 | -.71 | -.78 | -.28 | -.44 | -.33 | -.48 | 0.55 | 0.53 | 0.49 | 0.47 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 7. Simple correlation coefficients between subjective carcass scores and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Subjective score | Separable muscle | | Separable fat | | Separable bone | | Boned trimmed retail RLRC[1] | | Boned trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Conformation of: | | | | | | | | | | | | | | |
| Carcass | -.38 | -.36 | 0.40 | 0.43 | -.54 | -.55 | -.27 | -.24 | -.25 | -.24 | 0.38 | 0.40 | 0.37 | 0.38 |
| Hindquarter | -.31 | -.35 | 0.41 | 0.40 | -.47 | -.51 | -.15 | -.20 | -.13 | -.18 | 0.34 | 0.33 | 0.29 | 0.29 |
| Forequarter | -.37 | -.31 | 0.35 | 0.40 | -.57 | -.56 | -.37 | -.25 | -.39 | -.30 | 0.42 | 0.48 | 0.40 | 0.44 |
| Round | -.38 | -.32 | 0.34 | 0.39 | -.55 | -.53 | -.24 | -.20 | -.22 | -.20 | 0.35 | 0.37 | 0.33 | 0.34 |
| Carcass maturity | 0.54 | 0.45 | -.38 | -.45 | 0.37 | 0.33 | 0.54 | 0.51 | 0.54 | 0.54 | -.52 | -.56 | -.40 | -.42 |
| Marbling | -.25 | -.21 | 0.20 | 0.25 | -.36 | -.35 | -.27 | -.23 | -.26 | -.23 | 0.23 | 0.26 | 0.09 | 0.12 |
| Carcass grade | -.36 | -.33 | 0.33 | 0.38 | -.47 | -.47 | -.36 | -.35 | -.33 | -.32 | 0.36 | 0.40 | 0.21 | 0.24 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Correlation coefficients between marbling score and carcass grade with percents separable muscle and retail yields for the 700 to 750 lb. weight group were considerably lower than in the 500 to 550 lb. weight group (range, -.21 to -.35). The relationships between pounds of separable muscle and retail beef yields were also negative but in most instances lower than for percents, on both a combined and within weight group basis. These low relationships between conformation scores, carcass grade and marbling with retail yields support the findings of Cole et al. (1964) and Kirton (1964).

Positive correlation coefficients were observed between conformation scores and both weights and percents of separable carcass fat and fat trim yields in the combined and individual weight groups (range, 0.18 to 0.48). While carcass and forequarter conformation scores were more highly related to percent separable fat and fat trim yields than round and hindquarter conformation scores, little difference in the magnitude of these correlation coefficients existed between the two weight groups and combined weight groups. These data indicate that conformation score is influenced by degree of fat even though a deliberate attempt was made in this study to evaluate degree of muscling without regard for fat. This was accomplished on the ribbed carcass after measuring fat thickness at the twelfth rib. These results substantiate the statement of Briskey and Bray (1964) that evaluation of conformation is influenced by fatness, especially in very fat carcasses. These results also agree with the findings of Cole et al. (1964) and Kirton (1964) and support the statement of

Hedrick et al. (1963) who stated that "for a carcass to have a high cut-out, it is difficult to compensate for excess fat deposition with superior muscle development."

Carcass grade and marbling score were also positively correlated with carcass separable fat and fat trim yields in the combined and individual weight groups (range, 0.09 to 0.66). Highly significant ($P < .01$) correlations between these characteristics were found in the 500 to 550 lb. weight group (range, 0.45 to 0.66).

Carcass maturity score was positively related to measures of carcass muscle and bone (range, 0.10 to 0.64); whereas, it was negatively related to percent separable carcass fat and fat trim yields in the combined weight groups and to both pounds and percent separable carcass fat and fat trim yields within weight groups (range, -.06 to -.56).

## Relationships Between Linear Fat Measurements and Separable Components, Retail and Fat Trim Yields

Simple correlation coefficients between the fat probes and fat measurements at the 12th rib with pounds and percent separable components, retail beef and fat trim yields for the combined weight groups as well as within weight groups appear in tables 8, 9 and 10.

Correlation coefficients between fat measurements and percent separable components and retail yields were considerably higher, in most instances, than weight comparisons in the combined weight groups (table 8). This difference in magnitude of correlations was not observed for pounds and percent between fat trim yields and the linear fat measurements.

Table 8. Simple correlation coefficients between linear fat measurements and carcass separable components, retail and fat trim yields for the combined weight groups.

| Fat probes | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| 5th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.07 | -.71 | 0.66 | 0.77 | -.25 | -.76 | 0.00 | -.64 | -.01 | -.63 | 0.65 | 0.69 | 0.64 | 0.65 |
| 8 in. | -.12 | -.42 | 0.33 | 0.46 | -.20 | -.46 | -.07 | -.38 | -.07 | -.36 | 0.34 | 0.40 | 0.35 | 0.38 |
| 12 in. | 0.15 | -.50 | 0.59 | 0.54 | 0.06 | -.46 | 0.22 | -.49 | 0.20 | -.50 | 0.59 | 0.53 | 0.59 | 0.55 |
| 8th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.33 | -.57 | 0.33 | 0.61 | -.44 | -.62 | -.30 | -.52 | -.30 | -.51 | 0.41 | 0.57 | 0.45 | 0.52 |
| 8 in. | -.04 | -.58 | 0.56 | 0.60 | -.11 | -.51 | 0.03 | -.56 | 0.04 | -.52 | 0.58 | 0.57 | 0.62 | 0.60 |
| 12 in. | 0.07 | -.55 | 0.60 | 0.59 | -.06 | -.56 | 0.12 | -.59 | 0.13 | -.56 | 0.63 | 0.59 | 0.67 | 0.63 |
| 11th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.22 | -.58 | 0.42 | 0.60 | -.30 | -.58 | -.14 | -.53 | -.15 | -.52 | 0.48 | 0.57 | 0.54 | 0.59 |
| 8 in. | -.10 | -.63 | 0.56 | 0.66 | -.22 | -.62 | -.05 | -.61 | -.04 | -.57 | 0.59 | 0.62 | 0.66 | 0.67 |
| 12 in. | 0.07 | -.59 | 0.66 | 0.63 | -.06 | -.59 | 0.12 | -.63 | 0.13 | -.59 | 0.68 | 0.62 | 0.72 | 0.67 |
| 1st Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.11 | -.60 | 0.53 | 0.63 | -.21 | -.58 | -.10 | -.64 | -.09 | -.60 | 0.59 | 0.64 | 0.66 | 0.68 |
| 8 in. | -.09 | -.57 | 0.50 | 0.60 | -.14 | -.49 | -.03 | -.54 | -.05 | -.58 | 0.57 | 0.61 | 0.61 | 0.63 |
| 12 in. | 0.19 | -.62 | 0.75 | 0.64 | 0.12 | -.51 | 0.25 | -.66 | 0.23 | -.66 | 0.76 | 0.67 | 0.75 | 0.69 |
| 4th Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.04 | -.56 | 0.53 | 0.58 | -.11 | -.50 | 0.00 | -.60 | 0.00 | -.58 | 0.57 | 0.58 | 0.66 | 0.66 |
| 8 in. | -.27 | -.52 | 0.34 | 0.54 | -.33 | -.50 | -.23 | -.52 | -.22 | -.48 | 0.42 | 0.52 | 0.47 | 0.51 |
| 12 in. | 0.04 | -.60 | 0.61 | 0.61 | 0.00 | -.46 | 0.06 | -.68 | 0.06 | -.66 | 0.69 | 0.66 | 0.74 | 0.70 |
| 6th Lumbar | | | | | | | | | | | | | | |
| 4 in. | 0.05 | -.64 | 0.68 | 0.65 | -.01 | -.53 | 0.14 | -.60 | 0.12 | -.61 | 0.68 | 0.63 | 0.70 | 0.65 |
| 8 in. | -.09 | -.61 | 0.52 | 0.61 | -.12 | -.49 | -.05 | -.61 | -.06 | -.58 | 0.57 | 0.60 | 0.57 | 0.58 |
| 12 in. | 0.16 | -.44 | 0.55 | 0.46 | 0.08 | -.42 | 0.19 | -.47 | 0.18 | -.49 | 0.57 | 0.51 | 0.60 | 0.55 |

Table 8. Simple correlation coefficients between linear fat measurements and carcass separable components, retail and fat trim yields for the combined weight groups. (continued)

| Fat probes | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| 3rd Sacral | | | | | | | | | | | | | | |
| 4 in. | -.03 | -.65 | 0.62 | 0.63 | -.05 | -.47 | 0.09 | -.52 | 0.08 | -.50 | 0.57 | 0.53 | 0.63 | 0.58 |
| 8 in. | -.01 | -.62 | 0.58 | 0.58 | 0.01 | -.37 | 0.08 | -.56 | 0.08 | -.54 | 0.56 | 0.53 | 0.60 | 0.56 |
| 12 in. | -.39 | -.61 | 0.30 | 0.60 | -.37 | -.43 | -.35 | -.57 | -.34 | -.52 | 0.37 | 0.56 | 0.44 | 0.53 |
| 5th Sacral | | | | | | | | | | | | | | |
| 4 in. | 0.04 | -.50 | 0.51 | 0.51 | -.03 | -.43 | 0.04 | -.55 | 0.04 | -.52 | 0.52 | 0.50 | 0.53 | 0.50 |
| 8 in. | 0.04 | -.58 | 0.59 | 0.56 | 0.02 | -.41 | 0.10 | -.53 | 0.09 | -.52 | 0.58 | 0.53 | 0.60 | 0.56 |
| 12 in. | -.01 | -.51 | 0.50 | 0.52 | -.10 | -.48 | 0.04 | -.48 | 0.04 | -.45 | 0.48 | 0.46 | 0.53 | 0.49 |
| 12th Rib Fat Measurements | | | | | | | | | | | | | | |
| A | -.07 | -.53 | 0.49 | 0.55 | -.13 | -.46 | 0.04 | -.46 | 0.03 | -.45 | 0.48 | 0.48 | 0.55 | 0.54 |
| B | -.29 | -.60 | 0.40 | 0.66 | -.44 | -.70 | -.24 | -.55 | -.24 | -.54 | 0.46 | 0.61 | 0.51 | 0.58 |
| C | -.33 | -.68 | 0.45 | 0.72 | -.48 | -.74 | -.26 | -.60 | -.26 | -.57 | 0.51 | 0.66 | 0.59 | 0.66 |
| D | -.14 | -.62 | 0.53 | 0.64 | -.21 | -.56 | -.06 | -.56 | -.06 | -.54 | 0.55 | 0.58 | 0.64 | 0.64 |
| E | -.15 | -.60 | 0.50 | 0.63 | -.23 | -.56 | -.05 | -.51 | -.06 | -.51 | 0.51 | 0.56 | 0.59 | 0.61 |
| F | -.15 | -.57 | 0.46 | 0.60 | -.25 | -.56 | -.02 | -.39 | -.03 | -.40 | 0.42 | 0.47 | 0.49 | 0.51 |
| G | -.03 | -.57 | 0.5 | -.55 | -.13 | -.55 | 0.10 | -.44 | 0.09 | -.43 | 0.52 | 0.50 | 0.57 | 0.54 |
| Av. A,B,C. | -.26 | -.73 | 0.55 | 0.78 | -.41 | -.77 | -.16 | -.78 | -.17 | -.64 | 0.59 | 0.71 | 0.68 | 0.72 |
| Depth of brisket fat | 0.06 | -.52 | 0.56 | 0.55 | 0.01 | -.42 | 0.04 | -.59 | 0.02 | -.60 | 0.60 | 0.58 | 0.57 | 0.54 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 9. Simple correlation coefficients between linear fat measurements and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Fat probes | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| 5th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.68 | -.78 | 0.84 | 0.84 | -.81 | -.83 | -.59 | -.72 | -.62 | -.74 | 0.77 | 0.76 | 0.70 | 0.69 |
| 8 in. | -.39 | -.48 | 0.55 | 0.54 | -.59 | -.62 | -.35 | -.47 | -.36 | -.47 | 0.52 | 0.50 | 0.45 | 0.44 |
| 12 in. | -.58 | -.65 | 0.67 | 0.68 | -.64 | -.64 | -.56 | -.63 | -.58 | -.64 | 0.63 | 0.64 | 0.62 | 0.62 |
| 8th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.52 | -.58 | 0.63 | 0.64 | -.64 | -.65 | -.47 | -.58 | -.50 | -.60 | 0.63 | 0.62 | 0.58 | 0.56 |
| 8 in. | -.59 | -.59 | 0.55 | 0.58 | -.48 | -.46 | -.54 | -.56 | -.53 | -.55 | 0.53 | 0.54 | 0.58 | 0.58 |
| 12 in. | -.58 | -.62 | 0.63 | 0.64 | -.63 | -.63 | -.54 | -.63 | -.54 | -.62 | 0.62 | 0.62 | 0.65 | 0.64 |
| 11th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.55 | -.58 | 0.58 | 0.61 | -.65 | -.63 | -.52 | -.58 | -.52 | -.59 | 0.61 | 0.61 | 0.63 | 0.63 |
| 8 in. | -.54 | -.60 | 0.62 | 0.63 | -.61 | -.62 | -.54 | -.62 | -.52 | -.60 | 0.60 | 0.60 | 0.62 | 0.61 |
| 12 in. | -.46 | -.52 | 0.58 | 0.59 | -.64 | -.64 | -.54 | -.60 | -.53 | -.59 | 0.60 | 0.61 | 0.62 | 0.62 |
| 1st Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.53 | -.57 | 0.58 | 0.60 | -.60 | -.59 | -.62 | -.64 | -.61 | -.63 | 0.60 | 0.62 | 0.62 | 0.63 |
| 8 in. | -.56 | -.63 | 0.68 | 0.68 | -.61 | -.62 | -.53 | -.61 | -.60 | -.67 | 0.69 | 0.69 | 0.69 | 0.69 |
| 12 in. | -.60 | -.66 | 0.68 | 0.69 | -.64 | -.65 | -.62 | -.71 | -.64 | -.72 | 0.72 | 0.72 | 0.73 | 0.72 |
| 4th Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.55 | -.51 | 0.47 | 0.52 | -.52 | -.48 | -.59 | -.57 | -.56 | -.55 | 0.52 | 0.54 | 0.59 | 0.61 |
| 8 in. | -.55 | -.64 | 0.68 | 0.67 | -.60 | -.63 | -.57 | -.67 | -.60 | -.70 | 0.70 | 0.69 | 0.66 | 0.65 |
| 12 in. | -.69 | -.71 | 0.67 | 0.70 | -.56 | -.55 | -.67 | -.74 | -.66 | -.73 | 0.68 | 0.68 | 0.70 | 0.69 |
| 6th Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.57 | -.64 | 0.65 | 0.65 | -.52 | -.54 | -.54 | -.62 | -.56 | -.63 | 0.61 | 0.61 | 0.58 | 0.58 |
| 8 in. | -.55 | -.61 | 0.62 | 0.61 | -.56 | -.58 | -.54 | -.62 | -.49 | -.57 | 0.59 | 0.58 | 0.55 | 0.54 |
| 12 in. | -.34 | -.45 | 0.52 | 0.49 | -.51 | -.55 | -.40 | -.48 | -.43 | -.51 | 0.52 | 0.52 | 0.52 | 0.52 |

Table 9. Simple correlation coefficients between linear fat measurements and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group. (continued)

| Fat probes | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| 3rd Sacral | | | | | | | | | | | | | | |
| 4 in. | -.63 | -.64 | 0.56 | 0.59 | -.44 | -.44 | -.41 | -.47 | -.41 | -.46 | 0.44 | 0.44 | 0.44 | 0.44 |
| 8 in. | -.65 | -.60 | 0.50 | 0.54 | -.31 | -.28 | -.60 | -.58 | -.58 | -.57 | 0.49 | 0.51 | 0.46 | 0.47 |
| 12 in. | -.62 | -.64 | 0.59 | 0.60 | -.34 | -.35 | -.63 | -.68 | -.62 | -.67 | 0.65 | 0.64 | 0.60 | 0.59 |
| 5th Sacral | | | | | | | | | | | | | | |
| 4 in. | -.60 | -.58 | 0.51 | 0.55 | -.50 | -.47 | -.51 | -.54 | -.47 | -.50 | 0.45 | 0.46 | 0.41 | 0.41 |
| 8 in. | -.54 | -.57 | 0.53 | 0.55 | -.44 | -.45 | -.43 | -.49 | -.40 | -.45 | 0.42 | 0.42 | 0.42 | 0.42 |
| 12 in. | -.50 | -.54 | 0.51 | 0.52 | -.45 | -.45 | -.38 | -.43 | -.37 | -.41 | 0.36 | 0.36 | 0.34 | 0.34 |
| 12th Rib Fat measurement | | | | | | | | | | | | | | |
| A | -.50 | -.48 | 0.48 | 0.53 | -.55 | -.51 | -.59 | -.57 | -.62 | -.61 | 0.58 | 0.60 | 0.64 | 0.66 |
| B | -.53 | -.67 | 0.75 | 0.73 | -.72 | -.76 | -.50 | -.68 | -.51 | -.67 | 0.72 | 0.70 | 0.63 | 0.62 |
| C | -.60 | -.71 | 0.78 | 0.77 | -.78 | -.81 | -.58 | -.76 | -.56 | -.73 | 0.77 | 0.75 | 0.77 | 0.75 |
| D | -.52 | -.60 | 0.63 | 0.62 | -.53 | -.56 | -.47 | -.58 | -.48 | -.58 | 0.58 | 0.57 | 0.64 | 0.63 |
| E | -.53 | -.56 | 0.57 | 0.59 | -.52 | -.52 | -.49 | -.55 | -.52 | -.57 | 0.57 | 0.58 | 0.64 | 0.64 |
| F | -.54 | -.59 | 0.58 | 0.60 | -.56 | -.56 | -.39 | -.47 | -.42 | -.50 | 0.51 | 0.51 | 0.53 | 0.53 |
| G | -.56 | -.57 | 0.56 | 0.59 | -.60 | -.58 | -.40 | -.45 | -.42 | -.47 | 0.49 | 0.50 | 0.49 | 0.49 |
| Av. A,B,C | -.66 | -.76 | 0.83 | 0.83 | -.84 | -.86 | -.68 | -.82 | -.69 | -.82 | 0.84 | 0.84 | 0.82 | 0.81 |
| Depth of brisket fat | -.62 | -.59 | 0.57 | 0.63 | -.54 | -.50 | -.61 | -.58 | -.64 | -.62 | 0.55 | 0.58 | 0.52 | 0.53 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 10. Simple correlation coefficients between linear fat measurements and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Fat probes | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| 5th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.59 | -.59 | 0.61 | 0.64 | -.63 | -.67 | -.35 | -.43 | -.28 | -.36 | 0.54 | 0.53 | 0.51 | 0.51 |
| 8 in. | -.31 | -.36 | 0.35 | 0.35 | -.20 | -.24 | -.15 | -.25 | -.10 | -.20 | 0.29 | 0.27 | 0.31 | 0.30 |
| 12 in. | -.29 | -.34 | 0.36 | 0.36 | -.22 | -.27 | -.02 | -.18 | -.01 | -.14 | 0.33 | 0.29 | 0.38 | 0.36 |
| 8th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.61 | -.58 | 0.56 | 0.61 | -.57 | -.59 | -.49 | -.57 | -.42 | -.52 | 0.61 | 0.61 | 0.59 | 0.60 |
| 8 in. | -.58 | -.57 | 0.58 | 0.61 | -.56 | -.59 | -.37 | -.51 | -.28 | -.43 | 0.63 | 0.60 | 0.62 | 0.61 |
| 12 in. | -.47 | -.48 | 0.49 | 0.52 | -.49 | -.53 | -.26 | -.46 | -.18 | -.37 | 0.55 | 0.50 | 0.58 | 0.56 |
| 11th Thoracic | | | | | | | | | | | | | | |
| 4 in. | -.51 | -.59 | 0.61 | 0.59 | -.40 | -.48 | -.21 | -.49 | -.14 | -.42 | 0.62 | 0.54 | 0.60 | 0.57 |
| 8 in. | -.67 | -.66 | 0.64 | 0.69 | -.60 | -.63 | -.44 | -.56 | -.35 | -.47 | 0.65 | 0.64 | 0.73 | 0.73 |
| 12 in. | -.67 | -.69 | 0.67 | 0.70 | -.54 | -.59 | -.40 | -.61 | -.30 | -.52 | 0.67 | 0.62 | 0.71 | 0.70 |
| 1st Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.57 | -.64 | 0.66 | 0.66 | -.51 | -.58 | -.44 | -.63 | -.34 | -.54 | 0.73 | 0.69 | 0.76 | 0.75 |
| 8 in. | -.49 | -.48 | 0.44 | 0.46 | -.29 | -.30 | -.25 | -.41 | -.22 | -.39 | 0.52 | 0.48 | 0.52 | 0.51 |
| 12 in. | -.54 | -.64 | 0.64 | 0.62 | -.31 | -.40 | -.26 | -.49 | -.22 | -.47 | 0.60 | 0.54 | 0.59 | 0.57 |
| 4th Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.64 | -.62 | 0.59 | 0.63 | -.52 | -.54 | -.46 | -.56 | -.39 | -.51 | 0.62 | 0.60 | 0.71 | 0.70 |
| 8 in. | -.48 | -.49 | 0.49 | 0.51 | -.42 | -.46 | -.37 | -.53 | -.27 | -.44 | 0.56 | 0.52 | 0.53 | 0.52 |
| 12 in. | -.50 | -.51 | 0.49 | 0.51 | -.34 | -.37 | 0.43 | -.57 | -.38 | -.53 | 0.66 | 0.64 | 0.71 | 0.71 |
| 6th Lumbar | | | | | | | | | | | | | | |
| 4 in. | -.66 | -.68 | 0.66 | 0.68 | -.53 | -.58 | -.36 | -.51 | -.33 | -.49 | 0.67 | 0.64 | 0.70 | 0.70 |
| 8 in. | -.54 | -.60 | 0.57 | 0.57 | -.28 | -.33 | -.41 | -.54 | -.41 | -.57 | 0.65 | 0.62 | 0.59 | 0.59 |
| 12 in. | -.46 | -.41 | 0.33 | 0.38 | -.27 | -.25 | -.29 | -.31 | -.27 | -.29 | 0.36 | 0.37 | 0.48 | 0.48 |

Table 10. Simple correlation coefficients between linear fat measurements and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group. (continued)

| Fat probes | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| 3rd Sacral | | | | | | | | | | | | | | |
| 4 in. | -.70 | -.68 | 0.64 | 0.69 | -.53 | -.55 | -.44 | -.52 | -.39 | -.49 | 0.63 | 0.63 | 0.71 | 0.71 |
| 8 in. | -.62 | -.64 | 0.61 | 0.63 | -.45 | -.50 | -.26 | -.44 | -.22 | -.40 | 0.55 | 0.50 | 0.63 | 0.61 |
| 12 in. | -.65 | -.66 | 0.66 | 0.69 | -.63 | -.68 | -.36 | -.52 | -.21 | -.37 | 0.58 | 0.54 | 0.63 | 0.62 |
| 5th Sacral | | | | | | | | | | | | | | |
| 4 in. | -.47 | -.38 | 0.34 | 0.41 | -.43 | -.40 | -.54 | -.46 | -.51 | -.45 | 0.45 | 0.51 | 0.51 | 0.54 |
| 8 in. | -.58 | -.60 | 0.56 | 0.58 | -.34 | -.37 | -.43 | -.52 | -.44 | -.56 | 0.65 | 0.64 | 0.67 | 0.67 |
| 12 in. | -.52 | -.45 | 0.44 | 0.50 | -.54 | -.53 | -.47 | -.47 | -.39 | -.40 | 0.54 | 0.56 | 0.65 | 0.66 |
| 12th Rib fat measurements: | | | | | | | | | | | | | | |
| A | -.53 | -.60 | 0.60 | 0.59 | -.37 | -.45 | -.07 | -.33 | -.02 | -.28 | 0.44 | 0.35 | 0.48 | 0.44 |
| B | -.52 | -.52 | 0.55 | 0.57 | -.57 | -.61 | -.32 | -.44 | -.28 | -.42 | 0.56 | 0.54 | 0.64 | 0.63 |
| C | -.60 | -.65 | 0.69 | 0.70 | -.60 | -.68 | -.29 | -.47 | -.26 | -.45 | 0.69 | 0.65 | 0.67 | 0.66 |
| D | -.67 | -.64 | 0.62 | 0.66 | -.56 | -.58 | -.41 | -.54 | -.36 | -.51 | 0.64 | 0.61 | 0.69 | 0.68 |
| E | -.65 | -.64 | 0.63 | 0.67 | -.59 | -.62 | -.29 | -.43 | -.25 | -.39 | 0.55 | 0.52 | 0.56 | 0.55 |
| F | -.54 | -.54 | 0.56 | 0.58 | -.53 | -.56 | -.12 | -.24 | -.10 | -.21 | 0.42 | 0.39 | 0.48 | 0.47 |
| G | -.58 | -.57 | 0.56 | 0.59 | -.51 | -.54 | -.20 | -.32 | -.14 | -.27 | 0.49 | 0.46 | 0.56 | 0.55 |
| Av. A,B,C | -.65 | -.70 | 0.72 | 0.73 | -.60 | -.67 | -.25 | -.48 | -.20 | -.44 | 0.64 | 0.58 | 0.69 | 0.67 |
| Dept. of brisket fat | -.50 | -.46 | 0.42 | 0.46 | -.37 | -.36 | -.59 | -.54 | -.56 | -.54 | 0.54 | 0.58 | 0.46 | 0.45 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

These data suggest that linear fat measurements, in similar fat thickness groups but different weight groups, were similar in magnitude; whereas, the pounds separable components and retail beef yields were widely different between weight groups (table 3). However, fat trim yields were similar between weight groups and the relationships between the linear fat measurements and pounds and percent fat trim yields were more constant.

In contast to the combined weight groups, the within weight group (50 lb. weight range) correlation coefficients (tables 9 and 10) between linear fat measurements and pounds and percent separable components, retail and fat trim yields were similar. These differences in correlations between weights and percents on a combined weight group basis agree with the results of Orme (1958), Orme (1963), Allen (1963), Hedrick et al. (1963) and Miller et al. (1965).

The fat measruements most highly related to percent separable components and retail yields for the combined weight groups were: the 5th thoracic fat probe at four inches, fat measurement C over the 12th rib and the average of fat measurements A, B and C (range, -.57 to 0.78). These three linear measurements of fat also showed the highest relationship to both pounds and percent separable components and retail yields in the 500 to 550 lb. weight group (range, 0.69 to -.86). However, in the 700 to 750 lb. weight group, most of the relationships between these fat measurements were markedly reduced (range, -.36 to 0.73), but all correlations involving percents and most for weights remained highly significant. These findings support those of Lewis et al. (1964) who

reported significant ($P < .05$) correlations between fat probes and measurements and percent retail yield of the round, loin, rib and chuck. Since correlations were higher within the 500 to 550 lb. weight group than in the 700 to 750 lb. weight group, it appears that linear measurements of fat are more accurate indicators of separable muscle, fat, bone and retail yields for lighter carcasses than for heavier, fatter carcasses.

Within the 700 to 750 lb. weight group, the fat probes in the lumbar region were more highly correlated (range, -.22 to 0.76) with separable components than the same probes within the 500 to 550 lb. weight group (range, -.34 to -.74). These data indicate that in the heavier carcasses, covariances between fat probes in the lumbar region and separable components, retail and fat trim yields were greater in most instances than those in the 500 to 550 lb. weight group. Correlation coefficients between fat probes and measurements and fat trim yields for the combined weight groups as well as within weight groups were highly significant ($P < .01$) in most instances (range, 0.27 to 0.84).

Depth of brisket fat was negatively correlated ($P < .01$) with percent separable muscle, bone and retail yields for the combined weight groups (range, -.42 to -.60), but positively correlated with pounds of these components (range, 0.01 to 0.06). Within the two weight groups the depth of brisket fat and separable muscle and bone and retail yields were negative but significantly ($P < .05$) correlated when expressed as either pounds or percent. Depth of brisket fat was highly significantly correlated ($P < .01$) with pounds and percent separable fat and fat trim yields for the combined as well as the two individual weight groups (range, 0.42 to 0.63).

## Relationships Between Some Linear Carcass Measurements and Separable Components, Retail and Fat Trim Yields

Simple correlation coefficients between linear carcass measurements taken and separable components, retail and fat trim yields for the combined weight groups and for each weight group appear in tables 11 and 12. Correlation coefficients between depth of rib measurements and separable components, retail and fat trim yields were generally lower (range, 0.00 to 0.36) than those between other measurements and the same components. This was true in the combined weight groups as well as the two weight groups.

Length of round was highly correlated to pounds of separable muscle, bone and retail yields in the combined weight groups (0.82 to 0.92). However, these relationships were reduced when calculating correlations between this measurement and percentages or for pounds and/or percentages on a within weight group basis (range, 0.02 to 0.61), except for percent bone. In the case of bone, the correlation coefficients were still large enough to be useful for predictive purposes (range, 0.43 to 0.82). Length of round was negatively related to pounds and percent separable fat and fat trim yields within weight groups (range, -.47 to -.70). These findings are similar to those of Orme (1963) who reported measurements of carcass length and length of fore or hind legs in lambs was negatively related to measures of carcass fat. Cole et al. (1962) also reported a negative relationship between length of carcass and separable carcass fat.

Circumference of round generally showed a higher relationship to measurements of carcass fat than to bone or carcass muscling for the

Table 11. Simple correlation coefficients between some linear carcass measurements and carcass separable components, retail and fat trim yields for the combined weight groups.

| Linear measurement | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Depth 10th rib | 0.25 | -.15 | 0.35 | 0.18 | 0.15 | -.21 | 0.35 | -.04 | 0.36 | -.04 | 0.22 | 0.07 | 0.18 | 0.08 |
| Depth 12th rib | 0.23 | -.03 | 0.22 | 0.05 | 0.18 | -.06 | 0.33 | 0.06 | 0.32 | 0.04 | 0.13 | 0.00 | 0.06 | -.02 |
| Length of round | 0.82 | 0.19 | 0.37 | -.23 | 0.92 | 0.43 | 0.83 | 0.02 | 0.82 | 0.03 | 0.26 | -.16 | 0.11 | -.11 |
| Circ.[2] of round | 0.53 | -.29 | 0.69 | 0.32 | 0.43 | -.25 | 0.56 | -.40 | 0.55 | -.40 | 0.66 | 0.39 | 0.58 | 0.42 |
| L.dorsi muscle area | 0.67 | 0.26 | 0.25 | -.17 | 0.48 | -.01 | 0.62 | 0.12 | 0.60 | 0.07 | 0.20 | -.05 | 0.10 | -.02 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.
[2]Circ. = circumference.

Table 12. Simple correlation coefficients between some linear carcass measurements and carcass separable components, retail and fat trim yields for the 500 to 550 lb. and 700 to 750 lb. weight groups.

| Linear measurement | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| **500 to 550 lb. weight group** | | | | | | | | | | | | | | |
| Depth 10th rib | 0.09 | -.03 | 0.12 | 0.08 | -.14 | -.20 | 0.17 | 0.08 | 0.11 | 0.03 | 0.03 | 0.02 | -.07 | -.07 |
| Depth 12th rib | 0.13 | 0.07 | 0.00 | -.03 | -.03 | -.06 | 0.22 | 0.13 | 0.16 | 0.09 | 0.00 | -.02 | -.10 | -.11 |
| Length of round | 0.36 | 0.48 | -.61 | -.59 | 0.80 | 0.82 | 0.48 | 0.56 | 0.53 | 0.61 | -.70 | -.69 | -.66 | -.65 |
| Circ.[2] of round | -.13 | -.12 | 0.14 | 0.16 | -.29 | -.26 | -.13 | -.13 | -.15 | -.15 | 0.22 | 0.23 | 0.22 | 0.22 |
| L.dorsi muscle area | 0.44 | 0.31 | -.13 | -.18 | -.11 | -.16 | 0.34 | 0.30 | 0.25 | 0.22 | -.12 | -.14 | -.13 | -.13 |
| **700 to 750 lb. weight group** | | | | | | | | | | | | | | |
| Depth 10th rib | -.12 | -.24 | 0.29 | 0.23 | -.11 | -.20 | 0.25 | 0.02 | 0.31 | 0.11 | 0.03 | -.06 | 0.13 | 0.09 |
| Depth 12th rib | 0.04 | -.13 | 0.20 | 0.11 | 0.09 | -.02 | 0.42 | 0.13 | 0.45 | 0.17 | -.04 | -.15 | 0.01 | -.04 |
| Length of round | 0.52 | 0.43 | -.47 | -.55 | 0.82 | 0.81 | 0.46 | 0.38 | 0.37 | 0.29 | -.48 | -.53 | -.49 | -.52 |
| Circ. of round | -.48 | -.51 | 0.49 | 0.49 | -.30 | -.34 | -.35 | -.47 | -.32 | -.45 | 0.50 | 0.47 | 0.46 | 0.45 |
| L.dorsi muscle area | 0.45 | 0.50 | -.49 | -.48 | 0.25 | 0.30 | 0.30 | 0.47 | 0.31 | 0.51 | -.50 | -.47 | -.41 | -.40 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.
[2]Circ. = circumference.

combined weight groups. In the500 to 550 lb. weight group circumference of round showed low relationships to both weight and percent separable components, retail and fat trim yields (range, -.12 to -.29).

L. dorsi muscle area was highly significantly ($P < .01$) correlated with pounds of separable muscle and retail yields for the combined weight groups (range, 0.60 to 0.67). Correlations between L. dorsi muscle area and percent separable components and retail yields on a combined weight group basis as well as within weight group correlations were markedly lower. Cole et al. (1962), Field et al. (1963) and Henderson et al. (1966) show the same relationships between L. dorsi muscle area and weight and percent measures of carcass muscling.

## Multiple Regression Analyses of Objective Carcass Measurements on Separable Components, Retail and Fat Trim Yields

Only those multiple correlations which were high enough to be useful for predictive purposes and include a practical number of independent variables will be reported in the results and discussion portion of this manuscript. Other regression analyses which were calculated will be found in the supplement.

Multiple Regression Analyses of Total Carcass Separable Fat on Objective Carcass Measurements. In the combined weight groups, 86% and 94% of the variation in percent and pounds, respectively, of separable carcass fat could be accounted for with a combination of carcass weight and seven probes and fat thickness measurements (suppl. p. 168).

In the 500 to 550 lb. weight group, 90% of the variation in weight of separable fat and 89% of the variation in percent separable fat could be accounted for using the combination of variables in tables 13 and 14.

Table 13. Coefficient of determination between weight of carcass separable fat and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -143.153 | | 0.00 | |
| Carcass wt. | 0.348 | 0.338 | 0.00 | 0.82 |
| Probe-5th Thor.-4 in.[2] | 1.826 | 0.445 | 0.00 | 0.81 |
| Probe-6th Lumb.-8 in.[3] | 0.383 | 0.200 | 0.01 | 0.88 |
| Probe-6th Lumb.-12 in. | -.379 | -.175 | 0.03 | 0.88 |
| Fat depth over brisket | 4.718 | 0.207 | 0.01 | 0.87 |
| Fat measurement D | 0.699 | 0.223 | 0.01 | 0.87 |

$R^2$ = 0.90 Standard error of estimate = 5.91

[1]Value of the coefficient of determination if that variable was deleted from the analysis.

[2]Thor. = Thoracic vertebra.

[3]Lumb. = Lumbar vertebra.

Table 14. Coefficient of determination between percent carcass separable fat and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -8.412 | | 0.54 | |
| Carcass wt. | 0.045 | 0.127 | 0.09 | 0.88 |
| Probe-5th Thor.-4 in.[2] | 0.742 | 0.538 | 0.00 | 0.78 |
| Probe-1st Lumb.-8 in.[3] | -.178 | -.254 | 0.03 | 0.87 |
| Probe-3rd Sac.-12 in.[4] | 0.180 | 0.271 | 0.00 | 0.84 |
| Fat depth over brisket | 1.812 | 0.232 | 0.00 | 0.86 |
| Fat measurement D | 0.400 | 0.371 | 0.00 | 0.83 |

$R^2$ = 0.89 Standard error of estimate = 2.10

[1]Value of the coefficient of determination if that variable was deleted from the analysis.

[2]Thor. = Thoracic vertebra.

[3]Lumb. = Lumbar vertebra.

[4]Sac. = Sacral vertebra.

In the 700 to 750 lb. weight group, 88% of the variation in pounds of separable carcass fat could be accounted for using nine variables (suppl., p. 169). These same nine variables were responsible for 89% of the variation in percent separable carcass fat (suppl., p. 169 ). These results indicate that accuracy can be attained with a combination of objective carcass fat measurements to predict either percent or pounds of separable carcass fat. The standard error of estimates, for the prediction of percent separable fat, in the combined weight groups, 500 to 550 lb. weight group and 700 to 750 lb. weight group, were 2.10, 2.10 and 1.66%, respectively. These compare favorably with the standard error of estimate

of 2.34% found by Hankins and Howe (1946) for their prediction equation for percent separable carcass fat from percent separable fat of the 9-10-11 rib section.

In the combined weight groups, using only the five variables listed in table 15, 92% of the variation in weight of total carcass separable fat was accounted for. It can be observed from this table that carcass weight has the greatest effect in this prediction equation. Using essentially the same variables minus carcass weight and including one more fat measurement, 81% of the variation in percent carcass separable fat was accounted for (table 16). Using only these five independent variables

Table 15. Coefficient of determination between weight of total carcass separable fat and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -35.266 | | 0.00 | |
| Carcass wt. | 0.159 | 0.590 | 0.00 | 0.68 |
| Probe-5th Thor.-4 in.[2] | 1.686 | 0.271 | 0.00 | 0.87 |
| Probe-1st Lumbar-12 in. | 0.424 | 0.123 | 0.02 | 0.91 |
| Probe-Av. 3rd Sacral[3] | 0.914 | 0.178 | 0.00 | 0.90 |
| Fat measurement D | 0.588 | 0.133 | 0.00 | 0.91 |

$R^2$ = 0.92 Standard error of estimate = 7.58

[1]Value of the coefficient of determination if that variable was deleted from the analysis.

[2]Thor. = Thoracic vertebra.

[3]Av. of 3 probes taken at 4, 8 and 12 in. off the carcass dorsal midline.

Table 16. Coefficient of determination between percent carcass separable fat and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 21.678 | | 0.00 | |
| Probe-5th Thor.-4 in.[2] | 0.626 | 0.488 | 0.00 | 0.67 |
| Probe-8th Thor.-8 in. | -.282 | -.262 | 0.00 | 0.79 |
| Probe-1st Lumbar-12 in. | 0.134 | 0.189 | 0.01 | 0.79 |
| Probe-Av. 3rd Sacral[3] | 0.393 | 0.372 | 0.00 | 0.74 |
| Fat measurement D | 0.276 | 0.303 | 0.00 | 0.77 |

$R^{2}$ = 0.81 Standard error of estimate 2.34

[1]Value of the coefficient of determination if that variable was deleted from the analysis.

[2]Thor. = Thoracic vertebra.

[3]Av. of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

resulted in a standard error of estimate of 2.34% carcass separable fat, which is the same standard error of estimate reported by Hankins and Howe (1946) using their prediction equation for carcass separable fat involving separable fat of the 9-10-11 rib section . This same multiple regression analysis in the 500 to 550 lb. weight group was responsible for 85% of the variation in percent carcass separable fat with a standard error of estimate of 2.46% (suppl., p.170 ). In the 700 to 750 lb. weight group, 83% of the variation in percent carcass separable fat could be accounted for using these five fat measurements with a standard error of estimate of 1.93% (suppl., p. 170 ).

Multiple Regression Analyses of External Fat Trim from the Round, Loin, Rib and Chuck on Objective Carcass Measurements. In the combined weight groups, 79% of the variation in external fat trim from the round, loin, rib and chuck (RLRC) was accounted for using two fat probes, carcass weight and length of round (table 17). It can be observed from the data in this table that weight is the most important variable in the regression equation. These same four variables, in the combined weight groups, accounted for 71% of the variation in percent external fat trim from the RLRC (suppl., p. 171).

Table 17. Coefficient of determination between weight of external fat trim from the round, loin, rib and chuck and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 11.933 | | 0.08 | |
| Carcass wt. | 0.050 | 0.700 | 0.00 | 0.64 |
| Probe-4th Lumbar-12 in. | 0.320 | 0.332 | 0.00 | 0.73 |
| Probe Av. 3rd Sacral[2] | 0.416 | 0.307 | 0.00 | 0.73 |
| Length of round | -1.498 | -.434 | 0.00 | 0.73 |

$R^2$ = 0.79 Standard error of estimate = 3.13

[1]Value of the coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes taken at 4, 8 and 12 in. off the carcass dorsal midline at the 3rd Sacral vertebra.

In the 500 to 550 lb. weight group, 83% of the variation in the external fat trim from these same four wholesale cuts could be accounted for

using the independent variables shown in table 18. It should be noted from the data in this table that when the analysis was calculated within weight groups, carcass weight had little effect upon the weight of external fat trim from the RLRC. Ninety-three percent of the variation in percent external fat trim from the RLRC in the 500 to 550 lb. weight group could be accounted for using 15 variables, all of which had a significant ($P < .05$) effect upon percent fat trim (suppl., p. 171).

Table 18. Coefficient of determination between weight of external fat trim from the round, loin, rib and chuck and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -8.324 | | 0.62 | |
| Carcass wt. | 0.004 | 0.10 | 0.88 | 0.83 |
| Probe-3rd Sacral-12 in. | 0.199 | 0.290 | 0.00 | 0.77 |
| Fat measurement A | 0.238 | 0.297 | 0.01 | 0.79 |
| Fat measurement C | 0.509 | 0.494 | 0.00 | 0.74 |
| Fat measurement E | 0.367 | 0.526 | 0.00 | 0.77 |
| Fat measurement F | -.320 | -.490 | 0.01 | 0.79 |

$R^2 = 0.83$ Standard error of estimate = 2.71

[1]Value of coefficient of determination if that variable was deleted from the analysis.

In the 700 to 750 lb. weight group, 96% of the variation in pounds or percent of external fat trim was accounted for using the 22 variables given in the supplement p. 172.

Multiple Regression Analyses of Total Retail Fat Trim on Objective Carcass Measurements. The six independent variables given in table 19 were responsible for 87% of the variation present in weight of total retail fat trim for the combined weight groups. Eighty-one percent of the variation in percent of this same trait could be accounted for using the 12 independent variables presented in the suppl., p. 173.

Table 19. Coefficient of determination between weight of total retail fat trim and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -2.572 | | 0.87 | |
| Carcass wt. | 0.158 | 0.762 | 0.00 | 0.72 |
| Probe-4th Lumbar-12 in. | 0.438 | 0.156 | 0.01 | 0.85 |
| Probe-Av. of 3rd Sacral[2] | 0.709 | 0.179 | 0.00 | 0.85 |
| Fat depth over brisket | 3.810 | 0.169 | 0.00 | 0.85 |
| Length of round | -2.748 | -.273 | 0.00 | 0.85 |
| Fat measurement C | 0.562 | 0.161 | 0.02 | 0.86 |

$R^2$ = 0.87 Standard error of estimate = 7.41

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline at the 3rd Sacral vertebra.

Within the 500 to 550 lb. weight group, the coefficient of determination for weight of total retail fat trim was 0.85 using the five independent variables presented in table 20. Eighty-four percent of the variation

Table 20. Coefficient of determination between weight of total retail fat trim and a combination of objective carcass fat measurements, and the regression coefficient for each measurement (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 42.998 | | 0.51 | |
| Carcass wt. | 0.119 | 0.119 | 0.15 | 0.84 |
| Probe-Av. 3rd Sacral[2] | 0.725 | 0.385 | 0.00 | 0.73 |
| Length of round | -3.243 | -.237 | 0.02 | 0.83 |
| Fat measurement A | 0.663 | 0.302 | 0.00 | 0.79 |
| Fat measurement B | 0.432 | 0.282 | 0.01 | 0.82 |

$R^{2}$ = 0.85 Standard error of estimate - 6.80

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline at the 3rd Sacral vertebra.

in percent total retail fat trim could be accounted for in the 500 to 550 lb. weight group (table 21) using five carcass measurements. Carcass weight showed little effect on either pounds or percent total retail fat trim within weight groups.

In the 700 to 750 lb. weight group, 80% of the variation in weight of total retail fat trim was accounted for using eight variables (suppl., p. 173). Using six variables (suppl., p. 174), 73% of the variation in percent total retail fat trim could be accounted for in this weight group.

These results indicate that estimating yields of separable fat or fat trim from objective measurements was more difficult in the 700 to 750 lb. weight group than in the 500 to 550 lb. carcasses. However, comparable

Table 21. Coefficient of determination between percent total retail fat trim and a combination of objective carcass fat measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{21}$ deletes |
|---|---|---|---|---|
| Constant | 34.189 | | 0.16 | |
| Carcass wt. | 0.012 | 0.032 | 0.70 | 0.84 |
| Probe-3rd Sacral-12 in. | 0.272 | 0.393 | 0.00 | 0.72 |
| Length of round | -1.246 | -.247 | 0.02 | 0.82 |
| Fat measurement A | 0.264 | 0.327 | 0.00 | 0.77 |
| Fat measurement B | 0.168 | 0.296 | 0.01 | 0.80 |

$R^2$ = 0.84 Standard error of estimate = 2.58

[1]Value of coefficient of determination if that variable was deleted from the analysis.

accuracy to the 500 to 550 lb. carcasses could be attained in the 700 to 750 lb. weight group by increasing the number of variables in most instances.

Multiple Regression Analyses of Total Separable Carcass Muscle on Objective Carcass Measurements. For the combined weight groups, 93% of the variation in weight of total separable carcass muscle could be accounted for using the five independent variables listed in table 22. As can be seen from the data in this table, carcass weight was the most important variable in predicting separable carcass muscle. This agrees with the findings of Cole et al. (1962). Carcass weight, 5th thoracic fat probe 4 in. off the carcass dorsal midline, average of 3 fat probes at the 3rd sacral vertebra

Table 22. Coefficient of determination between weight of separable carcass muscle and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 25.362 | | 0.00 | |
| Carcass wt. | 0.241 | 0.896 | 0.00 | 0.49 |
| Probe-5th Thoracic-4 in. | -.779 | -.126 | 0.01 | 0.92 |
| Probe-Av. 3rd Sacral[2] | -1.175 | -.230 | 0.00 | 0.91 |
| Fat measurement C | -.501 | -.111 | 0.01 | 0.93 |
| L. dorsi muscle area | 1.407 | 0.093 | 0.03 | 0.93 |

$R^{2}$ = 0.93 Standard error of estimate = 6.78

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline at the 3rd sacral vertebra.

and fat measurement C were responsible for 73% of the variation in percent separable carcass muscle (suppl., p. 174). These data indicate that carcass weight contributed much less to determining percent separable carcass muscle than to weight.

In the 500 to 550 lb. weight group, three variables accounted for 71% of the variation in weight of total separable carcass muscle (suppl., p. 174 ). These same three variables accounted for 78% of the variation in percent separable carcass muscle (table 23). The multiple correlation coefficient between these three objective measurements and percent separable carcass muscle (0.88) compares favorably with the correlation of 0.85 between percent separable muscle of the 9-10-11 rib section and percent separable carcass muscle determined by Hankins and Howe (1946).

Table 23. Coefficient of determination between percent separable carcass muscle and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 86.511 | | 0.00 | |
| Carcass wt. | -.046 | -.168 | 0.08 | 0.76 |
| Probe-5th thoracic-4 in. | -.436 | -.407 | 0.00 | 0.70 |
| Probe-Av. 3rd sacral[2] | -.437 | -.491 | 0.00 | 0.63 |

$R^2$ = 0.78 Standard error of estimate = 2.20

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline at the 3rd Sacral vertebra.

In the 700 to 750 lb. weight group, low coefficients of determination were observed for pounds and percent separable carcass muscle using objective carcass measurements as the independent variables. Three variables; 1) carcass weight, 2) probe 4 in. off the carcass dorsal midline at the 5th thoracic vertebra (figure 2), and 3) the average of 3 probes taken at the 3rd sacral vertebra were responsible for 68% of the variation in pounds and 65% of the variation in percent separable carcass muscle (suppl., p. 175).

These data indicate that it was more difficult to predict pounds or percent separable carcass muscle in the 700 to 750 lb. weight group than in the 500 to 550 lb. carcasses. This may possibly be attributed to greater intermuscular fat deposition in the 700 to 750 lb. weight group than in the 500 to 550 lb. carcasses.

Multiple Regression Analyses of Total Carcass Separable Bone on Objective Carcass Measurements. In the combined weight groups, 91% of the variation in pounds of separable carcass bone could be accounted for using the independent variables listed in table 24. This equation is a practical and accurate method for prediction of separable carcass bone as it employs four easily taken measurements and has standard error of estimate of 1.94 lb.

Table 24. Coefficient of determination between weight of total carcass separable bone and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -21.423 | | 0.00 | |
| Carcass wt. | 0.032 | 0.468 | 0.00 | 0.87 |
| Probe-5th Thoracic-4 in. | -.292 | -.187 | 0.00 | 0.90 |
| Length of round | 1.499 | 0.457 | 0.00 | 0.87 |
| Fat measurement C | -.197 | -.173 | 0.00 | 0.90 |

$R^2$ = 0.91 Standard error of estimate = 1.94

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Using these same four variables, 80% of the variation in percent separable carcass bone was accounted for in the combined weight groups (table 25).

Table 25. Coefficient of determination between percent carcass separable bone and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 4.209 | | 0.02 | |
| Carcass weight | -.008 | -.575 | 0.00 | 0.73 |
| Probe-5th Thoracic-4 in. | -.103 | -.306 | 0.00 | 0.76 |
| Length of round | 0.503 | 0.712 | 0.00 | 0.70 |
| Fat measurement C | -.063 | -.256 | 0.00 | 0.77 |

$R^2$ = 0.80 Standard error of estimate = 0.63%

[1]Value of coefficient of determination if that variable was deleted from the analysis.

In the 500 to 550 lb. weight group, 78% of the variation in pounds of separable carcass bone was accounted for using carcass weight, 5th sacral fat probe - 4 in. (figure 2) and the length of round measurement (suppl., p. 175. These same three variables accounted for 83% of the variation in percent separable carcass bone in the 500 to 550 lb. weight group (suppl., p. 176). Carcass weight, average of 3 fat probes at the 3rd sacral (figure 2) and length of round accounted for 80% of the variation in pounds of separable carcass bone (suppl., p. 176) and 77% of the variation in percent separable carcass bone (suppl., p. 176) in the 700 to 750 lb. weight group.

On a combined or within weight group basis, the largest standard error of estimate for the prediction equations presented was 0.68%. This compares favorably to the standard error of estimate of 1.29% associated

with the prediction equation for percent separable bone of Hankins and Howe (1946).

Multiple Regression Analyses of Retail Yield Measures on Objective Carcass Measurements. In the combined weight groups, 91% of the variation in pounds of boned, trimmed round, loin, rib and chuck retail yield was accounted for using the variables listed in table 26.

Table 26. Coefficient of determination between weight of boned, trimmed round, loin, rib and chuck retail yield and a combination of objective measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -5.504 | | 0.76 | |
| Carcass weight | 0.206 | 0.860 | 0.00 | 0.76 |
| Probe-5th Thoracic-4 in. | -.303 | -.055 | 0.33 | 0.91 |
| Probe-8th Thoracic-8 in. | 0.242 | 0.521 | 0.34 | 0.91 |
| Probe-4th Lumbar-12 in. | -.579 | -.178 | 0.00 | 0.89 |
| Probe-Av. 3rd Sacral[2] | -.746 | -.164 | 0.00 | 0.90 |
| Length of round | 1.925 | 0.166 | 0.03 | 0.90 |

$R^2$ = 0.91 Standard error of estimate = 7.06

[1]Value of coefficient of determination if that variable were deleted from the analysis.

[2]Av. of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Using these same variables, 88% of the variation in total carcass boned, trimmed retail yield could be accounted for in the combined weight groups (table 27). On a percent basis in the combined and within weight

Table 27. Coefficient of determination between weight of total carcass boned, trimmed retail yield and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -2.973 | | 0.87 | |
| Carcass weight | 0.247 | 0.851 | 0.00 | 0.74 |
| Probe-5th Thoracic-4 in. | -.510 | -.076 | 0.23 | 0.88 |
| Probe-8th Thoracic-8 in. | 0.425 | 0.076 | 0.22 | 0.88 |
| Probe-4th Lumbar-12 in. | -.739 | -.188 | 0.00 | 0.87 |
| Probe-Av. 3rd Sacral[2] | -.867 | -.157 | 0.01 | 0.87 |
| Length of round | 2.262 | 0.161 | 0.07 | 0.88 |

$R^2$ = 0.88 Standard error of estimate = 9.66

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

groups, accuracy was poor in the prediction of percent of either retail yield from the round, loin, rib and chuck or total carcass retail yield. Also, on a within weight group basis, prediction accuracy of pounds of either of the retail yield measures was poor using only objective carcass measurements as independent variables.

## Relationships Between Wholesale Cut Separable Muscle and Carcass Separable Components, Retail and Fat Trim Yields

In this study, pounds of separable components, retail and fat trim yields were correlated with pounds of separable wholesale cut components, retail, fat trim and bone yields. Percent separable carcass components,

retail and fat trim yields were correlated with percent wholesale cut separable components, retail, fat trim and bone yields. Percent wholesale cut separable components, retail, fat trim and bone yields were calculated as a percentage of each individual cut rather than as a percentage of the entire carcass.

Simple correlation coefficients between pounds and percent separable wholesale cut muscle and pounds and percent of total carcass separable components, retail and fat trim yields for each weight group as well as for the combined weight groups appear in tables 28, 29 and 30. Correlations between pounds and percent separable wholesale cut muscle and pounds and percent total carcass separable muscle, bone and retail yields were highly significant ($P < .01$) for the combined weight groups (range, 0.48 to 0.98) except those for pounds and percent of brisket muscle in most instances and percent foreshank muscle (range, 0.02 to 0.61). While within weightgroup correlations were lower than in the combined weight groups, those between pounds of separable rump, foreshank and flank muscle with pounds of total carcass separable muscle, bone and retail yields were markedly reduced.

Correlations between pounds and percents total carcass separable muscle and pounds and percents wholesale round, loin, rib and chuck separable muscle indicate a high relationship ($P < .01$) exists in the combined and individual weight groups (range, 0.67 to 0.98). Pounds of separable chuck muscle showed the highest relationship to pounds of total carcass separable muscle for combined weight groups (0.98) as well as within

Table 28. Simple correlation coefficients between wholesale cut separable muscle and carcass separable components, retail and fat trim yields for the combined weight groups.

| Wholesale cut separable muscle | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | 0.93 | 0.84 | 0.29 | -.80 | 0.90 | 0.55 | 0.84 | 0.61 | 0.82 | 0.57 | 0.29 | -.57 | 0.13 | -.62 |
| Rump | 0.56 | 0.66 | 0.18 | -.67 | 0.56 | 0.48 | 0.66 | 0.75 | 0.68 | 0.76 | -.02 | -.72 | .10 | -.72 |
| Intact round | 0.97 | 0.83 | 0.31 | -.80 | 0.93 | 0.57 | 0.92 | 0.65 | 0.91 | 0.62 | 0.26 | -.62 | 0.08 | -.65 |
| Loin | 0.94 | 0.93 | 0.42 | -.90 | 0.84 | 0.67 | 0.87 | 0.70 | 0.85 | 0.68 | 0.40 | -.69 | 0.24 | -.69 |
| Rib | 0.88 | 0.95 | 0.36 | -.93 | 0.71 | 0.69 | 0.84 | 0.76 | 0.82 | 0.73 | 0.27 | -.76 | 0.11 | -.73 |
| Chuck | 0.98 | 0.92 | 0.37 | -.88 | 0.88 | 0.64 | 0.91 | 0.67 | 0.89 | 0.60 | 0.31 | -.64 | 0.16 | -.62 |
| Foreshank | 0.78 | 0.29 | 0.40 | -.23 | 0.73 | -.05 | 0.76 | 0.24 | 0.75 | 0.23 | 0.34 | -.17 | 0.16 | -.25 |
| Brisket | 0.12 | 0.02 | 0.12 | -.03 | 0.06 | -.03 | 0.17 | 0.18 | 0.61 | 0.47 | 0.47 | -.47 | 0.00 | -.17 |
| Plate | 0.90 | 0.87 | 0.37 | -.87 | 0.78 | 0.66 | 0.86 | 0.73 | 0.86 | 0.73 | 0.28 | -.75 | 0.09 | -.71 |
| Flank | 0.86 | 0.91 | 0.45 | -.92 | 0.75 | 0.76 | 0.85 | 0.79 | 0.86 | 0.78 | 0.31 | -.80 | 0.16 | -.73 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 29. Simple correlation coefficients between wholesale cut separable muscle and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Wholesale cut separable muscle | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | 0.80 | 0.84 | -.81 | -.76 | 0.71 | 0.42 | 0.60 | 0.67 | 0.57 | 0.64 | -.60 | -.55 | -.56 | -.54 |
| Rump | 0.58 | 0.76 | -.60 | -.74 | 0.54 | 0.52 | 0.68 | 0.80 | 0.68 | 0.78 | -.68 | -.74 | -.65 | -.75 |
| Intact round | 0.88 | 0.89 | -.90 | -.82 | 0.79 | 0.50 | 0.79 | 0.77 | 0.77 | 0.74 | -.79 | -.66 | -.74 | -.66 |
| Loin | 0.78 | 0.94 | -.62 | -.90 | 0.42 | 0.65 | 0.46 | 0.74 | 0.42 | 0.72 | -.38 | -.70 | -.41 | -.67 |
| Rib | 0.67 | 0.96 | -.37 | -.94 | 0.09 | 0.68 | 0.50 | 0.82 | 0.45 | 0.79 | -.35 | -.77 | -.35 | -.72 |
| Chuck | 0.94 | 0.93 | -.72 | -.88 | 0.62 | 0.59 | 0.68 | 0.74 | 0.59 | 0.66 | -.57 | -.64 | -.55 | -.61 |
| Foreshank | 0.34 | 0.09 | -.30 | -.03 | 0.42 | -.20 | 0.46 | 0.17 | 0.46 | 0.15 | -.30 | -.04 | -.36 | -.14 |
| Brisket | -.02 | 0.64 | 0.08 | -.59 | -.30 | 0.37 | -.20 | 0.46 | -.25 | 0.44 | 0.22 | -.36 | 0.28 | -.29 |
| Plate | 0.65 | 0.87 | -.55 | -.88 | 0.40 | 0.69 | 0.60 | 0.75 | 0.60 | 0.74 | -.55 | -.73 | -.64 | -.68 |
| Flank | 0.57 | 0.91 | -.30 | -.94 | 0.30 | 0.84 | 0.56 | 0.80 | 0.59 | 0.79 | -.46 | -.78 | -.46 | -.70 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC - Round, loin, rib anc chuck.

Table 30. Simple correlation coefficients between wholesale cut separable muscle and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Wholesale cut separable muscle | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | 0.79 | 0.89 | -.86 | -.89 | 0.74 | 0.73 | 0.35 | 0.62 | 0.27 | 0.57 | -.65 | -.68 | -.65 | -.77 |
| Rump | 0.18 | 0.49 | 0.09 | -.51 | 0.18 | 0.40 | 0.55 | 0.58 | 0.58 | 0.62 | -.25 | -.63 | -.19 | -.58 |
| Intact round | 0.90 | 0.83 | -.84 | -.83 | 0.48 | 0.69 | 0.63 | 0.56 | 0.56 | 0.54 | -.79 | -.65 | -.76 | -.70 |
| Loin | 0.76 | 0.92 | -.63 | -.90 | 0.64 | 0.71 | 0.51 | 0.65 | 0.47 | 0.62 | -.50 | -.69 | -.48 | -.74 |
| Rib | 0.68 | 0.93 | -.59 | -.91 | 0.45 | 0.70 | 0.58 | 0.72 | 0.56 | 0.70 | -.68 | -.80 | -.68 | -.80 |
| Chuck | 0.92 | 0.92 | -.77 | -.93 | 0.69 | 0.75 | 0.64 | 0.69 | 0.58 | 0.64 | -.72 | -.77 | -.69 | -.78 |
| Foreshank | 0.35 | 0.59 | -.51 | -.53 | 0.30 | 0.20 | 0.08 | 0.39 | 0.08 | 0.42 | -.43 | -.43 | -.49 | -.46 |
| Brisket | 0.40 | 0.88 | -.40 | -.85 | 0.19 | 0.60 | 0.07 | 0.64 | 0.11 | 0.62 | -.35 | -.73 | -.32 | -.67 |
| Plate | 0.73 | 0.88 | -.55 | -.85 | 0.48 | 0.59 | 0.55 | 0.66 | 0.56 | 0.69 | -.62 | -.78 | -.60 | -.72 |
| Flank | 0.62 | 0.91 | -.35 | -.89 | 0.44 | 0.61 | 0.57 | 0.76 | 0.60 | 0.76 | -.43 | -.83 | -.44 | -.76 |

Correlations > 0.321 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

weight groups (0.94 and 0.92 for the 500 to 550 and 700 to 750 lb. weight groups, respectively). Orme et al. (1960) also found that of all the wholesale cuts, pounds of separable chuck muscle showed the highest relationship to pounds of total separable carcass muscle. Correlations between wholesale round separable muscle and total carcass separable muscle were next highest (0.97, 0.88 and 0.90 for the combined, 500 to 550 lb. and 700 to 750 lb. weight groups, respectively). These findings also coincide with those of Orme et al. (1960). The percents separable muscle of these same wholesale cuts were as high, or more highly related to percent total carcass separable muscle within the two weight groups as in the combined weight groups (range, 0.83 to 0.93).

The highest correlation in the combined weight groups between percent wholesale cut separable muscle and percent carcass muscle was the rib (0.95). In order of decreasing magnitude of correlation coefficients between the above two traits were the loin (0.93), chuck (0.92) and flank (0.91). All correlations between percent wholesale cut separable muscle and percent carcass separable muscle were highly significant ($P < .01$) for the combined weight groups except for that of the brisket.

Within weight group correlation coefficients between percent wholesale cut separable muscle and percent carcass separable muscle showed percent rib, loin, chuck and flank muscle being most closely related to percent total carcass muscle (range, 0.91 to 0.96). All of these correlations have excellent predictive possibilities.

High negative correlations were found between the percent separable muscle of the rib and flank with percent separable fat and fat trim yields

in the combined and within weight groups. Within weight groups, separable muscle of the rib and flank also showed the highest relationships to percent separable retail yield from the round, loin, rib and chuck and percent total retail yield (range, 0.79 to 0.82). Hedrick et al. (1963) and Miller et al. (1965) also reported very high correlation coefficients between percent retail yield of the flank and retail yield measures. In their studies, however, neither the flank nor the rib showed the highest correlation to retail yield but instead percent retail yield of the round was highest.

The high relationships between percent separable flank muscle and percents of the seven carcass yields compared in this study, suggest the use of flank muscle for predicting these carcass yields. These relationships were high for both weights and percents in the combined weight groups as well as within weight groups (range, 0.16 to 0.94).

Correlation coefficients between pounds of wholesale cut separable muscle and carcass separable fat and fat trim yields were positive but lower than for pounds of separable muscle and retail yields (range, 0.00 to 0.47) on a combined weight group basis, except for correlations between pounds of rump muscle and fat trim yields (-.02 and -.10). However, correlations between percent wholesale cut separable muscle in the combined weight groups as well as weights and percents within weight groups became negative but were highly significant ($P < .01$) in most instances.

## Relationships Between Wholesale Cut Separable Fat and Carcass Separable Components, Retail and Fat Trim Yields

Simple correlation coefficients between pounds and percent wholesale cut separable fat and pounds and percent of carcass separable components, retail and fat trim yields for the combined weight groups appear in table 31 and those within weight groups appear in tables 32 and 33.

In the combined weight groups, pounds of wholesale cut separable fat showed the lowest relationships to pounds of separable carcass bone (range, 0.18 to 0.36) and low to moderate relationships to pounds of carcass separable muscle and retail yields (range, 0.22 to 0.55). Highly significant ($P < .01$) positive correlations were observed between pounds and percent wholesale cut separable fat and carcass separable fat and fat trim yields (range, 0.61 to 0.96), except for kidney knob (range, 0.32 to 0.62). When percent wholesale cut separable fat was correlated with percents carcass separable muscle, bone and retail yields on a combined weight group basis, these correlations (range, 0.54 to 0.94) were highly significantly ($P < .01$) negative.

On a combined weight group basis, the percent wholesale cut separable fat most closely related to percent carcass separable fat was that from the rib (0.96), followed in order by the loin (0.94), chuck (0.94), plate (0.92) and the round and flank (0.91). Within weight group correlations were also highest for these same wholesale cut percents separable fat and carcass separable fat though not in the same order of magnitude (tables 32 and 33). Percents separable fat from the kidney knob and foreshank showed the lowest relationship to carcass separable fat on a within weight

Table 31. Simple correlation coefficients between wholesale cut separable fat and carcass separable components, retail and fat trim yields for the combined weight groups.

| Wholesale cut separable fat | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | 0.37 | -.86 | 0.87 | 0.87 | 0.30 | -.56 | 0.47 | -.68 | 0.45 | -.63 | 0.79 | 0.67 | 0.79 | 0.72 |
| Rump | 0.33 | -.82 | 0.87 | 0.85 | 0.24 | -.58 | 0.46 | -.80 | 0.46 | -.80 | 0.74 | 0.82 | 0.73 | 0.82 |
| Intact round | 0.37 | -.90 | 0.90 | 0.91 | 0.29 | -.62 | 0.48 | -.75 | 0.48 | -.71 | 0.80 | 0.75 | 0.79 | 0.78 |
| Loin | 0.29 | -.93 | 0.93 | 0.94 | 0.18 | -.71 | 0.40 | -.73 | 0.38 | -.69 | 0.87 | 0.73 | 0.84 | 0.73 |
| Rib | 0.22 | -.94 | 0.92 | 0.96 | 0.08 | -.79 | 0.32 | -.80 | 0.31 | -.77 | 0.86 | 0.81 | 0.82 | 0.78 |
| Chuck | 0.45 | -.92 | 0.94 | 0.94 | 0.31 | -.67 | 0.53 | -.74 | 0.52 | -.69 | 0.84 | 0.75 | 0.77 | 0.73 |
| Foreshank | 0.24 | -.60 | 0.65 | 0.61 | 0.19 | -.47 | 0.29 | -.54 | 0.30 | -.48 | 0.61 | 0.53 | 0.61 | 0.60 |
| Brisket | 0.30 | -.79 | 0.84 | 0.80 | 0.20 | -.46 | 0.33 | -.65 | 0.32 | -.64 | 0.80 | 0.66 | 0.74 | 0.62 |
| Plate | 0.46 | -.90 | 0.93 | 0.92 | 0.36 | -.78 | 0.55 | -.76 | 0.53 | -.76 | 0.85 | 0.78 | 0.72 | 0.74 |
| Flank | 0.36 | -.90 | 0.94 | 0.91 | 0.26 | -.30 | 0.46 | -.78 | 0.45 | -.78 | 0.86 | 0.79 | 0.76 | 0.73 |
| Kidney knob | 0.31 | -.57 | 0.72 | 0.58 | 0.25 | -.47 | 0.35 | -.54 | 0.34 | -.53 | 0.62 | 0.42 | 0.50 | 0.32 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 32. Simple correlation coefficients between wholesale cut separable fat and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Wholesale cut separable fat | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | -.81 | -.88 | 0.67 | 0.87 | -.52 | -.66 | -.64 | -.77 | -.63 | -.76 | 0.58 | 0.71 | 0.60 | 0.69 |
| Rump | -.71 | -.86 | 0.65 | 0.88 | -.52 | -.73 | -.51 | -.87 | -.49 | -.86 | 0.50 | 0.84 | 0.54 | 0.84 |
| Intact round | -.85 | -.91 | 0.73 | 0.91 | -.58 | -.71 | -.65 | -.83 | -.63 | -.82 | 0.61 | 0.78 | 0.64 | 0.76 |
| Loin | -.85 | -.95 | 0.93 | 0.95 | -.75 | -.76 | -.66 | -.79 | -.66 | -.76 | 0.81 | 0.75 | 0.76 | 0.71 |
| Rib | -.76 | -.95 | 0.95 | 0.97 | -.81 | -.81 | -.62 | -.84 | -.64 | -.82 | 0.83 | 0.81 | 0.77 | 0.76 |
| Chuck | -.68 | -.94 | 0.90 | 0.96 | -.67 | -.78 | -.52 | -.81 | -.51 | -.76 | 0.72 | 0.76 | 0.68 | 0.73 |
| Foreshank | -.45 | -.66 | 0.30 | 0.65 | -.15 | -.51 | -.34 | -.71 | -.26 | -.63 | 0.28 | 0.60 | 0.34 | 0.67 |
| Brisket | -.58 | -.71 | 0.77 | 0.73 | -.58 | -.58 | -.53 | -.61 | -.57 | -.62 | 0.70 | 0.58 | 0.66 | 0.54 |
| Plate | -.69 | -.89 | 0.92 | 0.92 | -.69 | -.78 | -.49 | -.78 | -.50 | -.78 | 0.74 | 0.77 | 0.61 | 0.71 |
| Flank | -.70 | -.90 | 0.90 | 0.92 | -.78 | -.80 | -.50 | -.78 | -.49 | -.78 | 0.71 | 0.77 | 0.61 | 0.69 |
| Kidney knob | -.54 | -.71 | 0.77 | 0.74 | -.57 | -.64 | -.42 | -.63 | -.42 | -.61 | 0.59 | 0.55 | 0.46 | 0.44 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 33. Simple correlation coefficients between wholesale cut separable fat and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Wholesale cut separable fat | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | -.73 | -.88 | 0.80 | 0.90 | -.59 | -.82 | -.36 | -.62 | -.29 | -.54 | 0.72 | 0.70 | 0.80 | 0.80 |
| Rump | -.72 | -.75 | 0.84 | 0.80 | -.63 | -.77 | -.27 | -.66 | -.23 | -.65 | 0.63 | 0.77 | 0.67 | 0.76 |
| Intact round | -.77 | -.89 | 0.86 | 0.93 | -.64 | -.85 | -.35 | -.66 | -.29 | -.59 | 0.74 | 0.75 | 0.80 | 0.83 |
| Loin | -.69 | -.92 | 0.84 | 0.94 | -.55 | -.83 | -.32 | -.66 | -.27 | -.63 | 0.73 | 0.76 | 0.78 | 0.81 |
| Rib | -.77 | -.92 | 0.85 | 0.94 | -.65 | -.79 | -.36 | -.72 | -.30 | -.69 | 0.73 | 0.83 | 0.71 | 0.83 |
| Chuck | -.63 | -.88 | 0.81 | 0.92 | -.62 | -.85 | -.33 | -.66 | -.26 | -.60 | 0.69 | 0.77 | 0.68 | 0.77 |
| Foreshank | -.62 | -.65 | 0.58 | 0.69 | -.53 | -.66 | -.51 | -.56 | -.46 | -.53 | 0.57 | 0.66 | 0.59 | 0.70 |
| Brisket | -.69 | -.89 | 0.70 | 0.89 | -.54 | -.69 | -.59 | -.69 | -.52 | -.69 | 0.67 | 0.82 | 0.60 | 0.76 |
| Plate | -.66 | -.91 | 0.78 | 0.90 | -.43 | -.68 | -.35 | -.68 | -.33 | -.69 | 0.69 | 0.81 | 0.58 | 0.76 |
| Flank | -.75 | -.90 | 0.88 | 0.89 | -.46 | -.62 | -.41 | -.75 | -.36 | -.75 | 0.83 | 0.83 | 0.70 | 0.77 |
| Kidney knob | -.25 | -.36 | 0.37 | 0.32 | -.07 | -.18 | -.19 | -.42 | -.15 | -.40 | 0.21 | 0.16 | 0.16 | 0.13 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

group basis (0.58 and 0.61, respectively). As was shown for percent carcass separable fat, percent kidney knob separable fat had the lowest relationships with the fat trim yields in the combined weight groups and within weight groups. These data indicate kidney fat deposition is not entirely consistent with total carcass fat deposition.

Comparing the correlation coefficients within weight groups, the relationships between percents wholesale cut separable fat and percents of the seven carcass yield characteristics were higher in the 500 to 550 lb. weight group (range, 0.44 to 0.94) than in the 700 to 750 lb. weight group (range, -.13 to 0.94). However, the differences were not great and most correlations were highly significant ($P < .01$) and sufficiently high to be of predictive value.

## Relationships Between Wholesale Cut Separable Bone and Carcass Separable Components, Retail and Fat Trim Yields

Correlation coefficients between pounds and percent wholesale cut separable bone and pounds and percent carcass separable components, retail and fat trim yields for the combined weight groups and for each weight group appear in tables 34, 35 and 36. Highly significant ($P < .01$) positive correlations were observed for the combined weight groups between pounds and percent of carcass separable muscle, bone and retail yields (range, 0.36 to 0.98) except for pounds and percent flank bone and percent rump bone (0.12 to 0.27). Also highly significant ($P < .01$) negative relationships were found between percent wholesale cut separable bone and percent carcass separable fat and fat trim yields for the combined weight groups (range -.41 to -.80) except for percent flank and rump bone (range,

Table 34. Simple correlation coefficients between wholesale cut separable bone and carcass separable components, retail and fat trim yields for the combined weight groups.

| Wholesale cut separable bone | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | 0.85 | 0.46 | 0.29 | -.71 | 0.95 | 0.78 | 0.81 | 0.45 | 0.79 | 0.42 | 0.24 | -.52 | 0.10 | -.53 |
| Rump | 0.81 | 0.52 | 0.24 | -.74 | 0.93 | 0.74 | 0.81 | 0.23 | 0.80 | 0.21 | 0.12 | -.33 | -.01 | -.34 |
| Intact round | 0.87 | 0.53 | 0.28 | -.76 | 0.98 | 0.83 | 0.84 | 0.39 | 0.82 | 0.36 | 0.21 | -.49 | 0.06 | -.49 |
| Loin | 0.86 | 0.63 | 0.31 | -.79 | 0.94 | 0.85 | 0.82 | 0.49 | 0.80 | 0.42 | 0.28 | -.51 | 0.13 | -.48 |
| Rib | 0.84 | 0.70 | 0.29 | -.80 | 0.89 | 0.91 | 0.82 | 0.61 | 0.82 | 0.63 | 0.18 | -.71 | 0.04 | -.65 |
| Chuck | 0.87 | 0.55 | 0.24 | -.80 | 0.97 | 0.92 | 0.82 | 0.48 | 0.80 | 0.46 | 0.18 | -.56 | 0.04 | -.53 |
| Foreshank | 0.80 | 0.41 | 0.28 | -.54 | 0.92 | 0.60 | 0.79 | 0.36 | 0.77 | 0.32 | 0.21 | -.41 | 0.04 | -.41 |
| Brisket | 0.45 | 0.38 | 0.10 | -.62 | 0.53 | 0.55 | 0.43 | 0.46 | 0.45 | 0.50 | 0.00 | -.55 | -.13 | -.58 |
| Plate | 0.88 | 0.72 | 0.31 | -.74 | 0.93 | 0.88 | 0.83 | 0.54 | 0.82 | 0.50 | 0.25 | -.59 | 0.08 | -.54 |
| Flank | 0.12 | 0.27 | -.01 | -.73 | 0.15 | 0.32 | 0.07 | 0.12 | 0.08 | 0.16 | 0.04 | -.17 | 0.02 | -.16 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 35. Simple correlation coefficients between wholesale cut separable bone and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Wholesale cut separable bone | Separable muscle | | Separable fat | | Separable bone | | Boned trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | 0.59 | 0.49 | -.72 | -.59 | 0.92 | 0.79 | 0.58 | 0.56 | 0.57 | 0.56 | -.65 | -.60 | -.60 | -.57 |
| Rump | 0.47 | 0.39 | -.70 | -.49 | 0.87 | 0.74 | 0.54 | 0.28 | 0.57 | 0.30 | -.71 | -.37 | -.61 | -.32 |
| Intact round | 0.58 | 0.52 | -.76 | -.63 | 0.95 | 0.87 | 0.60 | 0.53 | 0.60 | 0.55 | -.71 | -.60 | -.64 | -.55 |
| Loin | 0.55 | 0.67 | -.63 | -.76 | 0.80 | 0.87 | 0.45 | 0.61 | 0.38 | 0.56 | -.42 | -.56 | -.39 | -.50 |
| Rib | 0.62 | 0.72 | -.60 | -.82 | 0.74 | 0.93 | 0.54 | 0.65 | 0.57 | 0.68 | -.60 | -.72 | -.55 | -.64 |
| Chuck | 0.67 | 0.60 | -.78 | -.72 | 0.94 | 0.93 | 0.57 | 0.57 | 0.55 | 0.57 | -.66 | -.62 | -.62 | -.57 |
| Foreshank | 0.48 | 0.48 | -.68 | -.54 | 0.90 | 0.67 | 0.50 | 0.45 | 0.52 | 0.44 | -.64 | -.51 | -.60 | -.45 |
| Brisket | 0.04 | 0.28 | -.23 | -.38 | 0.32 | 0.52 | 0.16 | 0.38 | 0.22 | 0.44 | -.33 | -.48 | -.37 | -.52 |
| Plate | 0.48 | 0.68 | -.55 | -.76 | 0.78 | 0.90 | 0.40 | 0.56 | 0.39 | 0.54 | -.49 | -.58 | -.51 | -.51 |
| Flank | 0.03 | 0.21 | -.08 | -.25 | 0.12 | 0.32 | -.10 | 0.01 | -.05 | 0.05 | 0.05 | -.07 | 0.04 | -.06 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 36. Simple correlation coefficients between wholesale cut separable bone and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Wholesale cut separable bone | Separable muscle | | Separable fat | | Separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Rumpless round | 0.57 | 0.42 | -.63 | -.55 | 0.85 | 0.80 | 0.32 | 0.34 | 0.22 | 0.23 | -.49 | -.46 | -.52 | -.54 |
| Rump | 0.67 | 0.75 | -.52 | -.81 | 0.86 | 0.86 | 0.62 | 0.40 | 0.54 | 0.32 | -.60 | -.53 | -.62 | -.60 |
| Intact round | 0.66 | 0.59 | -.65 | -.69 | 0.93 | 0.86 | 0.46 | 0.37 | 0.35 | 0.28 | -.57 | -.51 | -.60 | -.59 |
| Loin | 0.70 | 0.64 | -.55 | -.74 | 0.90 | 0.90 | 0.57 | 0.51 | 0.51 | 0.45 | -.52 | -.66 | -.54 | -.69 |
| Rib | 0.64 | 0.66 | -.44 | -.74 | 0.78 | 0.87 | 0.64 | 0.47 | 0.62 | 0.44 | -.52 | -.65 | -.54 | -.62 |
| Chuck | 0.72 | 0.46 | -.57 | -.58 | 0.94 | 0.89 | 0.55 | 0.30 | 0.46 | 0.22 | -.51 | -.46 | -.52 | -.48 |
| Foreshank | 0.54 | 0.40 | -.48 | -.48 | 0.76 | 0.62 | 0.44 | 0.38 | 0.37 | 0.32 | -.44 | -.45 | -.56 | -.49 |
| Brisket | 0.53 | 0.66 | -.33 | -.70 | 0.51 | 0.71 | 0.35 | 0.60 | 0.37 | 0.60 | -.40 | -.70 | -.42 | -.68 |
| Plate | 0.82 | 0.80 | -.66 | -.85 | 0.86 | 0.87 | 0.62 | 0.60 | 0.57 | 0.56 | -.64 | -.72 | -.64 | -.68 |
| Flank | 0.35 | 0.45 | -.15 | -.44 | 0.26 | 0.33 | 0.26 | 0.30 | 0.30 | 0.35 | -.16 | -.40 | -.16 | -.35 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

-.16 to -.34) with carcass fat yields. Within weight groups, high negative correlations were found between pounds and percents of wholesale cut separable bone and pounds and percents of carcass separable fat and fat trim yields (range, -.39 to -.78) except pounds and percents brisket and flank bone and percent rump bone (range, -.08 to -.49).

These correlations indicate that carcasses with heavier bone and/or higher percent separable bone also had more pounds and/or percent total carcass separable muscle and retail yields. Wythe et al. (1961) and Good et al. (1961) also reported this positive relationship between size and/or quantity of bone and amount of carcass muscle.

Highest relationships were found between pounds of round separable bone and pounds of carcass separable bone for the combined weight groups as well as within each weight group (0.98, 0.95 and 0.93, respectively). The next highest correlations were between pounds of separable chuck bone and pounds of carcass separable bone both within weight groups and on a combined weight group basis.

Percent separable bone in the chuck showed the highest correlation with percent carcass separable bone in the combined weight group and in the 500 to 550 lb. weight group (0.92 and 0.93, respectively). Following the chuck were percent separable bone in the rib (0.91 and 0.93) and plate (0.88 and 0.90) for the combined and 500 to 550 lb. weight groups, respectively. In the 700 to 750 lb. weight group the percent separable bone of the loin showed the highest correlation to percent carcass separable bone (0.90) followed by the chuck (0.89), rib (0.87) and the plate (0.87). Although correlations were not consistently as high as percent rib or chuck bone, percent wholesale round bone was highly significantly

($P < .01$) correlated with percent carcass separable bone in the combined weight groups and the 500 to 550 and 700 to 750 lb. weight groups (0.83, 0.87 and 0.86, respectively). Due to the ease of separation of total round bone compared to the other wholesale cuts which were highly correlated to total carcass bone, it is logical to suggest its use for predictive purposes.

## Relationships Between Percent Separable Components of Some Easily Separated Wholesale Cuts and Percent Separable Carcass Components

The 9-10-11 rib section, the flank, intact round and the rump were selected to study their possible predictive value of carcass composition, due to their ease of physical separation. Simple correlation coefficients were calculated between the percent separable components of these cuts and the percents of these same components of the entire carcass for the combined and individual weight groups as well as on a within weight and fat thickness group basis. These correlations appear in table 37.

The 9-10-11 rib section was choosen not only because of ease of separation, but also to determine the reliability of the regression equations reported by Hankins and Howe (1946) between percent separable components and separable carcass components within a group of carcasses of limited weight and fat thickness ranges. The relationship between percent muscle of the 9-10-11 rib section and percent separable carcass muscle was very high in the combined weight groups and within weight groups (0.92, 0.94 and 0.90, respectively). Crown and Damon (1960) reported correlation coefficients of similar magnitude between percent separable muscle of the 9-10-11 rib section and percent carcass separable

Table 37. Simple correlation coefficients between percent separable components of some wholesale cuts and separable components of the carcass.

| Cut and % separable component | Combined weight group | 500-550 lb. weight group | 700-750 lb. weight group | Group I | II | III | IV | V | VI | VII | VIII |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Muscle: | | | | | | | | | | | |
| 9-10-11 rib section | 0.92 | 0.94 | 0.90 | 0.90 | 0.82 | 0.94 | 0.92 | 0.83 | 0.71 | 0.88 | 0.80 |
| Flank | 0.91 | 0.91 | 0.91 | 0.84 | 0.85 | 0.78 | 0.76 | 0.95 | 0.83 | 0.82 | 0.86 |
| Round | 0.83 | 0.89 | 0.83 | 0.87 | 0.52 | 0.80 | 0.91 | 0.30 | 0.89 | 0.82 | 0.86 |
| Rump | 0.66 | 0.76 | 0.49 | 0.65 | 0.23 | 0.62 | 0.51 | 0.31 | 0.68 | 0.11 | 0.60 |
| Fat: | | | | | | | | | | | |
| 9-10-11 rib section | 0.94 | 0.95 | 0.91 | 0.92 | 0.86 | 0.95 | 0.90 | 0.85 | 0.78 | 0.92 | 0.75 |
| Flank | 0.91 | 0.92 | 0.89 | 0.93 | 0.89 | 0.77 | 0.71 | 0.92 | 0.87 | 0.80 | 0.73 |
| Round | 0.91 | 0.91 | 0.93 | 0.89 | 0.39 | 0.83 | 0.86 | 0.79 | 0.93 | 0.89 | 0.87 |
| Rump | 0.85 | 0.88 | 0.80 | 0.82 | 0.30 | 0.74 | 0.68 | 0.64 | 0.88 | 0.49 | 0.79 |
| Bone: | | | | | | | | | | | |
| 9-10-11 rib section | 0.76 | 0.78 | 0.75 | 0.87 | 0.67 | 0.45 | 0.64 | 0.09 | 0.79 | 0.57 | 0.74 |
| Flank | 0.32 | 0.32 | 0.33 | 0.74 | 0.68 | -.06 | 0.24 | 0.04 | -.10 | 0.32 | 0.45 |
| Round | 0.83 | 0.87 | 0.86 | 0.74 | 0.82 | 0.76 | 0.65 | 0.55 | 0.94 | 0.91 | 0.79 |
| Rump | 0.74 | 0.74 | 0.86 | 0.76 | 0.80 | 0.20 | 0.70 | 0.52 | 0.88 | 0.95 | 0.74 |

Correlations > 0.220 are significant ($P < .05$) for the combined weight groups.
Correlations > 0.287 are significant ($P < .01$) for the combined weight groups.
Correlations > 0.312 are significant ($P < .05$) for the individual weight groups.
Correlations > 0.403 are significant ($P < .01$) for the individual weight groups.

muscle. The correlations on a within weight and fat group basis were slightly lower, especially in group VI (range, 0.71 to 0.94).

Percent separable flank muscle showed an equally good relationship to percent separable carcass muscle (range, 0.76 to 0.95). Percent separable muscle of the wholesale round and rump, especially the rump, did not show quite as high or as consistent a relationship to percent carcass muscle (range, 0.30 to 0.91 and 0.11 to 0.76 for round and rump, respectively) as either the flank or 9-10-11 rib sections.

Similar results were observed between the percent separable fat of these cuts and percent separable carcass fat. The percent separable fat of the 9-10-11 rib section, flank, and wholesale round were highly correlated with percent carcass separable fat (range, 0.71 to 0.95). When comparing these relationships within weight and fat groups, the percent separable fat of the 9-10-11 rib sections and the flank were more consistently correlated to separable carcass fat (range, 0.71 to 0.95) than either the wholesale round or rump (range, 0.30 to 0.93).

When comparing correlations between percent separable bone of these four cuts with percent separable carcass bone, the percent round bone showed the highest and most consistent relationships, followed by those of the rump. Correlation coefficients for these characteristics within the eight fat thickness and weight groups ranged from 0.55 to 0.94 and 0.20 to 0.95 for the round and rump, respectively. The percent bone in the flank showed the poorest relationship with percent carcass bone which might be expected due to the small amount of bone present in this wholesale cut (range, -.06 to 0.74). The correlations between percent

9-10-11 rib bone and carcass separable bone were also comparitively low and not consistent within the eight fat thickness and weight groups (range, 0.09 to 0.87).

These data support the accuracy of Hankins and Howe (1946) equations and these observations and those of Crown and Damon (1960) indicate that the percent separable components of the 9-10-11 rib sections were good predictors of carcass components, particularly muscle and fat. However, these data also indicate that the percent separable muscle and fat from the flank were essentially equally as good as the 9-10-11 rib section for estimating percent carcass muscle and fat. Hankins and Howe (1946) reported that the percent ether extract of the flank showed the highest correlation (0.95) to percent ether extract of the edible portion of the dressed beef carcass. Because of the ease of physical separation of the flank as well as for economic reasons, this cut could be used with essentially the same degree of accuracy as the 9-10-11 rib section separation which today is the most widely used method for estimating total carcass muscle and fat.

## Multiple Regression Analyses of Separable Carcass Components, Retail and Fat Trim Yields on Objective Carcass Measurements and Wholesale Cut Separable Components

Multiple Regression Analyses of Total Carcass Separable Muscle on Objective Carcass Measurements and Weight of Wholesale Cut Separable Components. In the combined weight groups, 98% of the variation in pounds of separable carcass muscle could be accounted for using the six independent variables presented in table 38. Of these six independent variables, carcass weight,

weight of separable flank fat and weight of separable flank muscle appeared to have the greatest effect on separable carcass muscle. These data support the findings of Cole et al. (1960) who reported a simple correlation between carcass weight and pounds of separable carcass muscle of 0.77. These authors also reported multiple correlations (ranging from 0.85 to 0.97) using carcass weight and weight of wholesale cut separable muscle. The prediction equation shown in table 38 had a standard error of estimate of 3.91 lb. which was less than the most accurate prediction equation of Cole et al. (1960). The most accurate equation of these authors involved separable round muscle as the independent variable for predicting pounds of carcass separable muscle. This equation had a standard error of estimate of 4.38 lb.

Table 38. Coefficient of determination between weight of carcass separable muscle and a combination of weights of wholesale cut separable components and objective carcass measurements, and the regression coefficient for each of the variables (combined weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 1.634 | | 0.68 | |
| Carcass wt. | 0.282 | 1.052 | 0.00 | 0.79 |
| Probe-Av. 3rd Sacral[2] | -.718 | -.140 | 0.00 | 0.97 |
| Wt. sep. flank muscle[3] | 3.302 | 0.215 | 0.00 | 0.96 |
| Wt. sep. flank fat | -2.412 | -.401 | 0.00 | 0.94 |
| Wt. kidney knob-L.S.[4] | -.643 | -.093 | 0.00 | 0.97 |
| L.dorsi muscle area | 0.779 | 0.052 | 0.03 | 0.98 |

$R^2$ = 0.98 Standard error of estimate = 3.91

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline.

[3]Sep. = separable.

[4]L.S. = left side.

The six independent variables listed in table 39 were associated with 90% of the variation in percent separable carcass muscle in the combined weight groups. The prediction equation given in table 39 showed a standard error of estimate of 1.33%. This compares favorably with the standard error of estimate of 2.51% for the prediction equation of Hankins and Howe (1946) who used percent separable muscle from the 9-10-11 rib section to predict percent carcass muscle.

Table 39. Coefficient of determination between percent carcass separable muscle and a combination of weights of wholesale cut separable components and objective carcass measurements, and the regression coefficient for each of the variables (combined weight groups).

| Independent variable | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 54.012 | | 0.00 | |
| Carcass wt. | 0.014 | 0.315 | 0.00 | 0.89 |
| Probe-5th Thoracic-4 in. | -.143 | -.141 | 0.01 | 0.89 |
| Probe-Av. 3rd Sacral[2] | -.229 | -.274 | 0.00 | 0.87 |
| Wt. sep. flank muscle[3] | 0.883 | 0.352 | 0.00 | 0.87 |
| Wt. sep. flank fat | -.690 | -.703 | 0.00 | 0.80 |
| Kidney knob wt.-L.S.[4] | -.266 | -.234 | 0.00 | 0.87 |

$R^2$ = 0.90 Standard error of estimate = 1.33

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline.

[3]Sep. = separable.

[4]L.S. = left side.

In the 500 to 550 lb. weight group, 89% of the variation in pounds of separable carcass muscle could be accounted for by the following five variables: 1) carcass weight, 2) average of three fat probes at the third sacral vertebra, 3) weight of separable flank muscle, 4) weight of separable flank fat and 5) weight of the kidney knob from the left side of the carcass. The multiple regression analysis of separable carcass muscle weight on these five variables is given in the supplement, p. 177.

Using these same five variables, 92% of the variation in percent separable carcass muscle in the 500 to 550 lb. weight group can be accounted for (table 40). The effect of carcass weight on percent total carcass separable muscle was relatively unimportant in these regression analyses.

Table 40. Coefficient of determination between percent carcass separable muscle and a combination of weights of wholesale cut separable components and objective carcass measurements, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variable | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 58.876 | | 0.00 | |
| Carcass wt. | 0.007 | 0.025 | 0.72 | 0.92 |
| Probe-Av. 3rd sacral[2] | -.289 | -.324 | 0.00 | 0.86 |
| Wt. sep. flank muscle[3] | 0.942 | 0.201 | 0.00 | 0.89 |
| Wt. sep. flank fat | -.806 | -.516 | 0.00 | 0.82 |
| Kidney knob wt.-L.S.[4] | -.351 | -.228 | 0.00 | 0.89 |

$R^2$ = 0.92 Standard error of estimate = 1.39

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline.

[3]Sep. = separable.

[4]L.S. = left side.

In the 700 to 750 lb. weight group, the independent variables given in table 41 were responsible for 93% of the variation in pounds of separable carcass muscle. The prediction equation presented in this table showed a high degree of accuracy with a standard error of estimate of 3.74 lb. These same six variables were responsible for 91% of the variation in percent separable carcass muscle in the 700 to 750 lb. weight group (suppl., p.177). This equation showed a standard error of estimate of 1.18%.

Table 41. Coefficient of determination between weight of carcass separable muscle and a combination of weights of wholesale cut separable components and objective carcass measurements, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 80.178 | | 0.00 | |
| Carcass wt. | 0.177 | 0.267 | 0.00 | 0.88 |
| Probe-5th Thoracic-4 in. | -.444 | -.126 | 0.04 | 0.92 |
| Probe-Av. 3rd Sacral[2] | -.775 | -.279 | 0.00 | 0.90 |
| Wt. sep. flank muscle[3] | 3.918 | 0.336 | 0.00 | 0.85 |
| Wt. sep. flank fat | -2.079 | -.507 | 0.00 | 0.83 |
| Wt. kidney knob-L.S.[4] | -.635 | -.151 | 0.00 | 0.91 |

$R^{2}$ = 0.93 Standard error of estimate = 3.74

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Av. of 3 probes 4, 8 and 12 in. off the carcass dorsal midline.

[3]Sep. = separable.

[4]L.S. = left side.

Ninety-six percent of the variation in weight of total carcass separable muscle in the combined weight groups could be accounted for using the three variables presented in table 42. In the 500 to 550 lb. weight group, only 79% of the weight of total carcass separable muscle could be accounted for using these same variables (suppl., p. 177) and 86% in the 700 to 750 lb. weight group (suppl., p 178 ). The standard error of estimates associated with these equations were 5.19, 5.29 and 4.96 lb., respectively. It is of interest to note that, in contrast with other equations reported in this dissertation, the equation predicting weight of total carcass separable muscle in the 700 to 750 lb. weight group was more accurate than that for the prediction of this same trait in the 500 to 550 lb. weight group.

Table 42. Coefficient of determination between weight of carcass separable muscle and a combination of weights of wholesale cut separable components, and the regression coefficient for each variable (combined weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -3.193 | | 0.44 | |
| Carcass wt. | 0.284 | 1.060 | 0.00 | 0.75 |
| Wt. sep. flank muscle[2] | 4.409 | 0.287 | 0.00 | 0.93 |
| Wt. sep. flank fat | -3.394 | -.564 | 0.00 | 0.83 |

$R^{2}$ = 0.96 Standard error of estimate = 5.19

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Sep. = separable.

Using carcass weight, weight of separable flank muscle and flank fat, 81% of the variation in percent of total separable carcass muscle could be accounted for with a standard error of estimate of 1.81% in the combined weight group (table 43). These same variables accounted for 83% of the variation in this trait in the 500 to 550 lb. weight group (suppl., p. 178 ) and 86% of the variation in the 700 to 750 lb. weight group (suppl., p. 178 ). These equations had standard errors of estimate of 1.97 and 1.42%, respectively. Thus, greater accuracy was also attained in the 700 to 750 lb. carcasses than in the 500 to 550 lb. carcasses.

Table 43. Coefficient of determination between percent carcass separable muscle and a combination of weights of wholesale cut separable components, and the regression coefficient for each of the variables (combined weight groups).

| Independent variable | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 50.345 | | 0.00 | |
| Carcass wt. | 0.012 | 0.267 | 0.02 | 0.80 |
| Wt. sep. flank muscle[2] | 1.266 | 0.504 | 0.00 | 0.73 |
| Wt. sep. flank fat | -1.100 | -1.121 | 0.00 | 0.31 |

$R^{2}$ = 0.81 Standard error of estimate = 1.81

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Sep. = separable.

Multiple Regression Analyses of Total Carcass Separable Muscle on Objective Carcass Measurements and Percent Wholesale Cut Separable Muscle. The 9-10-11 rib section is used rather extensively for predicting carcass composition because of the high relationships to total carcass composition and the ease of separation of this section. Prediction equations for estimating carcass composition from the wholesale flank and round were calculated and were compared to the 9-10-11 rib section.

In the combined weight groups, using carcass weight, length of round and the percent separable muscle of the respective cuts, pounds and percent total carcass separable muscle could be most accurately predicted using the 9-10-11 rib section separable muscle, followed by flank separable muscle and then round separable muscle (table 44). Differences were small between equations 1, 2 and 3 for predicting pounds of total carcass separable muscle. It should be noted that in using equations 4, 5 and 6 to predict percent carcass separable muscle using 9-10-11 rib

section or flank separable muscle gave similar results, but using round separable muscle in the equation decreased accuracy.

Table 44. Multiple regression equations for estimating pounds and percent total carcass separable muscle using objective carcass measurements and percent wholesale cut separable muscle as predictors, and the coefficient of determination for each equation (combined weight groups).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -103.986 + 0.239(X_1) + 0.470(X_2) + 2.192(X_3)$ | 0.96 | 5.28 |
| 2 | $\hat{Y} = -78.232 + 0.252(X_1) + 0.438(X_2) + 1.880(X_4)$ | 0.95 | 5.77 |
| 3 | $\hat{Y} = -200.864 + 0.222(X_1) + 1.978(X_2) + 2.660(X_5)$ | 0.94 | 6.32 |
| 4 | $\hat{Y}_1 = 16.767 - .006(X_1) + 0.212(X_2) + 0.705(X_3)$ | 0.86 | 1.57 |
| 5 | $\hat{Y}_1 = 25.052 - .002(X_1) + 0.198(X_2) + 0.606(X_4)$ | 0.83 | 1.74 |
| 6 | $\hat{Y}_1 = -12.531 - .013(X_1) + 0.744(X_2) + 0.814(X_5)$ | 0.74 | 2.14 |

$\hat{Y}$ = Estimated pounds of total carcass separable muscle.

$\hat{Y}_1$ = Estimated percent total carcass separable muscle.

$X_1$ = Carcass weight (lb.).

$X_2$ = Length of round (in.)

$X_3$ = Percent 9-10-11 rib section separable muscle.

$X_4$ = Percent flank separable muscle.

$X_5$ = Percent round separable muscle.

In contrast to this, round separable muscle used in the equations shown in table 45 was the most accurate predictor of these three cuts in the 500 to 550 lb. weight group, while flank separable muscle was least accurate. However, differences among these equations were not great. In the 700 to 750 lb. weight group (table 46), these equations showed

Table 45. Multiple regression equations for estimating pounds and percent total carcass separable muscle using objective carcass measurements and percent wholesale cut separable muscle as predictors, and the coefficient of determination for each equation (500 to 550 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -42.462 + 0.180(X_1) - .375(X_2) + 2.033(X_3)$ | 0.85 | 4.50 |
| 2 | $\hat{Y} = 16.929 + 0.167(X_1) - 1.138(X_2) + 1.691(X_4)$ | 0.80 | 5.17 |
| 3 | $\hat{Y} = -125.147 + 0.063(X_1) + 1.303(X_2) + 3.094(X_5)$ | 0.86 | 4.25 |
| 4 | $\hat{Y}_1 = 35.418 - .028(X_1) - .096(X_2) + 0.736(X_3)$ | 0.89 | 1.59 |
| 5 | $\hat{Y}_1 = 57.036 - .034(X_1) - .356(X_2) + 0.606(X_4)$ | 0.84 | 1.90 |
| 6 | $\hat{Y}_1 = 5.896 - .071(X_1) + 0.516(X_2) + 1.113(X_5)$ | 0.89 | 1.55 |

$\hat{Y}$ = Estimated pounds of total carcass separable muscle.

$\hat{Y}_1$ = Estimated percent total carcass separable muscle.

$X_1$ = Carcass weight (lb.)

$X_2$ = Length of round (in.).

$X_3$ = Percent 9-10-11 rib section separable muscle.

$X_4$ = Percent flank separable muscle.

$X_5$ = Percent round separable muscle.

flank separable muscle as the most accurate predictor of weight or percent total carcass separable muscle. In this weight group, round separable muscle showed relatively low prediction accuracy for either pounds or percent total carcass separable lean.

Table 46. Multiple regression equations for estimating pounds and percent total carcass separable muscle using objective carcass measurements and percent wholesale cut separable muscle as predictors, and the coefficient of determination for each equation (700 to 750 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -87.434 + 0.178(X_1) + 1.183(X_2) + 2.330(X_3)$ | 0.81 | 5.79 |
| 2 | $\hat{Y} = -33.168 + 0.116(X_1) + 1.763(X_2) + 2.236(X_4)$ | 0.87 | 4.77 |
| 3 | $\hat{Y} = -153.699 + 0.210(X_1) + 1.170(X_2) + 2.434(X_5)$ | 0.70 | 7.34 |
| 4 | $\hat{Y}_1 = 19.892 - .014(X_1) + 0.388(X_2) + 0.646(X_3)$ | 0.82 | 1.59 |
| 5 | $\hat{Y}_1 = 35.084 - .032(X_1) + 0.562(X_2) + 0.613(X_4)$ | 0.87 | 1.38 |
| 6 | $\hat{Y}_1 = 2.305 - .006(X_1) + 0.407(X_2) + 0.663(X_5)$ | 0.70 | 2.08 |

$\hat{Y}$ = Estimated pounds of total carcass separable muscle.

$\hat{Y}_1$ = Estimated percent total carcass separable muscle.

$X_1$ = Carcass weight (lb.).

$X_2$ = Length of round (in.).

$X_3$ = Percent 9-10-11 rib section separable muscle.

$X_4$ = Percent flank separable muscle.

$X_5$ = Percent round separable muscle.

Multiple Regression Analyses of Separable Carcass Muscle on Combinations of Objective Carcass Measurements and Flank Separable Components. Due to the ease of separation of the wholesale flank and the economy both in time and economic loss of product, regression equations using the flank separable components for prediction of total carcass separable muscle were calculated and appear in tables 47, 48 and 49 for the combined weight groups, the 500 to 550 lb. weight group, and the 700 to 750 lb. weight group, respectively. These euqations show a high degree of accuracy for

Table 47. Multiple regression equations for estimating pounds and percent total carcass separable muscle using objective carcass measurements and flank separable components as predictors, and the coefficient of determination for each equation (combined weight groups).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = 12.715 + 0.259(X_1) - .276(X_2) - .119(X_3) - .393(X_4) + 0.893(X_5) - .595(X_6)$ | 0.96 | 5.16 |
| 2 | $\hat{Y} = -45.567 + 0.259(X_1) - .281(X_2) - .123(X_3) - .379(X_4) + 1.480(X_5)$ | 0.96 | 5.15 |
| 3 | $\hat{Y} = -48.794 + 0.255(X_1) - .270(X_2) - .387(X_4) + 1.566(X_5)$ | 0.96 | 5.15 |
| 4 | $\hat{Y}_1 = 55.174 + 0.001(X_1) - .137(X_2) - .031(X_3) - .120(X_4) + 0.289(X_5) - .185(X_6)$ | 0.88 | 1.51 |
| 5 | $\hat{Y}_1 = 37.029 + 0.001(X_1) - .138(X_2) - .032(X_3) - .116(X_4) + 0.472(X_5)$ | 0.87 | 1.51 |
| 6 | $\hat{Y}_1 = 36.190 + 0.0003(X_1) - .136(X_2) - .118(X_4) + 0.494(X_5)$ | 0.87 | 1.51 |

$\hat{Y}$ = Estimated pounds of total carcass separable muscle.

$\hat{Y}_1$ = Estimated percent total carcass separable muscle.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm).

$X_3$ = Probe - 1st lumbar vertebra, 12 in. off the carcass dorsal midline (mm).

$X_4$ = Probe - Av. of 3 at the 3rd sacral vertebra, 4, 8 and 12 in. off the carcass dorsal midline (mm).

$X_5$ = Percent flank separable muscle.

$X_6$ = Percent flank separable fat.

Table 48. Multiple regression equations for estimating pounds and percent total carcass separable muscle using objective carcass measurements and flank separable components as predictors, and the coefficient of determination for each equation (500 to 550 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = 73.831 + 0.202(X_1) - .324(X_2) + 0.027(X_3) - .356(X_4) + 0.415(X_5) - .848(X_6)$ | 0.86 | 4.59 |
| 2 | $\hat{Y} = -15.535 + 0.210(X_1) - .320(X_2) + 0.048(X_3) - .333(X_4) + 1.280(X_5)$ | 0.85 | 4.64 |
| 3 | $\hat{Y} = -14.168 + 0.210(X_1) - .298(X_2) - .331(X_4) + 1.258(X_5)$ | 0.85 | 4.58 |
| 4 | $\hat{Y}_1 = 78.524 - .020(X_1) - .151(X_2) - .0005(X_3) - .120(X_4) + 0.144(X_5) - .296(X_6)$ | 0.88 | 1.70 |
| 5 | $\hat{Y}_1 = 47.351 - .017(X_1) - .149(X_2) + 0.007(X_3) - .112(X_4) + 0.445(X_5)$ | 0.88 | 1.71 |
| 6 | $\hat{Y}_1 = 47.545 - .017(X_1) - .146(X_2) - .112(X_4) + 0.442(X_5)$ | 0.88 | 1.68 |

$\hat{Y}$ = Estimated pounds of total carcass separable muscle.

$\hat{Y}_1$ = Estimated percent total carcass separable muscle.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline.

$X_3$ = Probe - 1st lumbar vertebra, 12 in. off the carcass dorsal midline.

$X_4$ = Probe - Av. of 3 probes at 3rd sacral vertebra, 4, 8 and 12 in. off the carcass dorsal midline.

$X_5$ = Percent flank separable muscle.

$X_6$ = Percent flank separable fat.

Table 49. Multiple regression equations for estimating pounds and percent total carcass separable muscle using objective carcass measurements and flank separable components as predictors, and the coefficient of determination for each equation (700 to 750 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -191.412 + 0.177(X_1) - .555(X_2) - .252(X_3) - .466(X_4) + 3.795(X_5) + 2.062(X_6)$ | 0.91 | 4.12 |
| 2 | $\hat{Y} = 14.891 + 0.163(X_1) - .469(X_2) - .154(X_3) - .483(X_4) + 1.848(X_5)$ | 0.91 | 4.17 |
| 3 | $\hat{Y} = 14.584 + 0.151(X_1) - .403(X_2) - .514(X_4) + 1.976(X_5)$ | 0.91 | 4.17 |
| 4 | $\hat{Y}_1 = 5.205 - .014(X_1) - .193(X_2) - .073(X_3) - .102(X_4) + 0.931(X_5) + 0.451(X_6)$ | 0.90 | 1.25 |
| 5 | $\hat{Y}_1 = 50.334 - .018(X_1) - .174(X_2) - .052(X_3) - .106(X_4) + 0.505(X_5)$ | 0.90 | 1.25 |
| 6 | $\hat{Y}_1 = 50.232 - .022(X_1) - .152(X_2) - .116(X_4) + 0.548(X_5)$ | 0.89 | 1.26 |

$\hat{Y}$ = Estimated pounds of total carcass separable muscle.

$\hat{Y}_1$ = Estimated percent total carcass separable muscle.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline.

$X_3$ = Probe - 1st lumbar vertebra, 12 in. off the carcass dorsal midline.

$X_4$ = Probe - Av. of 3 probes at the 3rd sacral vertebra, 4, 8 and 12 in. off the carcass dorsal midline.

$X_5$ = Percent flank separable muscle.

$X_6$ = Percent flank separable fat.

predicting either pounds or percent carcass separable muscle (coefficient of determination range, 0.88 to 0.96). Slightly greater accuracy of prediction was obtained in the 700 to 750 lb. weight group, which is in contrast with most other prediction equations presented. These data suggest that the separable components of the flank are of greater predictive value in heavier carcasses than in lighter carcasses.

Multiple Regression Analyses of Total Carcass Separable Fat on Objective Carcass Measurements and Percent Wholesale Cut Separable Fat. Carcass weight, fat probe at the 5th thoracic vertebra (4 in. off the carcass dorsal midline) and separable fat from the 9-10-11 rib section, flank and round were used in multiple regression analyses as shown in tables 50, 51 and 52.

In the combined weight groups (table 50), 9-10-11 rib section separable fat included in the equation was the best predictor of carcass separable fat (pounds and percent) followed closely by flank separable fat and round separable fat (coefficient of determination range, 0.85 to 0.95). This same order was observed in the 500 to 550 lb. weight group (table 51), but in the 700 to 750 lb. weight group, flank separable fat was essentially comparable to 9-10-11 rib and round separable fat for predicting percent total carcass separable fat (coefficient of determination range, 0.85 to 0.87)(table 52). The coefficients of determination were very similar within weight groups, but it can be seen from the equations shown in tables 51 and 52 that greater accuracy can be obtained in predicting either pounds or percent carcass separable fat in 500 to 550 lb. weight carcasses as opposed to 700 to 750 lb. weight carcasses.

Table 50. Multiple regression equations for estimating pounds and percent total carcass separable fat using objective carcass measurements and percent wholesale cut separable fat as predictors, and the coefficient of determination for each equation (combined weight groups).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -82.782 + 0.179(X_1) + 0.896(X_2) + 1.850(X_3)$ | 0.95 | 5.64 |
| 2 | $\hat{Y} = -122.346 + 0.173(X_1) + 1.174(X_2) + 1.821(X_4)$ | 0.94 | 6.55 |
| 3 | $\hat{Y} = -73.978 + 0.176(X_1) + 0.807(X_2) + 2.886(X_5)$ | 0.94 | 6.29 |
| 4 | $\hat{Y}_1 = 7.934 - .0005(X_1) + 0.303(X_2) + 0.629(X_3)$ | 0.91 | 1.58 |
| 5 | $\hat{Y}_1 = -6.402 - .003(X_1) + 0.380(X_2) + 0.637(X_4)$ | 0.88 | 1.83 |
| 6 | $\hat{Y}_1 = 11.634 - .001(X_1) + 0.308(X_2) + 0.932(X_5)$ | 0.85 | 2.05 |

$\hat{Y}$ = Estimated pounds of carcass separable fat.

$\hat{Y}_1$ = Estimated percent carcass separable fat.

$X_1$ = Carcass weight (lb.)

$X_2$ = Probe - 5th thoracic, 4 in. off carcass dorsal midline (mm.).

$X_3$ = Percent 9-10-11 rib section separable fat.

$X_4$ = Percent flank separable fat.

$X_5$ = Percent round separable fat.

Table 51. Multiple regression equations for estimating pounds and percent total carcass separable fat using objective carcass measurements and percent wholesale cut separable fat as predictors, and the coefficient of determination for each equation (500 to 550 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -126.461 + 0.284(X_1) + 0.791(X_2) + 1.559(X_3)$ | 0.95 | 3.82 |
| 2 | $\hat{Y} = -164.739 + 0.299(X_1) + 1.074(X_2) + 1.430(X_4)$ | 0.92 | 5.07 |
| 3 | $\hat{Y} = -173.335 + 0.380(X_1) + 0.868(X_2) + 2.453(X_5)$ | 0.92 | 5.01 |
| 4 | $\hat{Y}_1 = -10.727 + 0.036(X_1) + 0.300(X_2) + 0.606(X_3)$ | 0.94 | 1.46 |
| 5 | $\hat{Y}_1 = -26.506 + 0.042(X_1) + 0.382(X_3) + 0.580(X_4)$ | 0.91 | 1.81 |
| 6 | $\hat{Y}_1 = -29.546 + 0.074(X_1) + 0.312(X_2) + 0.977(X_5)$ | 0.91 | 1.84 |

$\hat{Y}$ = Estimated pounds of total carcass separable fat.

$\hat{Y}_1$ = Estimated percent total carcass separable fat.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm.).

$X_3$ = Percent 9-10-11 rib section separable fat.

$X_4$ = Percent flank separable fat.

$X_5$ = Percent round separable fat.

Table 52. Multiple regression equations for estimating pounds and percent total carcass separable fat using objective carcass measurements and percent wholesale cut separable fat as predictors, and the coefficient of determination for each equation (700 to 750 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -96.248 + 0.176(X_1) + 1.005(X_2) + 2.194(X_3)$ | 0.86 | 6.47 |
| 2 | $\hat{Y} = -198.084 + 0.228(X_1) + 1.310(X_2) + 2.360(X_4)$ | 0.85 | 6.76 |
| 3 | $\hat{Y} = -71.687 + 0.168(X_1) + 0.366(X_2) + 3.272(X_5)$ | 0.85 | 6.69 |
| 4 | $\hat{Y}_1 = 5.846 + 0.003(X_1) + 0.266(X_2) + 0.622(X_3)$ | 0.87 | 1.67 |
| 5 | $\hat{Y}_1 = -23.084 + 0.018(X_1) + 0.352(X_2) + 0.670(X_4)$ | 0.85 | 1.76 |
| 6 | $\hat{Y}_1 = 12.925 + 0.0005(X_1) + 0.076(X_2) + 0.940(X_5)$ | 0.87 | 1.68 |

$\hat{Y}$ = Estimated pounds of total carcass separable fat.

$\hat{Y}_1$ = Estimated percent total carcass separable fat.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline.

$X_3$ = Percent 9-10-11 rib section separable fat.

$X_4$ = Percent flank separable fat.

$X_5$ = Percent round separable fat.

Multiple Regression Analyses of Total Carcass Separable Bone on Objective Carcass Measurements and Percent Wholesale Cut Separable Components. Percent 9-10-11 rib section bone, percent round bone and percent flank separable muscle were used in combination with carcass weight and length of round to calculate multiple regression equations for the prediction of total carcass separable bone. Flank separable muscle was used rather than flank separable bone since the percent of flank separable bone was low and showed a very low relationship to total carcass separable bone.

In the combined weight groups (table 53) there was little difference in the predictive value of any of the equations for either pounds or percent separable carcass bone (coefficient of determination range, 0.91 to 0.92 and 0.79 to 0.83 for pounds and percents, respectively).

In the 500 to 550 lb. weight group (table 54), the equations for predicting pounds and percent carcass separable bone using flank separable muscle showed the most accurate predictive values (0.87 and 0.89 for pounds and percents, respectively). The coefficients of determinations and standard error of estimates for the 700 to 750 lb. weight group were similar to those of the combined weight groups. These data indicate that pounds and percent carcass separable bone can most accurately be predicted in lighter weight carcasses.

Table 53. Multiple regression equations for estimating pounds and percent total carcass separable bone using objective carcass measurements and percent wholesale cut separable components as predictors, and the coefficient of determination for each equation (combined weight groups).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -48.402 + 0.026(X_1) + 1.909(X_2) + 0.942(X_3)$ | 0.91 | 1.91 |
| 2 | $\hat{Y} = -47.633 + 0.025(X_1) + 1.946(X_2) + 0.309(X_4)$ | 0.92 | 1.79 |
| 3 | $\hat{Y} = -44.629 + 0.031(X_1) + 1.200(X_2) + 1.887(X_5)$ | 0.92 | 1.81 |
| 4 | $\hat{Y}_1 = -4.833 - .010(X_1) + 0.634(X_2) + 0.325(X_3)$ | 0.81 | 0.61 |
| 5 | $\hat{Y}_1 = -4.569 - .010(X_1) + 0.650(X_2) + 0.105(X_4)$ | 0.83 | 0.57 |
| 6 | $\hat{Y}_1 = -3.705 - .010(X_1) + 0.466(X_2) + 0.554(X_5)$ | 0.79 | 0.64 |

$\hat{Y}$ = Estimated pounds of carcass separable bone.

$\hat{Y}_1$ = Estimated percent carcass separable bone.

$X_1$ = Carcass weight (lb.).

$X_2$ = Length of round (in.).

$X_3$ = Percent 9-10-11 rib section separable bone.

$X_4$ = Percent flank separable muscle.

$X_5$ = Percent round separable bone.

Table 54. Multiple regression equations for estimating pounds and percent total carcass separable bone using objective carcass measurements and percent wholesale cut separable components as predictors, and the coefficient of determination for each equation (500 to 550 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -25.202 + 0.001(X_1) + 1.600(X_2) + 0.841(X_3)$ | 0.79 | 1.81 |
| 2 | $\hat{Y} = -37.887 + 0.024(X_1) + 1.576(X_2) + 0.334(X_4)$ | 0.87 | 1.42 |
| 3 | $\hat{Y} = -11.152 - .014(X_1) + 0.646(X_2) + 2.291(X_5)$ | 0.83 | 1.60 |
| 4 | $\hat{Y}_1 = 1.435 - .020\ (X_1) + 0.613(X_2) + 0.308(X_3)$ | 0.83 | 0.67 |
| 5 | $\hat{Y}_1 = -3.160 - .012(X_1) + 0.611(X_2) + 0.120(X_4)$ | 0.89 | 0.56 |
| 6 | $\hat{Y}_1 = 6.493 - .026(X_1) + 0.272(X_2) + 0.829(X_5)$ | 0.86 | 0.61 |

$\hat{Y}$ = Estimated pounds of total carcass separable bone.

$\hat{Y}_1$ = Estimated percent total carcass separable bone.

$X_1$ = Carcass weight (lb.).

$X_2$ = Length of round (in.).

$X_3$ = Percent 9-10-11 rib section separable bone.

$X_4$ = Percent flank separable muscle.

$X_5$ = Percent round separable bone.

Table 55. Multiple regression equations for estimating pounds and percent total carcass separable bone using objective carcass measurements and percent wholesale cut separable components as predictors, and the coefficient of determination for each equation (700 to 750 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -63.479 + 0.039(X_1) + 1.994(X_2) + 1.209(X_3)$ | 0.80 | 1.96 |
| 2 | $\hat{Y} = -71.717 + 0.044(X_1) + 2.300(X_2) + 0.302(X_4)$ | 0.79 | 2.04 |
| 3 | $\hat{Y} = -64.258 + 0.065(X_1) + 1.019(X_2) + 1.906(X_5)$ | 0.83 | 1.82 |
| 4 | $\hat{Y}_1 = -7.921 - .003(X_1) + 0.564(X_2) + 0.344(X_3)$ | 0.80 | 0.53 |
| 5 | $\hat{Y}_1 = -10.200 - .002(X_1) + 0.657(X_2) + 0.082(X_4)$ | 0.77 | 0.57 |
| 6 | $\hat{Y}_1 = -8.164 + 0.004(X_1) + 0.306(X_2) + 0.522(X_5)$ | 0.81 | 0.51 |

$\hat{Y}$ = Estimated pounds of total carcass separable bone.

$\hat{Y}_1$ = Estimated percent total carcass separable bone.

$X_1$ = Carcass weight (lb.).

$X_2$ = Length of round (in.).

$X_3$ = Percent 9-10-11 rib section separable bone.

$X_4$ = Percent flank separable muscle.

$X_5$ = Percent round separable bone.

## Relationships Between Weight of Certain Entire Muscles and Muscle Groups and Weight of Total Separable Carcass Muscle and Bone

Weight of the l. dorsi muscle showed the highest relationship to pounds of total carcass muscle in the combined weight groups and in the 500 to 550 lb. weight group (0.90 and 0.70, respectively) (table 56). In the 700 to 750 lb. weight group, however, the highest relationship to total carcass muscle was shown by the semimembranosus plus adductor (0.71), followed by the biceps femoris (0.63) and the l. dorsi muscle (0.61).

Correlation coefficients between muscle weights and total carcass muscle weight were markedly lower when calculated on a within weight group basis, particularly for the quadriceps muscles (range, 0.20 to 0.40). All other correlations between individual and muscle group weights and total carcass muscle were highly significant ($P < .01$)(range, 0.45 to 0.90). Although correlations were slightly lower than for individual and muscle group weights, essentially the same relationships were observed between these muscle weights and total bone weight.

## Relationships Between Weights of Certain Entire Bones and Bone Groups and Weight of Total Separable Carcass Muscle and Bone

Highly significant correlation coefficients ($P < .01$) were found between weight of the radius plus ulna, femur, tibia plus fibula, scapula and humerus and total carcass bone weight for the combined weight groups and within weight groups and are shown in table 57 (range, 0.62 to 0.91). Correlations between individual and bone group weights and total carcass muscle ranged from 0.24 to 0.85 and with the exception of the radius plus ulna and tibia plus fibula in the 500 to 550 lb. weight group all were highly significant ($P < .01$). These correlation coefficients were similar to those reported by Orme (1963) in lambs.

Table 56. Simple correlation coefficients between some individual muscle and muscle group weights and carcass separable muscle and bone.

| | Combined weight groups | | 500 to 550 lb. weight group | | 700 to 750 lb. weight group | |
|---|---|---|---|---|---|---|
| Muscles: | Total separable muscle | Total separable bone | Total separable muscle | Total separable bone | Total separable muscle | Total separable bone |
| Semitendinosus | 0.86 | 0.76 | 0.57 | 0.28 | 0.72 | 0.54 |
| Quadriceps | 0.64 | 0.63 | 0.20 | 0.21 | 0.34 | 0.40 |
| Semimembranosus and Adductor | 0.87 | 0.84 | 0.66 | 0.53 | 0.71 | 0.68 |
| Biceps femoris | 0.87 | 0.84 | 0.60 | 0.56 | 0.63 | 0.63 |
| Psoas major | 0.75 | 0.64 | 0.45 | 0.12 | 0.52 | 0.40 |
| L. dorsi | 0.90 | 0.78 | 0.70 | 0.16 | 0.61 | 0.54 |

Correlations > 0.220 are significant ($P < .05$) for the combined weight groups.
Correlations > 0.287 are significant ($P < .01$) for the combined weight groups.
Correlations > 0.312 are significant ($P < .05$) for the individual weight groups.
Correlations > 0.403 are significant ($P < .01$) for the individual weight groups.

Table 57. Simple correlation coefficients between individual bone and bone group weights and carcass separable muscle and bone.

| | Combined weight groups | | 500 to 550 lb. weight group | | 700 to 750 lb. weight group | |
|---|---|---|---|---|---|---|
| Bones: | Total separable muscle | Total separable bone | Total separable muscle | Total separable bone | Total separable muscle | Total separable bone |
| Radius + Ulna | 0.79 | 0.85 | 0.24 | 0.63 | 0.42 | 0.62 |
| Femur | 0.79 | 0.90 | 0.41 | 0.87 | 0.52 | 0.72 |
| Tibia + Fibula | 0.77 | 0.90 | 0.39 | 0.78 | 0.52 | 0.81 |
| Scapula | 0.85 | 0.91 | 0.66 | 0.88 | 0.58 | 0.71 |
| Humerus | 0.78 | 0.84 | 0.50 | 0.74 | 0.46 | 0.62 |

Correlations > 0.220 are significant ($P < .05$) for the combined weight groups.
Correlations > 0.287 are significant ($P < .01$) for the combined weight groups.
Correlations > 0.312 are significant ($P < .05$) for the individual weight groups.
Correlations > 0.403 are significant ($P < .01$) for the individual weight groups.

The highest relationship in the combined weight group and the 500 to 550 lb. weight group was observed between scapula weight and total bone weight (0.91 and 0.88, respectively). In the 700 to 750 lb. weight group, the highest relationship was observed between tibia plus fibula weight and total bone weight (0.81). Relationships between weights of these bones and total carcass bone weight were sufficiently high for use in prediction equations. These data support the findings of Butterfield (1963b) who developed several prediction equations for separable carcass bone using the weights of various bones as the independent variables in his equations.

Multiple Regression Analyses of Pounds and Percent Separable Carcass Muscle and Bone on Individual and Groups of Muscle and Bone Weights

Multiple Regression Analyses of Pounds and Percent Separable Carcass Muscle on Muscle and Bone Weights. In the combined weight groups, 94% of the variation in pounds of separable carcass muscle could be accounted for using the independent variables shown in table 58. The same five variables only accounted for 78% of the variation in percent separable carcass muscle in the combined weight groups with a standard error of estimate of 1.98% (suppl., p. 179 ).

Eighty-eight percent of the variation was accounted for in pounds of separable carcass muscle in the 500 to 550 lb. weight group using the same variables that were included in the combined weight group analysis plus weight of the femur, tibia and fibula and the humerus (suppl., p. 179 ). However, in this weight group, when the five variables used in

Table 58. Coefficient of determination between weight of carcass separable muscle and a combination of muscle and bone weights, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 4.978 | | 0.31 | |
| Carcass wt. | 0.049 | 0.184 | 0.00 | 0.93 |
| *Semitendinosus* wt. | 10.055 | 0.259 | 0.00 | 0.92 |
| *Biceps femoris* wt. | 5.934 | 0.247 | 0.00 | 0.92 |
| *L. dorsi* wt. | 2.899 | 0.202 | 0.00 | 0.94 |
| Scapula wt. | 12.652 | 0.189 | 0.00 | 0.93 |

$R^{2}$ = 0.94 Standard error of estimate = 6.21

[1]Value of coefficient of determination if that variable was deleted from the analysis.

the combined weight group analysis were included, 88% of the variation in percent separable carcass muscle was accounted for (table 59). Using the multiple regression equation presented in this table to estimate percent separable carcass muscle resulted in a standard error of estimate of 1.65%. Weight of the *L. dorsi* muscle had the greatest effect upon percent separable carcass muscle of any single variable in this prediction equation. This is probably attributable to the part to whole relationship.

Estimation of pounds and percent separable carcass muscle from muscle and bone weights in the 700 to 750 lb. weight groups resulted in reduced accuracy. Carcass weight and those variables with a significant ($P < .05$) effect on pounds and percent separable carcass muscle resulted in coefficients of determination of 0.73 for pounds of separable carcass muscle

Table 59. Coefficient of determination between percent of carcass separable muscle and a combination of muscle and bone weights, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{21}$ deletes |
|---|---|---|---|---|
| Constant | 51.336 | | 0.00 | |
| Carcass wt. | -.086 | -.312 | 0.00 | 0.80 |
| Semitendinosus wt. | 2.748 | 0.229 | 0.00 | 0.84 |
| Biceps femoris wt. | 2.154 | 0.256 | 0.00 | 0.83 |
| L. dorsi wt. | 1.870 | 0.360 | 0.00 | 0.78 |
| Scapula wt. | 6.236 | 0.335 | 0.00 | 0.80 |

$R^2$ = 0.88 Standard error of estimate = 1.65

[1]Value of coefficient of determination if that variable was deleted from the analysis.

(suppl., p. 180 ) and 0.77 for percent of separable carcass muscle (suppl., p. 180 ).

These results support those of Orme et al. (1960) who presented simple linear regression equations for the prediction of pounds of separable carcass muscle from muscle weights. The standard error of estimate of the multiple regression equations presented here were less in most instances than those presented by Orme et al. (1960).

Multiple Regression Analyses of Pounds and Percent Separable Carcass Bone on Muscle and Bone Weights. In the combined weight groups, accurate prediction equations for either pounds or percent separable carcass bone were calculated from muscle and bone weights. Six independent variables, listed in table 60, were responsible for 94% of the variation in pounds of separable carcass bone.

Table 60. Coefficient of determination between weight of separable carcass bone and a combination of muscle and bone weights, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -.814 | | 0.53 | |
| Carcass wt. | 0.0002 | 0.002 | 0.91 | 0.94 |
| Semitendinosus wt. | 0.961 | 0.098 | 0.04 | 0.94 |
| Biceps femoris wt. | 0.806 | 0.133 | 0.01 | 0.94 |
| Femur wt. | 1.779 | 0.172 | 0.01 | 0.94 |
| Tibia & Fibula wt. | 3.843 | 0.302 | 0.00 | 0.92 |
| Scapula wt. | 6.036 | 0.359 | 0.00 | 0.91 |

$R^2 = 0.94$ Standard error of estimate = 1.58

[1]Value of coefficient of determination if that variable was deleted from the analysis.

With one less variable (Semitendinosus weight), 88% of the variation in percent separable carcass bone was accounted for (standard error of estimate of 0.50%)(table 61). In contrast to the analysis for pounds of separable carcass bone, carcass weight has a highly significant ($P < .01$) effect upon percent separable carcass bone in the combined weight groups.

Ninety-five and 96% of the variation in pounds and percent of separable carcass bone, respectively, can be accounted for in the 500 to 550 lb. weight group. These prediction equations had a high degree of accuracy with a standard error of estimate of 0.92 lb., using five variables, to estimate pounds of carcass bone (suppl., p. 180) and a standard error of estimate of 0.33%, using six variables, to predict percent separable carcass bone (suppl., p. 181 ).

Table 61. Coefficient of determination between percent carcass separable muscle and a combination of muscle and bone weights, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 11.172 | | 0.00 | |
| Carcass wt. | -.018 | -1.239 | 0.00 | 0.31 |
| Biceps femoris wt. | 0.224 | 0.172 | 0.03 | 0.87 |
| Femur wt. | 0.806 | 0.362 | 0.00 | 0.85 |
| Tibia + Fibula wt. | 1.200 | 0.437 | 0.00 | 0.83 |
| Scapula wt. | 2.175 | 0.600 | 0.00 | 0.78 |

$R^2$ = 0.88 Standard error of estimate = 0.50

[1]Value of coefficient of determination if that variable was deleted from the analysis.

In the 700 to 750 lb. group, the prediction equations were less accurate. For pounds of separable carcass bone, 85% of the variation was accounted for using four independent variables (suppl., p. 181).with a standard error of estimate of 1.73 lb. For percent separable carcass bone, 88% of the variation was accounted for using five independent variables (suppl., p. 181) with a standard error of estimate of 0.42%.

## Relationships Between Weight and Percent Total Muscle, Fat and Bone

Correlation coefficients between weights and percents of total carcass separable muscle, fat and bone for the combined and individual weight groups appear in table 62. Correlations between percent muscle and percent fat were very high (-.98) on a combined and within weight group basis. The correlations between percent fat and percent bone were also high (-.84).

Positive correlations were observed between percent muscle and bone (0.74, 0.73 and 0.75 for the combined, 500 to 550 lb. and 700 to 750 lb. weight groups, respectively).

Table 62. Simple correlation coefficients between weights and percents of total carcass separable muscle, fat and bone for the combined and individual weight groups.

| Weight group | Separable muscle | | Separable fat | | Separable bone | |
|---|---|---|---|---|---|---|
| Separable component | lb. | % | lb. | % | lb. | % |
| Combined wt. group | | | | | | |
| Muscle | 1.00 | 1.00 | 0.40 | -.98 | 0.90 | 0.74 |
| Fat | | | 1.00 | 1.00 | 0.28 | -.84 |
| Bone | | | | | 1.00 | 1.00 |
| 500 to 550 lb. wt. group | | | | | | |
| Muscle | 1.00 | 1.00 | -.82 | -.98 | 0.65 | 0.73 |
| Fat | | | 1.00 | 1.00 | -.79 | -.84 |
| Bone | | | | | 1.00 | 1.00 |
| 700 to 750 lb. wt. group | | | | | | |
| Muscle | 1.00 | 1.00 | -.85 | -.98 | 0.78 | 0.75 |
| Fat | | | 1.00 | 1.00 | -.65 | -.84 |
| Bone | | | | | 1.00 | 1.00 |

Correlations > 0.220 are significant ($P < .05$) for combined weight groups.
Correlations > 0.287 are significant ($P < .01$) for combined weight groups.
Correlations > 0.312 are significant ($P < .05$) for individual weight groups.
Correlations > 0.403 are significant ($P < .01$) for individual weight groups.

Correlations involving weight of separable components were lower than for percents; however, all, except that between weight of total carcass fat and bone for the combined weight groups, were highly significant ($P < .01$). These relationships are similar to the results reported by Brown et al. (1962), Hedrick et al. (1963) and Miller et al. (1965). These authors reported high negative relationships between carcass fat and muscle and positive relationships between carcass bone and muscle.

## Relationships Between Wholesale Cut Retail Yield and Total Carcass Separable Components, Retail and Fat Trim Yields

Simple correlation coefficients between pounds and percent wholesale cut retail yields and pounds and percent separable components, retail and fat trim yields on a combined and within weight group basis appear in tables 63, 64 and 65.

The highest relationships between pounds of wholesale cut retail yields and pounds of carcass separable muscle, boned, trimmed round, loin, rib and chuck yield and total retail yield were the chuck and round yields (range, 0.60 to 0.95). These relationships existed for the combined as well as for the within weight groups. In general, pounds of wholesale cut retail yield was positively correlated with pounds and percent carcass muscling and bone and on a within weight group basis, negatively related to pounds and percent separable carcass fat and fat trim yields.

On a percent basis in the combined weight groups, the relationships between wholesale cut retail yield and separable carcass muscle and bone were lower than for weight. Correlations between percent wholesale cut retail yields and carcass separable fat were negative and higher than weight correlations. However, correlation coefficients between percent and weights of retail yield from the round, loin, rib and chuck and total retail yield were quite similar.

Correlations between percent retail yield of the flank and percent round, loin, rib and chuck yield (range, 0.72 to 0.82) and total retail yield (range, 0.84 to 0.89) were higher than those for weight. On a percent basis in all groups, correlations between retail yield from the

Table 63. Simple correlation coefficients between wholesale cut retail yield and carcass separable components, retail and fat trim yields for the combined weight groups.

| Wholesale cut retail yield | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | 0.90 | 0.55 | 0.39 | -.57 | 0.87 | 0.42 | 0.94 | 0.80 | 0.95 | 0.85 | 0.24 | -.82 | 0.11 | -.83 |
| Loin | 0.81 | 0.66 | 0.48 | -.69 | 0.75 | 0.52 | 0.88 | 0.85 | 0.87 | 0.86 | 0.29 | -.86 | 0.16 | -.87 |
| Rib | 0.75 | 0.56 | 0.40 | -.60 | 0.63 | 0.50 | 0.84 | 0.84 | 0.83 | 0.88 | 0.18 | -.88 | 0.03 | -.85 |
| Chuck | 0.92 | 0.59 | 0.52 | -.62 | 0.82 | 0.49 | 0.97 | 0.91 | 0.95 | 0.89 | 0.38 | -.88 | 0.24 | -.82 |
| Foreshank | 0.40 | 0.29 | -.03 | -.35 | 0.51 | 0.34 | 0.45 | 0.52 | 0.52 | 0.64 | -.19 | -.63 | -.20 | -.69 |
| Brisket | 0.59 | 0.61 | 0.20 | -.62 | 0.55 | 0.44 | 0.60 | 0.76 | 0.67 | 0.81 | 0.06 | -.80 | 0.02 | -.48 |
| Plate | 0.65 | 0.42 | 0.47 | -.42 | 0.55 | 0.28 | 0.73 | 0.57 | 0.77 | 0.65 | 0.28 | -.60 | 0.20 | -.49 |
| Flank | 0.56 | 0.73 | 0.34 | -.75 | 0.46 | 0.57 | 0.67 | 0.81 | 0.73 | 0.88 | 0.09 | -.87 | 0.06 | -.73 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 64. Simple correlation coefficients between wholesale cut retail yield and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Wholesale cut retail yield | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | 0.73 | 0.57 | -.75 | -.59 | 0.74 | 0.43 | 0.88 | 0.83 | 0.88 | 0.88 | -.82 | -.84 | -.83 | -.86 |
| Loin | 0.40 | 0.72 | -.36 | -.74 | 0.37 | 0.55 | 0.67 | 0.89 | 0.72 | 0.91 | -.60 | -.90 | -.63 | -.88 |
| Rib | 0.46 | 0.62 | -.21 | -.65 | 0.10 | 0.54 | 0.71 | 0.86 | 0.69 | 0.92 | -.50 | -.92 | -.54 | -.90 |
| Chuck | 0.71 | 0.64 | -.46 | -.68 | 0.44 | 0.57 | 0.81 | 0.90 | 0.71 | 0.92 | -.56 | -.92 | -.57 | -.87 |
| Foreshank | 0.36 | 0.40 | -.55 | -.48 | 0.63 | 0.54 | 0.46 | 0.55 | 0.58 | 0.67 | -.64 | -.71 | -.58 | -.66 |
| Brisket | 0.28 | 0.63 | -.36 | -.65 | 0.32 | 0.53 | 0.36 | 0.76 | 0.50 | 0.84 | -.48 | -.84 | -.39 | -.73 |
| Plate | 0.24 | 0.52 | -.15 | -.52 | 0.09 | 0.40 | 0.53 | 0.70 | 0.60 | 0.74 | -.45 | -.71 | -.50 | -.65 |
| Flank | 0.32 | 0.78 | -.34 | -.81 | 0.25 | 0.67 | 0.57 | 0.82 | 0.70 | 0.89 | -.64 | -.88 | -.57 | -.77 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 65. Simple correlation coefficients between wholesale cut retail yield and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Wholesale cut retail yield | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | 0.60 | 0.50 | -.51 | -.51 | 0.56 | 0.39 | 0.74 | 0.66 | 0.76 | 0.76 | -.65 | -.73 | -.51 | -.73 |
| Loin | 0.35 | 0.58 | -.22 | -.60 | 0.35 | 0.48 | 0.60 | 0.71 | 0.50 | 0.70 | -.43 | -.76 | -.30 | -.81 |
| Rib | 0.44 | 0.45 | -.22 | -.48 | 0.35 | 0.43 | 0.71 | 0.74 | 0.68 | 0.71 | -.47 | -.72 | -.45 | -.67 |
| Chuck | 0.62 | 0.49 | -.37 | -.48 | 0.49 | 0.33 | 0.90 | 0.82 | 0.86 | 0.81 | -.60 | -.74 | -.50 | -.52 |
| Foreshank | 0.26 | 0.02 | -.20 | 0.04 | 0.22 | -.17 | 0.39 | 0.22 | 0.52 | 0.41 | -.37 | -.28 | -.20 | -.03 |
| Brisket | 0.38 | 0.57 | -.27 | -.51 | 0.26 | 0.20 | 0.39 | 0.61 | 0.54 | 0.73 | -.41 | -.68 | -.28 | -.46 |
| Plate | 0.12 | 0.22 | 0.03 | -.18 | 0.06 | 0.02 | 0.28 | 0.14 | 0.44 | 0.31 | -.13 | -.22 | 0.03 | -.01 |
| Flank | 0.13 | 0.65 | 0.11 | -.61 | -.06 | 0.34 | 0.41 | 0.72 | 0.57 | 0.84 | -.15 | -.79 | -.03 | -.57 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

flank and the seven carcass compositional components were essentially as high or higher than those from any other wholesale cut. These findings are similar to those reported by Hedrick et al. (1963) and Miller et al. (1965) who found the flank retail yield and carcass retail yield relationship quite high and included retail flank yield as an independent variable in some of their prediction equations. In contrast to these data, Brungardt and Bray (1963) reported that percent trimmed round and round retail yields were most highly related to carcass retail yields. However, correlations between separable muscle from the round and carcass retail yields differed greatly when comparing them on a combined and within weight group basis (tables 28, 29 and 30) while those between separable muscle of the flank and carcass retail yields were much more consistent in all groups.

Thus, because of the ease in obtaining flank retail yield and/or separable components and the economics involved, the wholesale flank (Wellington, 1952, cutting procedure) should be considered for use in estimating retail and/or fat trim yields. Percent retail yields of the wholesale cuts in the 500 to 550 lb. weight group showed higher relationships to percent carcass retail and fat trim yields than those in the 700 to 750 lb. weight group.

### Relationships Between Pounds and Percent Wholesale Cut Fat Trim and Total Carcass Separable Components, Retail and Fat Trim Yields

Correlations between pounds and percent wholesale cut fat trim yields and pounds and percent carcass separable components, retail and fat trim yields appear in tables 66, 67 and 68. Pounds and percents of separable

Table 66. Simple correlation coefficients between wholesale cut fat trim and carcass separable components, retail and fat trim yields for the combined weight groups.

| Wholesale cut fat trim | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | 0.26 | -.62 | 0.41 | 0.67 | 0.16 | -.59 | 0.16 | -.80 | 0.12 | -.85 | 0.55 | 0.88 | 0.46 | 0.89 |
| Loin | 0.08 | -.70 | 0.30 | 0.74 | 0.03 | -.64 | 0.00 | -.82 | -.04 | -.84 | 0.45 | 0.89 | 0.32 | 0.87 |
| Rib | 0.11 | -.66 | 0.58 | 0.71 | -.02 | -.64 | 0.04 | -.86 | -.01 | -.89 | 0.76 | 0.94 | 0.66 | 0.88 |
| Chuck | 0.35 | -.67 | 0.76 | 0.72 | 0.21 | -.65 | 0.29 | -.90 | 0.26 | -.89 | 0.87 | 0.93 | 0.72 | 0.82 |
| Foreshank | 0.21 | -.33 | 0.41 | 0.37 | 0.13 | -.39 | 0.08 | -.57 | 0.03 | -.64 | 0.64 | 0.70 | 0.58 | 0.54 |
| Brisket | 0.23 | -.70 | 0.71 | 0.73 | 0.20 | -.62 | 0.22 | -.74 | 0.20 | -.86 | 0.81 | 0.88 | 0.72 | 0.70 |
| Plate | 0.55 | -.54 | 0.80 | 0.55 | 0.47 | -.45 | 0.58 | -.66 | 0.55 | -.73 | 0.78 | 0.70 | 0.61 | 0.58 |
| Flank | 0.30 | -.73 | 0.91 | 0.75 | 0.21 | -.58 | 0.36 | -.81 | 0.34 | -.88 | 0.90 | 0.87 | 0.80 | 0.74 |
| Kidney knob | 0.28 | -.57 | 0.70 | 0.56 | 0.23 | -.47 | 0.36 | -.46 | 0.36 | -.46 | 0.56 | 0.32 | 0.43 | 0.21 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.289 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 67. Simple correlation coefficients between wholesale cut fat trim and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Wholesale cut fat trim | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | -.26 | -.62 | 0.41 | 0.67 | -.20 | -.57 | -.48 | -.84 | -.55 | -.90 | 0.59 | 0.90 | 0.53 | 0.92 |
| Loin | -.15 | -.69 | 0.31 | 0.73 | -.17 | -.62 | -.28 | -.87 | -.34 | -.90 | 0.47 | 0.92 | 0.26 | 0.88 |
| Rib | -.44 | -.67 | 0.58 | 0.72 | -.52 | -.65 | -.60 | -.87 | -.70 | -.93 | 0.83 | 0.96 | 0.72 | 0.91 |
| Chuck | -.43 | -.67 | 0.66 | 0.73 | -.60 | -.68 | -.62 | -.88 | -.70 | -.91 | 0.88 | 0.95 | 0.75 | 0.89 |
| Foreshank | -.31 | -.42 | 0.41 | 0.47 | -.38 | -.48 | -.55 | -.60 | -.64 | -.70 | 0.73 | 0.77 | 0.72 | 0.74 |
| Brisket | -.71 | -.72 | 0.66 | 0.77 | -.60 | -.69 | -.77 | -.82 | -.79 | -.89 | 0.82 | 0.90 | 0.75 | 0.79 |
| Plate | -.52 | -.59 | 0.67 | 0.61 | -.56 | -.54 | -.55 | -.76 | -.55 | -.78 | 0.74 | 0.77 | 0.62 | 0.70 |
| Flank | -.74 | -.78 | 0.86 | 0.81 | -.71 | -.67 | -.66 | -.83 | -.68 | -.89 | 0.82 | 0.88 | 0.72 | 0.77 |
| Kidney knob | -.55 | -.70 | 0.74 | 0.71 | -.57 | -.64 | -.29 | -.53 | -.26 | -.47 | 0.47 | 0.42 | 0.32 | 0.29 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 68. Simple correlation coefficients between wholesale cut fat trim and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Wholesale cut fat trim | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | -.07 | -.61 | 0.06 | 0.66 | -.21 | -.64 | -.32 | -.68 | -.36 | -.72 | 0.30 | 0.80 | 0.19 | 0.83 |
| Loin | -.14 | -.69 | 0.24 | 0.74 | -.15 | -.68 | -.33 | -.71 | -.40 | -.70 | 0.47 | 0.84 | 0.32 | 0.87 |
| Rib | -.48 | -.64 | 0.41 | 0.69 | -.52 | -.65 | -.67 | -.81 | -.65 | -.76 | 0.61 | 0.85 | 0.42 | 0.77 |
| Chuck | -.54 | -.68 | 0.51 | 0.70 | -.44 | -.60 | -.66 | -.85 | -.63 | -.83 | 0.67 | 0.86 | 0.42 | 0.68 |
| Foreshank | -.10 | -.13 | 0.06 | 0.14 | -.08 | -.15 | -.44 | -.40 | -.48 | -.51 | 0.37 | 0.51 | 0.23 | 0.31 |
| Brisket | -.48 | -.67 | 0.44 | 0.65 | -.18 | -.44 | -.48 | -.67 | -.41 | -.76 | 0.55 | 0.79 | 0.42 | 0.59 |
| Plate | -.33 | -.43 | 0.42 | 0.41 | -.10 | -.27 | -.10 | -.34 | -.15 | -.49 | 0.35 | 0.44 | 0.13 | 0.19 |
| Flank | -.71 | -.65 | 0.83 | 0.61 | -.47 | -.35 | -.51 | -.73 | -.45 | -.84 | 0.85 | 0.80 | 0.69 | 0.60 |
| Kidney knob | -.78 | -.42 | 0.82 | 0.38 | -.65 | -.25 | -.60 | -.42 | -.52 | -.45 | 0.86 | 0.20 | 0.15 | 0.12 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

carcass muscle and bone were negatively related to pounds and percents wholesale cut fat trim within weight groups (range, -.07 to -.78); whereas, in the combined weight groups the relationships between pounds of these characteristics were positive but low (range, 0.08 to 0.55). Percent wholesale cut fat trim was highly significantly ($P < .01$) negatively related to percent carcass muscle and bone both in the combined and within weight groups except those between percent fat trim from the foreshank and separable muscle and bone and percent plate, flank and kidney fat and total carcass bone in the 700 to 750 lb. weight group.

Among the wholesale cuts, pounds of fat trim from the kidney knob and flank showed the highest relationships to pounds of total separable carcass fat for the combined and within weight groups (range, 0.70 to 0.91). When compared on a percent basis, correlations for kidney knob and flank with total carcass separable fat were lower, with the greatest reduction in the 700 to 750 lb. weight group. The relationships between percent fat trim of the other wholesale cuts and total carcass separable fat were highly significant ($P < .01$) with the exception of the percent foreshank fat in the 700 to 750 lb. weight group (0.14). These data indicate that foreshank fat deposition is not consistent with total carcass fat deposition.

Highly significant ($P < .01$) correlation coefficients were found between percent wholesale cut fat trim yields and percent boned, trimmed round, loin, rib and chuck retail yield and total retail yield in the combined and within weight groups, except for plate fat trim in the 700 to 750 lb. weight group (range, -.40 to -.93). The lowest relationships

for all wholesale cuts with retail yields were noted in the 700 to 750 lb. weight group (range, -10 to -.85). In the 500 to 550 lb. weight group, percent fat trim from all wholesale cuts except the kidney knob and foreshank showed correlations with retail yields of -.76 or higher. Percent flank fat trim was also highly related to retail yields (range, -.73 to -.89) and would again suggest use of the flank for predictive purposes.

Percents wholesale cut fat trim, except that from the kidney knob, were positively and highly significantly ($P < .01$) related to percent total fat trim yields for the combined weight groups (range, 0.54 to 0.93). With the exception of the kidney knob, foreshank and plate, correlations between percent fat trim yields and percent carcass fat trim yields were highly significant ($P < .01$) within the two weight groups (range, 0.59 to 0.96). Correlations between pounds and percent wholesale cut fat trim yields and pounds and percent carcass separable components, retail and fat trim yields were generally higher in the 500 to 550 lb. weight group than in the 700 to 750 lb. weight group.

## Relationships Between Wholesale Cut Bone Yield and Total Carcass Separable Components, Retail and Fat Trim Yields

Simple correlation coefficients between pounds and percent wholesale cut bone yields and pounds and percent carcass separable components, retail and fat trim yields for the combined and within weight groups appear in tables 69, 70 and 71. These relationships were similar to those previously discussed between separable bone and the seven carcass compositional components. Both pounds and percents wholesale cut bone yields were generally

Table 69. Simple correlation coefficients between wholesale cut bone yield and carcass separable components, retail and fat trim yields for the combined weight groups.

| Wholesale cut bone yield | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | 0.84 | 0.38 | 0.32 | -.48 | 0.92 | 0.65 | 0.83 | 0.30 | 0.82 | 0.31 | 0.22 | -.48 | 0.09 | -.48 |
| Loin | 0.74 | 0.35 | 0.37 | -.40 | 0.80 | 0.51 | 0.74 | 0.29 | 0.74 | 0.32 | 0.23 | -.46 | 0.14 | -.40 |
| Rib | 0.76 | 0.52 | 0.31 | -.56 | 0.73 | 0.60 | 0.70 | 0.38 | 0.69 | 0.40 | 0.24 | -.52 | 0.14 | -.44 |
| Chuck | 0.90 | 0.59 | 0.31 | -.66 | 0.92 | 0.76 | 0.84 | 0.44 | 0.83 | 0.48 | 0.24 | -.62 | 0.08 | -.57 |
| Foreshank | 0.80 | 0.04 | 0.32 | -.03 | 0.88 | 0.10 | 0.80 | 0.07 | 0.81 | -.04 | 0.20 | -.06 | 0.06 | -.15 |
| Brisket | 0.48 | 0.63 | -.07 | -.71 | 0.62 | 0.79 | 0.44 | 0.57 | 0.46 | 0.58 | -.10 | -.66 | -.16 | -.59 |
| Plate | 0.79 | 0.67 | 0.24 | -.72 | 0.83 | 0.77 | 0.78 | 0.61 | 0.73 | 0.58 | 0.12 | -.66 | 0.00 | -.59 |
| Flank | 0.10 | 0.14 | 0.13 | -.22 | 0.21 | 0.39 | 0.21 | 0.28 | 0.25 | 0.36 | -.03 | -.38 | -.01 | -.29 |

Correlations > 0.220 are significant ($P < .05$).
Correlations > 0.287 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 70. Simple correlation coefficients between wholesale cut bone yield and carcass separable components, retail and fat trim yields for the 500 to 550 lb. weight group.

| Wholesale cut bone yield | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | 0.45 | 0.34 | -.70 | -.45 | 0.76 | 0.59 | 0.47 | 0.37 | 0.51 | 0.43 | -.71 | -.55 | -.69 | -.54 |
| Loin | 0.02 | 0.21 | -.21 | -.25 | 0.30 | 0.38 | 0.16 | 0.30 | 0.26 | 0.38 | -.45 | -.47 | -.37 | -.38 |
| Rib | 0.26 | 0.43 | -.20 | -.48 | 0.23 | 0.55 | 0.20 | 0.41 | 0.22 | 0.47 | -.31 | -.56 | -.22 | -.45 |
| Chuck | 0.58 | 0.54 | -.66 | -.62 | 0.72 | 0.72 | 0.51 | 0.52 | 0.50 | 0.57 | -.65 | -.67 | -.60 | -.60 |
| Foreshank | 0.39 | -.04 | -.60 | 0.09 | 0.68 | -.12 | 0.42 | 0.02 | 0.53 | 0.01 | -.70 | -.06 | -.65 | -.10 |
| Brisket | 0.26 | 0.64 | -.57 | -.73 | 0.56 | 0.80 | 0.23 | 0.60 | 0.31 | 0.63 | -.48 | -.67 | -.40 | -.59 |
| Plate | 0.31 | 0.58 | -.43 | -.66 | 0.58 | 0.77 | 0.41 | 0.60 | 0.46 | 0.59 | -.57 | -.65 | -.58 | -.59 |
| Flank | -.11 | 0.14 | -.04 | -.23 | 0.23 | 0.46 | 0.06 | 0.21 | 0.19 | 0.32 | -.21 | -.35 | -.17 | -.29 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

Table 71. Simple correlation coefficients between wholesale cut bone yield and carcass separable components, retail and fat trim yields for the 700 to 750 lb. weight group.

| Wholesale cut bone yield | Total separable muscle | | Total separable fat | | Total separable bone | | Boned, trimmed retail RLRC[1] | | Boned, trimmed retail yield | | Total fat trim | | External fat trim from RLRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % | lb. | % |
| Round | 0.58 | 0.46 | -.58 | -.57 | 0.83 | 0.78 | 0.48 | 0.32 | 0.41 | 0.22 | -.56 | -.50 | -.50 | -.54 |
| Loin | 0.62 | 0.66 | -.53 | -.73 | 0.77 | 0.80 | 0.50 | 0.44 | 0.42 | 0.41 | -.53 | -.64 | -.42 | -.63 |
| Rib | 0.63 | 0.71 | -.68 | -.74 | 0.61 | 0.72 | 0.32 | 0.39 | 0.26 | 0.32 | -.55 | -.54 | -.49 | -.50 |
| Chuck | 0.80 | 0.68 | -.67 | -.76 | 0.86 | 0.84 | 0.56 | 0.36 | 0.52 | 0.32 | -.60 | -.57 | -.63 | -.59 |
| Foreshank | 0.52 | 0.27 | -.48 | -.36 | 0.76 | 0.54 | 0.46 | 0.30 | 0.44 | 0.18 | -.50 | -.35 | -.50 | -.41 |
| Brisket | 0.56 | 0.62 | -.44 | -.68 | 0.68 | 0.76 | 0.43 | 0.44 | 0.47 | 0.42 | -.42 | -.59 | -.42 | -.58 |
| Plate | 0.71 | 0.79 | -.57 | -.82 | 0.73 | 0.78 | 0.69 | 0.67 | 0.66 | 0.64 | -.62 | -.75 | -.53 | -.62 |
| Flank | 0.00 | 0.10 | 0.19 | -.12 | 0.07 | 0.16 | 0.41 | 0.37 | 0.44 | 0.37 | -.09 | -.38 | 0.04 | -.19 |

Correlations > 0.312 are significant ($P < .05$).
Correlations > 0.403 are significant ($P < .01$).
[1]RLRC = Round, loin, rib and chuck.

positively related to measures of carcass muscling and bone and negatively related to carcass fatness.

As would be expected, in the combined weight groups the highest relationships were noted between pounds and percent wholesale cut bone yields (except pounds and percent flank bone yield and percent foreshank bone yield) and pounds and percent total carcass bone (range, 0.51 to 0.92). In the combined weight groups, the highest relationships were observed between pounds of bone from the round (0.92), chuck (0.92) and foreshank (0.88) and pounds of separable carcass bone. On a percent basis, these same relationships were markedly reduced (range, 0.10 to 0.76).

## Multiple Regression Analyses of Pounds and Percent Retail Yield Measures on a Combination of Wholesale Cut Yields and Carcass Scores and Measurements

Multiple Regression Analyses of Pounds and Percent Boned, Trimmed Retail Yield from the Round, Loin, Rib and Chuck on a Combination of Wholesale Cut Yields and Objective Carcass Measurements. In the combined weight groups, 95% of the variation in pounds of boned, trimmed retail yield from the round, loin, rib and chuck (RLRC) could be accounted for by the six independent variables listed in table 72. The prediction of weight of retail yield from the RLRC using this equation resulted in a standard error of estimate of 5.28 lb. In the 500 to 550 lb. weight group, 85% of the variation in retail yield from the RLRC was accounted for by seven independent variables (suppl., p. 182). In the 700 to 750 lb. weight group, only five variables had a significant effect on weight of boned, trimmed RLRC yield and they were associated with 76% of the variation present in this variable (suppl., p. 182).

Table 72. Coefficient of determination between weight of boned, trimmed round, loin, rib and chuck retail yield and a combination of weights of wholesale cut yields and objective carcass measurements, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -75.841 | | 0.00 | |
| Carcass wt. | 0.217 | 0.906 | 0.00 | 0.84 |
| Round score[2] | 1.535 | 0.104 | 0.00 | 0.94 |
| Length of round | 4.028 | 0.347 | 0.00 | 0.93 |
| Wt. foreshank bone-R.S.[3] | -4.945 | -.157 | 0.02 | 0.94 |
| Wt. flank yield-R.S. | 2.198 | 0.201 | 0.00 | 0.92 |
| Wt. flank fat-R.S. | -2.197 | -.407 | 0.00 | 0.89 |

$R^2$ = 0.95 Standard error of estimate = 5.28

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]See table 2 for scoring system used.

[3]R.S. = Right side.

When the wholesale cut yields were expressed in percentages, 94% of the variation in pounds of boned, trimmed retail RLRC yield was accounted for combined weight groups using six independent variables (suppl., p. 183). In the combined weight groups, 79% of the variation in percent retail yield of the RLRC was accounted for by the six variables listed in table 73.

In the 500 to 550 lb. weight group, 79% of the variation in weight of boned, trimmed RLRC yield could be accounted for using carcass weight, length of round, 1. dorsi muscle area and percent retail yield of the flank (suppl., p. 183). Eighty-three percent of the variation in percent

Table 73. Coefficient of determination between percent boned, trimmed round, loin, rib and chuck retail yield and a combination of percent wholesale cut yields and carcass scores and measurements, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 10.953 | | 0.09 | |
| Carcass wt. | -.023 | -.600 | 0.00 | 0.72 |
| Round score[2] | 0.417 | 0.179 | 0.02 | 0.77 |
| Length of round | 1.439 | 0.786 | 0.00 | 0.71 |
| Wt. foreshank bone-R.S.[3] | -1.670 | -.336 | 0.02 | 0.77 |
| L. dorsi muscle area | 0.394 | 0.185 | 0.01 | 0.77 |
| % flank yield-R.S. | 0.301 | 0.696 | 0.00 | 0.52 |

$R^{2}$ = 0.79 Standard error of estimate = 1.70

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]See table 2 for scoring system used.

[3]R.S. = Right side.

retail yield of the RLRC could be accounted for using these same four variables plus weight of the foreshank bone (suppl., p. 183).

In the 700 to 750 lb. weight group, only 76% of the variation in pounds of retail yield of the RLRC (suppl., p. 184) and 67% of the variation in percent of the same trait (suppl., p. 184) could be accounted for using carcass weight, round score, length of round and percent retail yield of the flank.

Multiple Regression Analyses of Pounds and Percent Boned, Trimmed Retail Round, Loin, Rib and Chuck Yield on Objective Carcass Measurements and Percent Flank Retail Yield. In the combined weight groups, 94% of the variation in pounds of RLRC yield and 76% of the variation in percent RLRC yield can be accounted for using the variables listed in the equations shown in table 74. In the 500 to 550 lb. weight group (table 75), somewhat greater accuracy in predicting percent of RLRC yield was attained. The coefficients of determination for equations 1 (0.78) and 2 (0.81) in the 500 to 550 lb. weight group were lower compared to equations 1 (0.94) and 2 (0.94) in the combined weight groups. The coefficients of determination for equations 3 (0.78 and 4 (0.81) in the 500 to 550 lb. weight group were greater than the corresponding equations for the combined weight groups (0.76 and 0.76, respectively).

In the 700 to 750 lb. weight group (table 76), less of the total variation in either pounds or percent RLRC yield could be accounted for using these multiple regression analyses than in either the combined or the 500 to 550 lb. weight groups (coefficient of determination range 0.67 to 0.75). These data indicate that as beef carcasses get heavier (fatter), more difficulty in accurately estimating pounds or percent of RLRC yield is encountered.

These regression analyses were slightly less accurate with somewhat larger standard errors of estimate than those reported by Murphy et al. (1960) and Brungardt and Bray (1963).

Table 74. Multiple regression equations for estimating pounds and percent boned, trimmed round, loin, rib and chuck retail yield using objective carcass measurements and percent flank retail yield as predictors, and the coefficient of determination for each equation (combined weight groups).

| Equation No. | Estimating equations | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -44.501 + 0.204(X_1) + 0.024(X_2) - .314(X_3) + 1.610(X_5) + 0.797(X_6)$ | 0.94 | 5.86 |
| 2 | $\hat{Y} = -41.795 + 0.206(X_1) - .307(X_3) - .034(X_4) + 1.510(X_5) + 0.786(X_6)$ | 0.94 | 5.86 |
| 3 | $\hat{Y}_1 = 40.969 - .014(X_1) - .049(X_2) - .128(X_3) + 0.407(X_5) + 0.236(X_6)$ | 0.76 | 1.80 |
| 4 | $\hat{Y}_1 = 40.614 - .014(X_1) - .129(X_3) - .031(X_4) + 0.429(X_5) + 0.235(X_6)$ | 0.76 | 1.79 |

$\hat{Y}$ = Estimated pounds of boned, trimmed retail round, loin, rib and chuck yield.

$\hat{Y}_1$ = Estimated percent boned, trimmed retail round, loin, rib and chuck yield.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm.).

$X_3$ = Probe - 3rd sacral vertebra, 12 in. off the carcass dorsal midline (mm.).

$X_4$ = Fat measurement A (mm.).

$X_5$ = Length of round (in.).

$X_6$ = Percent flank retail yield.

Table 75. Multiple regression equations for estimating pounds and percent boned, trimmed round, loin, rib and chuck retail yield using objective carcass measurements and percent flank retail yield as predictors, and the coefficient of determination for each equation (500 to 550 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -100.107 + 0.295(X_1) - .200(X_2) - .418(X_3) + 2.391(X_5) + 0.543(X_6)$ | 0.78 | 5.14 |
| 2 | $\hat{Y} = -61.465 + 0.257(X_1) - .437(X_3) - .284(X_4) + 1.935(X_5) + 0.493(X_6)$ | 0.81 | 4.84 |
| 3 | $\hat{Y}_1 = 18.648 + 0.019(X_1) - .112(X_2) - .153(X_3) + 0.697(X_5) + 0.190(X_6)$ | 0.78 | 2.01 |
| 4 | $\hat{Y}_1 = 32.241 + 0.003(X_1) - .162(X_3) - .110(X_4) + 0.566(X_5) + 0.177(X_6)$ | 0.81 | 1.91 |

$\hat{Y}$ = Estimated pounds of boned, trimmed retail round, loin, rib and chuck yield.

$\hat{Y}_1$ = Estimated percent boned, trimmed retail round, loin, rib and chuck yield.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm.).

$X_3$ = Probe - 3rd sacral vertebra, 12 in. off the carcass dorsal midline (mm.).

$X_4$ = Fat measurement A (mm.).

$X_5$ = Length of round (in.).

$X_6$ = Percent flank retail yield.

Table 76. Multiple regression equations for estimating pounds and/or percent boned, trimmed round, loin, rib and chuck retail yield using objective carcass measurements and percent flank retail yield as predictors, and the coefficient of determination for each equation (700 to 750 lb. weight group).

| Equation No. | Estimating equations | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -71.018 + 0.211(X_1) + 0.038(X_2) - .326(X_3) + 1.714(X_5) + 1.268(X_6)$ | 0.74 | 5.94 |
| 2 | $\hat{Y} = -59.662 + 0.183(X_1) - .422(X_3) + 0.168(X_4) + 1.846(X_5) + 1.333(X_6)$ | 0.75 | 5.74 |
| 3 | $\hat{Y}_1 = 41.033 - .016(X_1) - .034(X_2) - .124(X_3) + 0.378(X_5) + 0.299(X_6)$ | 0.67 | 1.59 |
| 4 | $\hat{Y}_1 = 40.567 - .020(X_1) - .146(X_3) + 0.021(X_4) + 0.450(X_5) + 0.309(X_6)$ | 0.68 | 1.58 |

$\hat{Y}$ = Estimated pounds of boned, trimmed retail round, loin, rib and chuck yield.

$\hat{Y}_1$ = Estimated percent boned, trimmed retail round, loin, rib and chuck yield.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm.).

$X_3$ = Probe - 3rd sacral vertebra, 12 in. off the carcass dorsal midline (mm.).

$X_4$ = Fat measurement A (mm.).

$X_5$ = Length of round (in.).

$X_6$ = Percent flank retail yield.

Multiple Regression Analyses of Pounds and Percent Boned, Trimmed Total Carcass Retail Yield on a Combination of Weights of Wholesale Cut Yields and Carcass Scores and Measurements. In the combined weight groups, 96% of the variation in pounds of total carcass boned, trimmed retail yield was accounted for using six independent variables (table 77).

Table 77. Coefficient of determination between pounds of boned, trimmed total carcass retail yield and a combination of weights of wholesale cut yields and objective carcass measurements, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -25.066 | | 0.08 | |
| Carcass wt. | 0.189 | 0.651 | 0.00 | 0.93 |
| Depth of 10th rib | 1.992 | 0.061 | 0.02 | 0.96 |
| Length of round | 1.493 | 0.106 | 0.03 | 0.96 |
| Wt. untrimmed round-R.S.[2] | 0.542 | 0.204 | 0.01 | 0.96 |
| Wt. retail flank yield-R.S. | 3.692 | 0.278 | 0.00 | 0.91 |
| Wt. retail flank fat-R.S. | -2.089 | -.319 | 0.00 | 0.93 |

$R^2$ = 0.96 Standard error of estimate = 5.70

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]R.S. = Right side.

Estimating percent total carcass boned, trimmed retail yield in the combined weight groups, 84% of the variation could be accounted for using the five independent variables shown in table 78.

Greater accuracy was found in the 500 to 550 lb. weight group as 87% of the variation in pounds of boned, trimmed retail yield was related

Table 78. Coefficient of determination between percent boned, trimmed total carcass retail yield and a combination of weights of wholesale cut yields and carcass scores and measurements, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 41.717 | | 0.00 | |
| Carcass wt. | -.024 | -.494 | 0.00 | 0.80 |
| Round score[2] | 0.602 | 0.201 | 0.00 | 0.81 |
| Length of round | 1.118 | 0.474 | 0.00 | 0.79 |
| Wt. retail flank yield-R.S.[3] | 1.116 | 0.502 | 0.00 | 0.67 |
| Wt. retail flank fat-R.S. | -.788 | -.718 | 0.00 | 0.64 |

$R^2$ = 0.84 Standard error of estimate = 1.91

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]See table 2 for scoring system used.

[3]R.S. = Right side

to the five independent variables shown in table 79. This prediction equation, involving five variables, would be useful for the prediction of pounds of boned, trimmed retail yield in 500 to 550 lb. carcasses. These same five variables accounted for 90% of the variation in percent boned, trimmed carcass retail yield in the 500 to 550 lb. weight group (table 80).

In the 700 to 750 lb. weight group, 80% of the variation in weight of boned, trimmed carcass retail yield could be accounted by carcass weight and weights of retail flank muscle and fat (suppl., p. 185). Seventy-six percent of the variation in percent of this same variable could be accounted for using these same three independent variables plus the weight of the kidney knob (suppl., p. 185).

Table 79. Coefficient of determination between weight of boned, trimmed total carcass retail yield and a combination of weights of wholesale cut yields and objective carcass measurements, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -130.465 | | 0.01 | |
| Carcass wt. | 0.312 | 0.376 | 0.00 | 0.77 |
| Length of round | 3.905 | 0.344 | 0.00 | 0.80 |
| Wt. retail flank yield-R.S.[2] | 3.557 | 0.446 | 0.00 | 0.70 |
| Wt. retail flank fat-R.S. | -2.142 | -.518 | 0.00 | 0.72 |
| L. dorsi muscle area | 2.085 | 0.203 | 0.01 | 0.83 |

$R^2$ = 0.87 Standard error of estimate = 5.38

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]R.S. = Right side.

Table 80. Coefficient of determination between percent boned, trimmed total carcass retail yield and a combination of weights of wholesale cut yields and objective carcass measurements, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 15.513 | | 0.33 | |
| Carcass wt. | 0.005 | 0.014 | 0.81 | 0.90 |
| Length of round | 1.327 | 0.299 | 0.00 | 0.85 |
| Wt. retail flank yield-R.S.[2] | 1.230 | 0.394 | 0.00 | 0.77 |
| Wt. retail flank fat-R.S. | -.808 | -.500 | 0.00 | 0.76 |
| L. dorsi muscle area | 0.907 | 0.226 | 0.00 | 0.86 |

$R^2$ = 0.90 Standard error of estimate = 1.83

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]R.S. = Right side.

The preceding equations compare favorably with prediction equations of Murphy et al. (1960), Breidenstein (1962) and Brungardt and Bray (1963) for accuracy of prediction. The equations of Murphy et al. (1960) and Brungardt and Bray (1963) predict only the boned, trimmed retail yield of the RLRC; whereas, those presented here also estimate total carcass boned, trimmed retail yield. Greater accuracy was noted in the 500 to 550 lb. weight group than either the 700 to 750 lb. weight group or the combined weight groups.

Multiple Regression Analyses of Pounds and Percent Boned, Trimmed Total Carcass Retail Yield on a Combination of Wholesale Cut Yield Percentages and Carcass Scores and Measurements. When percent wholesale cut retail and fat trim yields were used in the prediction equations, the results were similar to those for wholesale cut retail weights in the combined weight groups. Ninety-five percent of the variation in pounds of total carcass boned, trimmed retail yield could be accounted for (combined weight groups) using the following four variables: 1) carcass weight; 2) length of round; 3) l. dorsi muscle area; and 4) % retail flank yield (suppl., p. 186).

The same variables plus round score, accounted for 85% of the variation in percent boned, trimmed carcass retail yield in the combined weight groups (suppl., p. 186).

In the 500 to 550 lb. weight group, 84 and 88% of the variation could be accounted for in pounds and percent, respectively, of boned, trimmed retail carcass yield (suppl., p. 187). In the 700 to 750 lb. weight group,

79 and 74% of the variation in the same two variables could be accounted for using the regression equations presented in the suppl., p. 188.

These equations, particularly on a combined weight group basis and in the 500 to 550 lb. weight group, compare favorably in accuracy with the prediction equations of Murphy et al. (1960), Breidenstein (1962) and Brungardt and Bray (1963).

Multiple Regression Analyses of Boned, Trimmed Total Carcass Retail Yield on Objective Carcass Measurements and Percent Flank Retail Yield. Ninety-four percent of the variation in pounds of boned, trimmed carcass retail yield (combined weight groups) could be accounted for using either equation 1 or 2 shown in table 81. Eighty-three and 84% of the variation in percent boned, trimmed carcass retail yield could be accounted for using equations 3 and 4 (table 81), respectively.

Greater accuracy of prediction of percent boned, trimmed carcass retail yield was accomplished in the 500 to 550 lb. weight group (table 82) using either equation 3 or 4. In the 700 to 750 lb. weight group, however, only 74% of the variation in percent boned, trimmed carcass retail yield could be accounted for using the corresponding equations (equations 3 or 4, table 83).

These data indicate that total carcass boned, trimmed retail yield could be quite accurately estimated using a combination of objective carcass measurements and percent flank retail yield. However, it would appear that greater accuracy of prediction can be obtained in lighter weight carcasses than those of heavier weights.

Table 81. Multiple regression equations for estimating pounds and percent boned, trimmed total carcass retail yield using objective carcass measurements and percent flank retail yield as predictors, and the coefficient of determination for each equation (combined weight groups).

| Equation No. | Estimating equations | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -67.173 + 0.255(X_1) + 0.144(X_2) - .208(X_3) + 1.707(X_5) + 1.283(X_6)$ | 0.94 | 6.59 |
| 2 | $\hat{Y} = -60.751 + 0.260(X_1) - .193(X_3) - .016(X_4) + 1.454(X_5) + 1.261(X_6)$ | 0.94 | 6.60 |
| 3 | $\hat{Y}_1 = 44.627 - .015(X_1) - .019(X_2) - .102(X_3) + 0.460(X_5) + 0.392(X_6)$ | 0.83 | 1.92 |
| 4 | $\hat{Y}_1 = 45.402 - .014(X_1) - .100(X_3) - .030(X_4) + 0.436(X_5) + 0.388(X_6)$ | 0.84 | 1.91 |

$\hat{Y}$ = Estimated pounds of boned, trimmed total carcass retail yield.

$\hat{Y}_1$ = Estimated percent boned, trimmed total carcass retail yield.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm.).

$X_3$ = Probe - 3rd sacral vertebra, 12 in. off the carcass dorsal midline (mm.).

$X_4$ = Fat measurement A (mm.).

$X_5$ = Length of round (in.).

$X_6$ = Percent flank retail yield.

Table 82. Multiple regression equations for estimating pounds and percent boned, trimmed total carcass retail yield using objective carcass measurements and percent retail flank yield as predictors, and the coefficient of determination for each equation (500 to 550 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -153.246 + 0.357(X_1) + 0.044(X_2) - .438(X_3) + 3.547(X_5) + 0.933(X_6)$ | 0.84 | 5.79 |
| 2 | $\hat{Y} = -92.587 + 0.317(X_1) - .452(X_3) - .361(X_4) + 2.581(X_5) + 0.810(X_6)$ | 0.87 | 5.32 |
| 3 | $\hat{Y}_1 = 10.981 + 0.022(X_1) - .026(X_2) - .158(X_3) + 1.085(X_5) + 0.336(X_6)$ | 0.87 | 2.10 |
| 4 | $\hat{Y}_1 = 32.862 + 0.005(X_1) - .165(X_3) - .140(X_4) + 0.766(X_5) + 0.297(X_6)$ | 0.89 | 1.90 |

$\hat{Y}$ = Estimated pounds of boned, trimmed total carcass retail yield.

$\hat{Y}_1$ = Estimated percent boned, trimmed total carcass retail yield.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm.).

$X_3$ = Probe - 3rd sacral vertebra, 12 in. off the carcass dorsal midline (mm.).

$X_4$ = Fat measurement A (mm.).

$X_5$ = Length of round (in.).

$X_6$ = Percent flank retail yield.

Table 83. Multiple regression equations for estimating pounds and percent boned, trimmed total carcass retail yield using objective carcass measurements and percent flank retail yield as predictors, and the coefficient of determination for each equation (700 to 750 lb. weight group).

| Equation No. | Estimating equation | Coefficient of determination | Standard error of estimate |
|---|---|---|---|
| 1 | $\hat{Y} = -104.379 + 0.300(X_1) - .069(X_2) - .019(X_3) + 1.229(X_5) + 1.820(X_6)$ | 0.80 | 6.33 |
| 2 | $\hat{Y} = -96.877 + 0.266(X_1) - .154(X_3) + 0.190(X_4) + 1.540(X_5) + 1.899(X_6)$ | 0.82 | 6.09 |
| 3 | $\hat{Y}_1 = 44.587 - .008(X_1) - .075(X_2) - .043(X_3) + 0.220(X_5) + 0.443(X_6)$ | 0.74 | 1.65 |
| 4 | $\hat{Y}_1 = 42.242 - .012(X_1) - .074(X_3) + 0.022(X_4) + 0.352(X_5) + 0.455(X_6)$ | 0.74 | 1.65 |

$\hat{Y}$ = Estimated pounds of boned, trimmed total carcass retail yield.

$\hat{Y}_1$ = Estimated percent boned, trimmed total carcass retail yield.

$X_1$ = Carcass weight (lb.).

$X_2$ = Probe - 5th thoracic vertebra, 4 in. off the carcass dorsal midline (mm.).

$X_3$ = Probe - 3rd sacral vertebra, 12 in. off the carcass dorsal midline (mm.).

$X_4$ = Fat measurement A (mm.).

$X_5$ = Length of round (in.).

$X_6$ = Percent flank retail yield.

Relationships Between L. dorsi Muscle Potassium and Sodium and L. dorsi Weight, Area and Total Carcass Separable Muscle

Simple correlation coefficients were calculated between L. dorsi muscle potassium and sodium and L. dorsi muscle weight, area and total carcass separable muscle on a fresh basis (total ppm of chemically determined element present in the muscle sample) and on a protein basis (ppm of the element/percent protein in the sample). These correlations appear in table 84.

Table 84. Simple correlation coefficients between muscle potassium and sodium and L. dorsi muscle weight, area, and total carcass separable muscle.

| | Potassium | | Sodium | |
|---|---|---|---|---|
| | Fresh basis | Protein basis[1] | Fresh basis | Protein basis[1] |
| Combined weight groups | | | | |
| L. dorsi muscle wt. | 0.16 | 0.09 | 0.24 | 0.20 |
| L. dorsi muscle area | 0.20 | 0.19 | 0.08 | 0.07 |
| Total separable muscle of carcasses | 0.17 | 0.01 | 0.25 | 0.16 |
| 500 to 550 lb. weight group | | | | |
| L. dorsi muscle wt. | 0.04 | 0.30 | -.20 | -.02 |
| L. dorsi muscle area | 0.11 | 0.24 | -.24 | -.14 |
| Total separable muscle of carcasses | 0.18 | 0.06 | -.29 | -.32 |
| 700 to 750 lb. weight group | | | | |
| L. dorsi muscle wt. | 0.14 | 0.06 | -.09 | -.12 |
| L. dorsi muscle area | 0.19 | 0.26 | -.08 | -.06 |
| Total separable muscle of carcasses | 0.11 | 0.08 | 0.00 | -.02 |

Correlations > 0.220 are significant ($p < .05$) for the combined weight groups.
Correlations > 0.287 are significant ($P < .01$) for the combined weight groups.
Correlations > 0.312 are significant ($P < .05$) for the individual weight groups.
Correlations > 0.403 are significant ($P < .01$) for the individual weight groups.
[1]Expressed as ppm/percent protein.

It is apparent upon examining these data that l. dorsi muscle potassium and sodium content had little relationship to l. dorsi muscle weight, area or total carcass separable muscle. Correlations reported here showed little if any predictive value for total carcass separable muscle. This is in contrast to the results of Kirton and Pearson (1963a) and (1963b) who found correlations, between potassium content of a sample of entire lamb carcasses and percent protein of the sample, which were high enough to be of limited predictive use. It should be noted however that these workers determined potassium content of a tissue sample of the entire carcass whereas, in this study a sample of the l. dorsi muscle was studied. Gillett et al. (1965) found considerable variation in potassium content between various entire porcine muscles.

## Means and Standard Deviations of Some Subjective Carcass Scores and Some Chemical and Organoleptic Characteristics

The means and standard deviations for the subjective carcass scores, chemical and organoleptic characteristics discussed in this section for the combined and individual weight groups and fat thickness ranges within weight groups are presented in table 85.

On a within weight and fat thickness group basis, the means for carcass grade and marbling score show a positive relationship to 12th rib fat thickness and total carcass fat content. As fat thickness (12th rib) increased, there was a marked increase in carcass grade and marbling score particularly in groups I through IV (5.20 to 8.00 for carcass grade and 11.70 to 18.30 for marbling score). Maturity score means show a negative relationship to measures of carcass fatness.

Table 85. Means and standard deviations of several subjective carcass scores and some chemical and organoleptic characteristics for the combined and individual weight groups and fat thickness ranges within weight groups.

| Trait | | Combined weight group | 500-550 lb. weight group | 700-750 lb. weight group | Group I 0.26"-0.50" | II 0.51"-0.75" | III 0.76"-1.00" | IV 1.01"-1.25" | V 0.26"-0.50" | VI 0.51"-0.75" | VII 0.76"-1.00" | VIII 1.01"-1.25" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carcass grade | Mean | 7.20 | 7.02 | 7.38 | 5.20 | 7.00 | 7.90 | 8.00 | 6.90 | 7.40 | 7.60 | 7.60 |
| | S.D.[1] | 1.57 | 1.79 | 1.31 | 1.69 | 1.88 | 0.88 | 1.05 | 1.20 | 0.97 | 1.78 | 1.26 |
| Marbling score | Mean | 16.99 | 16.05 | 17.92 | 11.70 | 16.70 | 17.50 | 18.30 | 17.20 | 17.80 | 18.30 | 18.40 |
| | S.D. | 3.82 | 3.88 | 3.56 | 2.45 | 3.37 | 2.84 | 3.20 | 2.94 | 2.78 | 4.78 | 3.84 |
| Maturity | Mean | 3.42 | 2.82 | 4.02 | 3.10 | 2.70 | 2.70 | 2.80 | 4.70 | 3.90 | 3.50 | 4.00 |
| | S.D. | 1.08 | 0.71 | 1.05 | 1.03 | 0.82 | 0.48 | 0.63 | 1.64 | 0.57 | 0.85 | 0.47 |
| % ether extract of L. D.[2] | Mean | 8.56 | 8.34 | 8.79 | 4.09 | 7.85 | 11.13 | 10.28 | 7.60 | 7.76 | 10.82 | 8.97 |
| | S.D. | 3.50 | 3.89 | 3.11 | 1.70 | 2.47 | 3.78 | 3.00 | 2.78 | 2.87 | 3.46 | 2.58 |
| % protein of L. D. | Mean | 21.18 | 21.04 | 21.33 | 21.56 | 21.21 | 20.64 | 20.73 | 21.39 | 21.24 | 21.13 | 21.55 |
| | S.D. | 0.91 | 0.90 | 0.92 | 1.08 | 0.30 | 0.89 | 0.92 | 0.78 | 1.06 | 1.03 | 0.86 |
| % moisture of L. D. | Mean | 69.50 | 69.74 | 69.26 | 73.24 | 69.94 | 67.55 | 68.26 | 70.47 | 70.48 | 67.27 | 68.84 |
| | S.D. | 2.90 | 3.14 | 2.66 | 1.24 | 2.34 | 3.18 | 2.06 | 1.80 | 2.65 | 2.72 | 2.26 |
| Tenderness Warner-Bratzler | Mean | 10.08 | 9.76 | 10.39 | 10.25 | 10.14 | 9.02 | 9.64 | 10.85 | 10.31 | 10.29 | 10.12 |
| | S.D. | 1.36 | 1.18 | 1.47 | 1.09 | 1.01 | 1.45 | 0.81 | 1.66 | 1.68 | 0.80 | 1.67 |
| Tenderness Panel[3] | Mean | 6.60 | 6.66 | 6.53 | 6.19 | 6.72 | 6.83 | 6.92 | 6.20 | 6.44 | 6.46 | 7.03 |
| | S.D. | 0.68 | 0.66 | 0.69 | 0.75 | 0.66 | 0.66 | 0.30 | 0.67 | 0.40 | 0.76 | 0.68 |
| Juiciness Panel | Mean | 6.48 | 6.52 | 6.45 | 6.38 | 6.77 | 6.38 | 6.56 | 6.57 | 6.23 | 6.45 | 6.53 |
| | S.D. | 0.54 | 0.57 | 0.52 | 0.50 | 0.32 | 0.76 | 0.60 | 0.50 | 0.72 | 0.54 | 0.25 |
| Flavor Panel | Mean | 6.30 | 6.29 | 6.31 | 6.00 | 6.54 | 6.25 | 6.38 | 6.46 | 5.98 | 6.31 | 6.47 |
| | S.D. | 0.50 | 0.48 | 0.52 | 0.56 | 0.31 | 0.44 | 0.48 | 0.55 | 0.46 | 0.54 | 0.44 |

[1]S.D. = Standard deviation. [2]L.D. = 1. dorsi muscle. [3]Nine point hedonic scale.

Means for percent protein, ether extract and moisture of the l. dorsi muscle showed the expected relationships to fat thickness except for groups III and VII which had greater mean percents ether extract and percents protein with less moisture than groups IV and VIII.

Mean tenderness scores, both Warner-Bratzler and taste panel, indicated that as fat thickness, carcass grade and marbling score increased, tenderness increased. There were no marked relationships between panel flavor and juiciness scores and any of the characteristics studied. Within weight and fat thickness group correlations were determined for organoleptic data but are not presented in this dissertation.

## SUMMARY

Ten steer carcasses were selected within each of four fat thickness ranges (average of three measurements at the 12th rib) (0.26 to 0.50 in., 0.51 to 0.75 in., 0.76 to 1.00 in. and 1.01 to 1.25 in.) within each of two weight groups (500 to 550 lb. and 700 to 750 lb.). The carcasses were subjectively scored for each grade factor and some linear measurements of fat and muscle were recorded. External fat thickness probes were made 4, 8 and 12 in. off the dorsal midline of the left side of each carcass, perpendicular to the anterior edge of the 5th, 8th and 11th thoracic vertebrae, the 1st, 4th and 6th lumbar vertebrae and the 3rd and 5th sacral vertebrae.

The left side of each carcass was cut into wholesale cuts and physically separated into muscle, fat and bone with the exception of the round and rib. The rump was removed from the wholesale round and then the two portions individually physically separated. The wholesale rib was cut into the 6-7-8, 9-10-11 and 12th rib sections and each section was individually physically separated. The right side of each carcass was cut into boneless, closely trimmed (approximately 0.3 in.) retail cuts by wholesale cut.

Analysis of variance showed highly significant ($P < .01$) differences due to fat thickness for pounds and percent of the seven carcass compositional and yield characteristics studied. It also showed highly significant differences ($P < .01$) due to carcass weight for these same compositional and yield characteristics except percents carcass separable muscle, fat and bone. Highly significant ($P < .01$) interaction effects (inter-

action of carcass weight and fat thickness) were noted in percents round, loin, rib and chuck retail yield, total carcass retail yield, total fat trim and external fat trim from the round, loin, rib and chuck.

Subjective carcass scores showed little promise for estimation of carcass yield or composition. Despite a deliberate attempt to evaluate conformation independent of fat, subjective conformation scores were more highly correlated with measures of carcass fatness than muscling.

The fat probes were highly positively correlated with measures of carcass fatness and highly negatively related to measures of muscling and bone. The most promising fat thickness probe sites for predicting carcass composition, retail and fat trim yields were the 5th thoracic vertebra, 4 in. off the dorsal carcass midline and the average of the 3 probes at the 3rd sacral vertebra.

Regression equations for estimating carcass separable components, retail and fat trim yields, from the independent variables fat probes and carcass weight were more accurate for the 500 to 550 lb. weight group than the 700 to 750 lb. weight group. In general, pounds of the carcass separable components, retail or fat trim yields were more accurately predicted in the combined weight groups than percents.

Correlations between pounds and percents separable wholesale cut muscle and pounds and percent total carcass separable muscle, bone and retail yields were highly significant ($P < .01$) for the combined weight groups (range, 0.48 to 0.98) except for pounds and percent brisket muscle and percent foreshank muscle (range, 0.02 to 0.61). Pounds of separable chuck muscle showed the highest relationship to pounds of total carcass separable muscle for the combined weight groups (0.98) as well as within

weight groups (0.94 and 0.92 for the 500 to 550 lb. and 700 to 750 lb. weight groups, respectively).

Percent rib separable muscle showed the highest correlation with percent carcass separable muscle (0.95) followed by the loin (0.93), chuck (0.92) and the flank (0.91)(combined weight groups). All correlations between percent wholesale cut separable muscle and percent carcass separable muscle were highly significant ($P < .01$) for the combined weight groups except for that of the brisket.

In the combined weight groups, the percent rib separable fat was most highly related to percent total carcass separable fat (0.96) followed in order by the loin and chuck (0.94), plate (0.92) and the round and flank (0.91). These same cuts were also most highly related to carcass separable fat within weight groups although not in the same order.

Percent separable bone in the chuck had the highest correlation with percent carcass separable bone in the combined and 500 to 550 lb. weight groups (0.92 and 0.93, respectively). In the 700 to 750 lb. weight group, percent loin separable bone showed the highest relationship to percent carcass separable bone (0.90) followed by the chuck (0.89).

Percent 9-10-11 rib section and wholesale flank separable muscle and fat had the highest and most consistent correlations with percent total carcass separable muscle and fat for all weight and fat thickness groups (range, 0.71 to 0.95). Slightly lower correlations were observed between the percent wholesale round separable components and total carcass separable components for the individual and combined weight groups.

Ninety-four to 96% of the variation in pounds and 74 to 86% of the variation in percent of carcass separable muscle could be accounted for by

percents separable muscle from the 9-10-11 rib, flank or round, carcass weight and length of round in the combined weight groups. Regression equations including percent round separable muscle were less accurate than the 9-10-11 rib section or the flank for estimating total carcass muscle.

From 85 to 95% of the variation in pounds and percent carcass separable fat could be accounted for in the combined weight groups by carcass weight, 5th thoracic vertebra fat probe 4 in. off the midline and percent separable fat of the 9-10-11 rib section, flank or round.

Seventy-nine to 91% of the variation in percent total carcass separable bone could be accounted for in the combined weight groups by carcass weight, length of round and percent separable 9-10-11 rib section bone, round bone or separable flank muscle. Regression equations including flank muscle most accurately estimated either pounds or percent carcass separable bone followed in order by the percent 9-10-11 rib section bone and percent round bone.

These results indicate that the wholesale flank separable components could be utilized to accurately estimate carcass separable components. This accuracy, the ease and small amount of time for separation of the flank and small economic loss of product compared to the rib, round or chuck strongly suggest the use of the wholesale flank separable components for estimation of total carcass composition.

Of the muscles studied, weight of the l. dorsi muscle had the highest relationship to pounds of total carcass muscle in the combined and 500 to 550 lb. weight groups (0.90 and 0.70, respectively). In the 700 to

750 lb. weight group, the highest correlation with pounds of carcass separable muscle was observed for the semimembranosus plus adductor muscles (0.71).

Highly significant correlation coefficients ($P < .01$) were found between weight of the radius plus ulna, femur, tibia plus fibula, scapula and humerus and total carcass bone weight for the combined and individual weight groups (range, 0.62 to 0.91).

Even though regression equations involving muscle and bone weights plus carcass weight to predict pounds or percent carcass separable muscle and bone were accurate, the laborious physically dissection techniques and economic loss of product limit their usefulness.

Correlations between percent muscle and fat were high (-.98) for the combined and individual weight groups. Correlations between percent carcass fat and bone were also highly significant ($P < .01$) (-.84) for the combined and individual weight groups. Positive correlations were observed between percent muscle and bone (0.74, 0.73 and 0.75 for the combined, 500 to 550 lb. and 700 to 750 lb. weight groups, respectively).

In most instances, percent retail and fat trim yields of the flank showed the highest relationships to total carcass retail and fat trim yields for the combined and individual weight groups (range, 0.57 to 0.89). These retail yield data also suggest the use of the wholesale flank for estimating round, loin, rib and chuck (RLRC) and total carcass retail yield.

Flank separable components plus combinations of objective measurements accounted for 95% of the variation in pounds of RLRC retail yield

and 96% of the variation in carcass retail yield in the combined weight groups. Only 79 and 84% of the variation in percents of these retail yields could be accounted for in the combined weight groups by these same independent variables. Greater accuracy for estimating retail yields was observed in the 500 to 550 lb. weight group than in the 700 to 750 lb. weight group. Also, greater accuracy was obtained in the prediction of total carcass retail yield than for RLRC retail yield.

Low, non-significant correlation coefficients were found between 1. dorsi muscle potassium and sodium and 1. dorsi muscle weight, area and total carcass separable muscle (range, 0.00 to 0.30). Means of the organoleptic analyses were not consistent with compositional data.

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SUPPLEMENT

Table A. Coefficient of determination between weight of carcass separable fat and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variable | Regression coefficients | Beta weights | Sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -41.671 | | 0.00 | |
| Carcass wt. | 0.176 | 0.655 | 0.00 | 0.68 |
| Probe-5th thoracic-4 in. | 1.578 | 0.254 | 0.00 | 0.90 |
| Probe-8th thoracic-12 in. | -.931 | -.165 | 0.00 | 0.93 |
| Probe-1st lumbar-12 in. | 0.642 | 0.187 | 0.00 | 0.92 |
| Probe-6th lumbar-12 in. | -.346 | -.113 | 0.01 | 0.93 |
| Probe-Av. 3rd sacral[2] | 1.050 | 0.204 | 0.00 | 0.92 |
| Fat measurement B | 0.367 | 0.140 | 0.00 | 0.93 |
| Fat measurement D | 0.796 | 0.180 | 0.00 | 0.92 |

$R^2$ = 0.94 Standard error of estimate - 6.67

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table B. Coefficient of determination between percent carcass separable fat and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variable | Regression coefficients | Beta weights | Sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 23.515 | | 0.00 | |
| Carcass wt. | -.004 | -.074 | 0.20 | 0.85 |
| Probe-5th thoracic-4 in. | 0.573 | 0.447 | 0.00 | 0.76 |
| Probe-8th thoracic-8 in. | -.274 | -.254 | 0.00 | 0.83 |
| Probe-1st lumbar-12 in. | 0.215 | 0.304 | 0.00 | 0.82 |
| Probe-6th lumbar-12 in. | -.092 | -.146 | 0.02 | 0.84 |
| Probe-Av. 3rd sacral[2] | 0.358 | 0.338 | 0.00 | 0.80 |
| Fat measurement B | 0.100 | 0.186 | 0.00 | 0.83 |
| Fat measurement D | 0.249 | 0.273 | 0.00 | 0.82 |

$R^2$ = 0.86 Standard error of estimate = 2.10

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table C. Coefficient of determination between weight of carcass separable fat and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -55.228 | | 0.22 | |
| Carcass wt. | 0.098 | 0.115 | 0.10 | 0.87 |
| Probe-5th thoracic-4 in. | 2.191 | 0.482 | 0.00 | 0.72 |
| Probe-8th thoracic-8 in. | -1.470 | -.434 | 0.00 | 0.83 |
| Probe-1st lumbar-8 in. | -.702 | -.327 | 0.00 | 0.84 |
| Probe-1st lumbar-12 in. | 1.496 | 0.559 | 0.00 | 0.74 |
| Probe-4th lumbar-8 in. | 0.464 | 0.241 | 0.01 | 0.85 |
| Probe-3rd sacral-8 in. | 0.839 | 0.291 | 0.00 | 0.84 |
| Circumference of round | 1.649 | 0.176 | 0.02 | 0.86 |
| Fat measurement D | 0.941 | 0.334 | 0.00 | 0.84 |

$R^{2}$ = 0.88 Standard error of estimate = 6.47

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table D. Coefficient of determination between percent carcass separable fat and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variable | Regression coefficients | Beta weights | Sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 17.367 | | 0.13 | |
| Carcass wt. | -.018 | -.078 | 0.24 | 0.89 |
| Probe-5th thoracic-4 in. | 0.573 | 0.474 | 0.00 | 0.74 |
| Probe-8th thoracic-8 in. | -.371 | -.411 | 0.00 | 0.84 |
| Probe-1st lumbar-8 in. | -.174 | -.305 | 0.00 | 0.85 |
| Probe-1st lumbar-12 in. | 0.390 | 0.548 | 0.00 | 0.76 |
| Probe-4th lumbar-8 in. | 0.120 | 0.236 | 0.01 | 0.86 |
| Probe-3rd sacral-8 in. | 0.240 | 0.314 | 0.00 | 0.84 |
| Circumference of round | 0.446 | 0.178 | 0.02 | 0.88 |
| Fat measurement D | 0.274 | 0.366 | 0.00 | 0.84 |

$R^{2}$ = 0.89 Standard error of estimate = 1.66

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table E. Coefficient of determination between percent carcass separable fat and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 21.047 | | 0.00 | |
| Probe-5th thoracic-4 in. | 0.852 | 0.618 | 0.00 | 0.67 |
| Probe-8th thoracic-8 in. | -.248 | -.190 | 0.09 | 0.83 |
| Probe-1st lumbar-12 in. | 0.036 | 0.041 | 0.72 | 0.85 |
| Probe-Av. 3rd sacral[2] | 0.353 | 0.308 | 0.00 | 0.79 |
| Fat measurement D | 0.316 | 0.293 | 0.00 | 0.80 |

$R^2$ = 0.85 Standard error of estimate = 2.46

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table F. Coefficient of determination between percent carcass separable fat and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficient | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 19.984 | | 0.00 | |
| Probe-5th thoracic-4 in. | 0.524 | 0.434 | 0.00 | 0.71 |
| Probe-8th thoracic-8 in. | -.294 | -.327 | 0.01 | 0.80 |
| Probe-1st lumbar-12 in. | 0.267 | 0.374 | 0.00 | 0.76 |
| Probe-Av. 3rd sacral[2] | 0.411 | 0.431 | 0.00 | 0.76 |
| Fat measurement D | 0.212 | 0.283 | 0.01 | 0.80 |

$R^2$ = 0.83 Standard error of estimate = 1.93

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table G. Coefficient of determination between percent external fat trim from the round, loin, rib and chuck and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 8.430 | | 0.00 | |
| Carcass wt. | 0.011 | 0.524 | 0.00 | 0.63 |
| Probe-4th lumbar-12 in. | 0.104 | 0.355 | 0.00 | 0.64 |
| Probe-Av. 3rd sacral[2] | 0.138 | 0.334 | 0.00 | 0.64 |
| Length of round | -.543 | -.518 | 0.00 | 0.62 |

$R^2$ = 0.71 Standard error of estimate = 1.12

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table H. Coefficient of determination between percent external fat trim from the round, loin, rib and chuck and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variable | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 4.769 | | 0.43 | |
| Carcass wt. | -.025 | -.183 | 0.02 | 0.91 |
| Probe-5th thoracic-8 in. | -.081 | -.246 | 0.00 | 0.90 |
| Probe-8th thoracic-12 in. | -.140 | -.254 | 0.04 | 0.92 |
| Probe-11th thoracic-4 in. | 0.148 | 0.335 | 0.01 | 0.91 |
| Probe-11th thoracic-12 in. | -.129 | -.250 | 0.03 | 0.91 |
| Probe-6th lumbar-4 in. | 0.114 | 0.272 | 0.01 | 0.91 |
| Probe-6th lumbar-12 in. | 0.103 | 0.354 | 0.00 | 0.90 |
| Probe-3rd sacral-12 in. | 0.086 | 0.332 | 0.00 | 0.87 |
| Probe-5th sacral-4 in. | -.117 | -.395 | 0.00 | 0.88 |
| Circumference of round | 0.230 | 0.138 | 0.03 | 0.92 |
| Fat measurement A | 0.118 | 0.387 | 0.00 | 0.89 |
| Fat measurement B | 0.053 | 0.251 | 0.02 | 0.91 |
| Fat measurement C | 0.177 | 0.454 | 0.00 | 0.90 |
| Fat measurement E | 0.162 | 0.611 | 0.00 | 0.85 |
| Fat measurement F | -.163 | -.660 | 0.00 | 0.88 |

$R^2$ = 0.93 Standard error of estimate = 0.77

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table I. Coefficient of determination between percent external fat trim from the round, loin, rib and chuck and a combination of objective measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficient | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 9.229 | | 0.03 | |
| Carcass wt. | -.019 | -.235 | 0.01 | 0.94 |
| Probe-5th thoracic-4 in. | 0.096 | 0.228 | 0.01 | 0.94 |
| Probe-5th thoracic-8 in. | 0.062 | 0.277 | 0.00 | 0.93 |
| Probe-8th thoracic-4 in. | -.175 | -.435 | 0.00 | 0.93 |
| Probe-8th thoracic-12 in. | -.281 | -.796 | 0.00 | 0.85 |
| Probe-11th thoracic-4 in. | -.272 | -.717 | 0.00 | 0.92 |
| Probe-1st lumbar-4 in. | 0.312 | 0.837 | 0.00 | 0.88 |
| Probe-1st lumbar-8 in. | -.139 | -.699 | 0.00 | 0.91 |
| Probe-1st lumbar-12 in. | 0.153 | 0.618 | 0.00 | 0.89 |
| Probe-4th lumbar-8 in. | 0.120 | 0.672 | 0.00 | 0.92 |
| Probe-4th lumbar-12 in. | 0.094 | 0.430 | 0.00 | 0.92 |
| Probe-3rd sacral-8 in. | 0.405 | 1.518 | 0.00 | 0.89 |
| Probe-Av. 3rd sacral[2] | -.641 | -1.931 | 0.00 | 0.90 |
| Probe-5th sacral-12 in. | 0.104 | 0.289 | 0.00 | 0.92 |
| Fat depth over brisket | -1.043 | -.595 | 0.00 | 0.89 |
| Circumference of round | 0.216 | 0.248 | 0.01 | 0.94 |
| Fat measurement B | 0.051 | 0.280 | 0.00 | 0.93 |
| Fat measurement D | 0.265 | 1.015 | 0.00 | 0.85 |
| Fat measurement E | 0.109 | 0.564 | 0.01 | 0.94 |
| Fat measurement F | -.134 | -.750 | 0.00 | 0.93 |
| Fat measurement G | 0.101 | 0.531 | 0.00 | 0.93 |

$R^{2}$ = 0.96 Standard error of estimate = 0.46

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table J. Coefficient of determination between percent total retail fat trim and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 23.525 | | 0.00 | |
| Carcass wt. | 0.019 | 0.347 | 0.01 | 0.79 |
| Probe-5th thoracic-4 in. | 0.241 | 0.191 | 0.03 | 0.80 |
| Probe-8th thoracic-8 in. | -.294 | -.277 | 0.00 | 0.79 |
| Probe-11th thoracic-4 in. | 0.212 | 0.191 | 0.04 | 0.80 |
| Probe-1st lumbar-12 in. | 0.165 | 0.237 | 0.02 | 0.80 |
| Probe-4th lumbar-12 in. | 0.187 | 0.245 | 0.00 | 0.79 |
| Probe-6th lumbar-8 in. | 0.096 | 0.152 | 0.05 | 0.80 |
| Probe-3rd sacral-4 in. | -.212 | -.216 | 0.03 | 0.80 |
| Probe-Av. 3rd sacral[2] | 0.387 | 0.372 | 0.00 | 0.77 |
| Depth of fat over brisket | 1.088 | 0.184 | 0.01 | 0.79 |
| Length of round | -1.049 | -.396 | 0.00 | 0.78 |
| Fat measurement G | -.115 | -.185 | 0.04 | 0.80 |

$R^2$ = 0.81 Standard error of estimate = 2.41

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table K. Coefficient of determination between weight of total retail fat trim and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficient | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 32.886 | | 0.41 | |
| Carcass wt. | 0.008 | 0.013 | 0.85 | 0.80 |
| Probe-5th thoracic-4 in. | 0.962 | 0.285 | 0.01 | 0.75 |
| Probe-6th lumbar-8 in. | 0.637 | 0.368 | 0.00 | 0.72 |
| Probe-6th lumbar-12 in. | -.455 | -.274 | 0.02 | 0.76 |
| Probe-3rd sacral-12 in. | 0.622 | 0.252 | 0.04 | 0.77 |
| Probe-5th sacral-8 in. | 0.714 | 0.351 | 0.00 | 0.72 |
| Fat measurement D | 0.782 | 0.374 | 0.00 | 0.73 |
| Fat measurement F | -.377 | -.264 | 0.04 | 0.77 |

$R^2$ = 0.80 Standard error of estimate = 6.22

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table L. Coefficient of determination between percent total retail fat trim and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 42.801 | | 0.00 | |
| Carcass wt. | -.042 | -.233 | 0.02 | 0.68 |
| Probe-4th lumbar-12 in. | 0.144 | 0.286 | 0.03 | 0.68 |
| Probe-6th lumbar-8 in. | 0.177 | 0.357 | 0.01 | 0.66 |
| Probe-6th lumbar-12 in. | -.149 | -.314 | 0.01 | 0.67 |
| Probe-3rd sacral-12 in. | 0.243 | 0.344 | 0.00 | 0.64 |
| Probe-5th sacral-8 in. | 0.219 | 0.375 | 0.00 | 0.64 |

$R^2$ = 0.73 Standard error of estimate = 2.00

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table M. Coefficient of determination between percent carcass separable muscle and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 62.175 | | 0.00 | |
| Carcass wt. | 0.0004 | -.008 | 0.86 | 0.73 |
| Probe-5th thoracic-4 in. | -.289 | -.286 | 0.00 | 0.69 |
| Probe-Av. 3rd sacral[2] | -.400 | -.479 | 0.00 | 0.59 |
| Fat measurement C | -.173 | -.234 | 0.01 | 0.70 |

$R^2$ = 0.73 Standard error of estimate = 2.20

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table N. Coefficient of determination between weight of carcass separable muscle and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 96.744 | | 0.01 | |
| Carcass wt. | 0.128 | 0.190 | 0.09 | 0.68 |
| Probe-5th thoracic-4 in. | -1.144 | -.438 | 0.00 | 0.61 |
| Probe-Av. 3rd sacral[2] | -1.231 | -.566 | 0.00 | 0.51 |

$R^2$ = 0.71 Standard error of estimate = 6.23

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table O. Coefficient of determination between weight of carcass separable muscle and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 111.062 | | 0.02 | |
| Carcass wt. | 0.149 | 0.225 | 0.03 | 0.63 |
| Probe-5th thoracic-4 in. | -.828 | -.235 | 0.05 | 0.64 |
| Probe-Av. 3rd sacral[2] | -1.847 | -.664 | 0.00 | 0.37 |

$R^2$ = 0.68 Standard error of estimate - 7.61

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table P. Coefficient of determination between percent carcass separable muscle and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 77.117 | | 0.00 | |
| Carcass wt. | -.022 | -.121 | 0.23 | 0.64 |
| Probe-5th thoracic-4 in. | -.275 | -.277 | 0.02 | 0.60 |
| Probe-Av. 3rd sacral[2] | -.474 | -.607 | 0.00 | 0.39 |

$R^2$ = 0.65 Standard error of estimate = 2.23

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table Q. Coefficient of determination between weight of carcass separable bone and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -16.544 | | 0.29 | |
| Carcass wt. | 0.021 | 0.090 | 0.32 | 0.78 |
| Probe-5th thoracic-4 in. | -.474 | -.533 | 0.00 | 0.64 |
| Length of round | 1.501 | 0.480 | 0.00 | 0.66 |

$R^2$ = 0.78 Standard error of estimate = 1.83

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table R. Coefficient of determination between percent carcass separable bone and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$ [1] deletes |
|---|---|---|---|---|
| Constant | 4.603 | | 0.44 | |
| Carcass wt. | -.013 | -.138 | 0.09 | 0.81 |
| Probe-5th thoracic-4 in. | -.174 | -.468 | 0.00 | 0.72 |
| Length of round | 0.577 | 0.442 | 0.00 | 0.72 |

$R^2$ = 0.83 Standard error of estimate = 0.68

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table S. Coefficient of determination between weight of carcass separable bone and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$ [1] deletes |
|---|---|---|---|---|
| Constant | -55.665 | | 0.00 | |
| Carcass wt. | 0.052 | 0.238 | 0.01 | 0.75 |
| Probe-Av. 3rd sacral[2] | -.358 | -.390 | 0.00 | 0.69 |
| Length of round | 2.096 | 0.581 | 0.00 | 0.57 |

$R^2$ = 0.80 Standard error of estimate = 1.98

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table T. Coefficient of determination between percent carcass separable bone and a combination of objective carcass measurements, and the regression coefficient for each of the measurements (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$ [1] deletes |
|---|---|---|---|---|
| Constant | -5.973 | | 0.11 | |
| Carcass wt. | -.00004 | -.001 | 0.94 | 0.77 |
| Probe-Av. 3rd Sacral[2] | -.092 | -.380 | 0.00 | 0.66 |
| Length of round | 0.612 | 0.640 | 0.00 | 0.49 |

$R^2$ = 0.77 Standard error of estimate = 0.57

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table U. Coefficient of determination between weight of carcass separable muscle and a combination of objective carcass measurements and weight of flank separable components, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 27.154 | | 0.30 | |
| Carcass wt. | 0.247 | 0.366 | 0.00 | 0.82 |
| Probe-Av. 3rd sacral[2] | -.777 | -.357 | 0.00 | 0.82 |
| Wt. separable flank muscle | 3.317 | 0.290 | 0.00 | 0.82 |
| Wt. separable flank fat | -2.176 | -.570 | 0.00 | 0.76 |
| Wt. kidney knob-left side | -.768 | -.204 | 0.01 | 0.87 |

$R^2$ = 0.89 Standard error of estimate = 3.96

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table V. Coefficient of determination between percent carcass separable muscle and a combination of objective carcass measurements, flank separable component weights and kidney knob weight, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 66.132 | | 0.00 | |
| Carcass wt. | -.008 | -.045 | 0.50 | 0.91 |
| Probe-5th thoracic-4 in. | -.157 | -.158 | 0.02 | 0.89 |
| Probe-Av. 3rd sacral[2] | -.154 | -.197 | 0.02 | 0.89 |
| Wt. separable flank muscle | 0.973 | 0.296 | 0.00 | 0.85 |
| Wt. separable flank fat | -.658 | -.571 | 0.00 | 0.79 |
| Wt. kidney knob-left side | -.167 | -.142 | 0.02 | 0.89 |

$R^2$ = 0.91 Standard error of estimate = 1.18

[1]Value of coefficient of determination if that variable was deleted from the analysis.

[2]Average of 3 probes, 4, 8 and 12 in. off the carcass dorsal midline.

Table W. Coefficient of determination between weight of carcass separable muscle and a combination of carcass weight and weights of flank separable components, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 27.984 | | 0.40 | |
| Carcass wt. | 0.214 | 0.317 | 0.00 | 0.73 |
| Wt. separable flank muscle | 4.986 | 0.435 | 0.00 | 0.62 |
| Wt. separable flank fat | -3.246 | -.850 | 0.00 | 0.39 |

$R^2$ = 0.79 Standard error of estimate = 5.29

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table X. Coefficient of determination between weight of carcass separable muscle and a combination of carcass weight and weights of flank separable components, and the regression coefficient for each of the independent variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 60.400 | | 0.06 | |
| Carcass wt. | 0.193 | 0.291 | 0.00 | 0.81 |
| Wt. separable flank muscle | 4.321 | 0.370 | 0.00 | 0.76 |
| Wt. separable flank fat | -3.231 | -.788 | 0.00 | 0.39 |

$R^2$ = 0.86 Standard error of estimate = 4.96

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table Y. Coefficient of determination between percent carcass separable muscle and a combination of carcass weight and weights of flank separable components, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 60.932 | | 0.00 | |
| Carcass wt. | -.010 | -.036 | 0.70 | 0.83 |
| Wt. separable flank muscle | 1.592 | 0.340 | 0.00 | 0.72 |
| Wt. separable flank fat | -1.228 | -.786 | 0.00 | 0.48 |

$R^2$ = 0.83 Standard error of estimate = 1.97

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table Z. Coefficient of determination between percent carcass separable muscle and a combination of carcass weight and weights of flank separable components, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 60.360 | | 0.00 | |
| Carcass wt. | -.004 | -.020 | 0.79 | 0.86 |
| Wt. separable flank muscle | 1.059 | 0.322 | 0.00 | 0.78 |
| Wt. separable flank fat | -.934 | -.810 | 0.00 | 0.36 |

$R^2$ = 0.86 Standard error of estimate = 1.42

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AA. Coefficient of determination between percent carcass separable muscle and a combination of muscle and bone weights, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 53.115 | | 0.00 | |
| Carcass wt. | -.066 | -1.513 | 0.00 | 0.14 |
| Semitendinosus wt. | 2.932 | 0.463 | 0.00 | 0.71 |
| Biceps femoris wt. | 1.832 | 0.468 | 0.00 | 0.72 |
| Longissimus dorsi wt. | 0.883 | 0.378 | 0.00 | 0.75 |
| Scapula wt. | 5.036 | 0.462 | 0.00 | 0.71 |

$R^{2}$ = 0.78 Standard error of estimate = 1.98

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AB. Coefficient of determination between weight of carcass separable muscle and a combination of muscle and bone weights and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -6.525 | | 0.82 | |
| Carcass wt. | 0.014 | 0.021 | 0.77 | 0.88 |
| Semitendinosus wt. | 6.310 | 0.215 | 0.00 | 0.85 |
| Biceps femoris wt. | 6.183 | 0.301 | 0.00 | 0.81 |
| L. dorsi wt. | 5.811 | 0.458 | 0.00 | 0.75 |
| Femur wt. | -8.657 | -.330 | 0.03 | 0.86 |
| Tibia plus fibula wt. | 9.337 | 0.305 | 0.01 | 0.86 |
| Scapula wt. | 12.288 | 0.270 | 0.03 | 0.86 |
| Humerus wt. | 8.033 | 0.204 | 0.03 | 0.86 |

$R^{2}$ = 0.88 Standard error of estimate = 4.27

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AC. Coefficient of determination between weight of carcass separable muscle and a combination of muscle weights, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficient | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -8.902 | | 0.82 | |
| Carcass wt. | 0.112 | 0.168 | 0.07 | 0.70 |
| Semitendinosus wt. | 14.621 | 0.558 | 0.00 | 0.46 |
| Biceps femoris wt. | 8.341 | 0.483 | 0.00 | 0.53 |

$R^2$ = 0.73 Standard error of estimate = 6.94

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AD. Coefficient of determination between percent carcass separable muscle and a combination of muscle weights, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficient | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 40.729 | | 0.00 | |
| Carcass wt. | -.030 | -.161 | 0.06 | 0.74 |
| Semitendinosus wt. | 3.923 | 0.532 | 0.00 | 0.51 |
| Biceps femoris wt. | 2.560 | 0.527 | 0.00 | 0.52 |

$R^2$ = 0.77 Standard error of estimate = 1.83

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AE. Coefficient of determination between weight of carcass separable bone and a combination of muscle and bone weights, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -1.738 | | 0.77 | |
| Carcass wt. | -.004 | -.016 | 0.71 | 0.95 |
| Biceps femoris wt. | 1.494 | 0.214 | 0.00 | 0.91 |
| Tibia + fibula wt. | 3.762 | 0.362 | 0.00 | 0.87 |
| Scapula wt. | 5.495 | 0.355 | 0.00 | 0.90 |
| Humerus wt. | 4.127 | 0.308 | 0.00 | 0.90 |

$R^2$ = 0.95 Standard error of estimate = 0.92

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AF. Coefficient of determination between percent carcass separable bone and a combination of muscle and bone weights, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 13.223 | | 0.00 | |
| Carcass wt. | -.025 | -.265 | 0.00 | 0.91 |
| Biceps femoris wt. | 0.641 | 0.220 | 0.00 | 0.93 |
| Psoas major wt. | -.465 | -.094 | 0.02 | 0.96 |
| Tibia + fibula wt. | 1.434 | 0.330 | 0.00 | 0.90 |
| Scapula wt. | 2.241 | 0.347 | 0.00 | 0.92 |
| Humerus wt. | 1.233 | 0.220 | 0.00 | 0.94 |

$R^{2}$ = 0.96 Standard error of estimate = 0.33

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AG. Coefficient of determination between weight of carcass separable bone and a combination of muscle and bone weights, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -17.789 | | 0.10 | |
| Carcass wt. | 0.024 | 0.110 | 0.12 | 0.84 |
| Semitendinosus wt. | 2.123 | 0.245 | 0.00 | 0.80 |
| Tibia + fibula wt. | 6.853 | 0.566 | 0.00 | 0.61 |
| Scapula wt. | 5.060 | 0.312 | 0.00 | 0.79 |

$R^{2}$ = 0.85 Standard error of estimate = 1.73

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AH. Coefficient of determination between percent carcass separable bone and a combination of muscle and bone weights, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 2.226 | | 0.45 | |
| Carcass wt. | -.004 | -.064 | 0.37 | 0.88 |
| Semitensinosus wt. | 0.516 | 0.225 | 0.00 | 0.84 |
| Biceps femoris wt. | 0.307 | 0.203 | 0.03 | 0.86 |
| Tibia + fibula wt. | 1.604 | 0.500 | 0.00 | 0.75 |
| Scapula wt. | 1.286 | 0.299 | 0.00 | 0.83 |

$R^{2}$ = 0.88 Standard error of estimate = 0.42

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AI. Coefficient of determination between weight of round, loin, rib and chuck retail yield and a combination of wholesale cut weights and yields, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -117.856 | | 0.00 | |
| Carcass wt. | 0.234 | 0.376 | 0.00 | 0.76 |
| Length of round | 3.306 | 0.388 | 0.00 | 0.80 |
| Weight of round-right side | 0.747 | 0.258 | 0.02 | 0.82 |
| Weight of shank bone-right side | -5.740 | -.275 | 0.04 | 0.83 |
| Weight of flank yield-right side | 2.141 | 0.357 | 0.00 | 0.76 |
| Weight of flank fat-right side | -1.585 | -.510 | 0.00 | 0.75 |
| L. dorsi muscle area | 1.642 | 0.213 | 0.02 | 0.82 |

$R^{2}$ = 0.85 Standard error of estimate = 4.39

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AJ. Coefficient of determination between weight of round, loin, rib and chuck retail yield and a combination of objective carcass measurements, carcass scores and flank yield and fat trim weights, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -101.832 | | 0.04 | |
| Carcass wt. | 0.239 | 0.429 | 0.00 | 0.64 |
| Round score | 2.387 | 0.272 | 0.03 | 0.72 |
| Length of round | 3.382 | 0.369 | 0.01 | 0.70 |
| Wt. flank yield | 2.321 | 0.379 | 0.00 | 0.64 |
| Wt. flank fat | -2.144 | -.619 | 0.00 | 0.50 |

$R^{2}$ = 0.76 Standard error of estimate = 5.72

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AK. Coefficient of determination between weight of round, loin, rib and chuck retail yield and a combination of carcass scores, measurements, foreshank bone weight and percent flank yield, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -99.978 | | 0.00 | |
| Carcass wt. | 0.210 | 0.878 | 0.00 | 0.81 |
| Round score | 1.986 | 0.135 | 0.00 | 0.93 |
| Length of round | 4.389 | 0.378 | 0.00 | 0.92 |
| Circumference of round | -1.035 | -.105 | 0.03 | 0.94 |
| Wt. foreshank bone-right side | -4.613 | -.146 | 0.04 | 0.94 |
| % flank yield-right side | 0.946 | 0.346 | 0.00 | 0.87 |

$R^2$ = 0.94 Standard error of estimate - 5.60

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AL. Coefficient of determination between weight of round, loin, rib and chuck retail yield and a combination of objective carcass measurements and percent flank fat trim, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | -73.816 | | 0.10 | |
| Carcass wt. | 0.249 | 0.399 | 0.00 | 0.67 |
| Length of round | 3.390 | 0.397 | 0.00 | 0.70 |
| L. *dorsi* area | 2.589 | 0.335 | 0.00 | 0.70 |
| % flank fat trim | -.689 | -.674 | 0.00 | 0.52 |

$R^2$ = 0.79 Standard error of estimate = 5.00

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AM. Coefficient of determination between percent round, loin, rib and chuck retail yield and a combination of objective carcass measurements, foreshank bone weight and percent flank fat trim, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^2$[1] deletes |
|---|---|---|---|---|
| Constant | 21.636 | | 0.17 | |
| Carcass wt. | -.0005 | -.002 | 0.93 | 0.83 |
| Length of round | 1.687 | 0.503 | 0.00 | 0.74 |
| Wt. of foreshank bone-right side | -2.402 | -.292 | 0.03 | 0.81 |
| L. *dorsi* muscle area | 0.957 | 0.315 | 0.00 | 0.76 |
| % flank fat trim | -.293 | -.728 | 0.00 | 0.60 |

$R^2$ = 0.83 Standard error of estimate = 1.77

[1]Value of coefficient of determination if that variable was deleted from

Table AN. Coefficient of determination between weight of round, loin, rib and chuck retail yield and a combination of carcass measurements, scores and percent yield, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -150.434 | | 0.00 | |
| Carcass wt. | 0.185 | 0.333 | 0.00 | 0.66 |
| Round score | 2.431 | 0.277 | 0.02 | 0.72 |
| Length of round | 4.097 | 0.447 | 0.00 | 0.66 |
| % flank yield | 1.381 | 0.689 | 0.00 | 0.31 |

$R^{2}$ = 0.76 Standard error of estimate - 5.57

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AO. Coefficient of determination between percent round, loin, rib and chuck retail yield and a combination of carcass measurements, scores and percent flank yield, and the regression for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 17.248 | | 0.19 | |
| Carcass wt. | -.026 | -.199 | 0.06 | 0.63 |
| Round score | 0.600 | 0.286 | 0.05 | 0.63 |
| Length of round | 1.152 | 0.524 | 0.00 | 0.53 |
| % flank yield | 0.338 | 0.702 | 0.00 | 0.20 |

$R^{2}$ = 0.67 Standard error of estimate = 1.57

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AP. Coefficient of determination between weight of carcass retail yield and carcass weight, flank yield and fat trim, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -32.346 | | 0.41 | |
| Carcass wt. | 0.360 | 0.523 | 0.00 | 0.57 |
| Wt. flank yield | 3.467 | 0.457 | 0.00 | 0.60 |
| Wt. flank fat trim | -2.749 | -.642 | 0.00 | 0.42 |

$R^2$ = 0.80 Standard error of estimate - 6.30

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AQ. Coefficient of determination between percent carcass retail yield and a combination of kidney knob weight and flank retail yield and fat trim weights, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 54.413 | | 0.00 | |
| Carcass wt. | 0.020 | 0.130 | 0.17 | 0.75 |
| Kidney knob wt.-right side | -.210 | -.238 | 0.01 | 0.71 |
| Wt. flank yield | 0.677 | 0.393 | 0.00 | 0.62 |
| Wt. flank fat trim | -.693 | -.712 | 0.00 | 0.32 |

$R^2$ = 0.76 Standard error of estimate = 1.57

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AR. Coefficient of determination between weight of carcass retail yield and a combination of objective carcass measurements and percent flank yield, and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -78.712 | | 0.00 | |
| Carcass wt. | 0.243 | 0.837 | 0.00 | 0.78 |
| Length of round | 1.864 | 0.132 | 0.01 | 0.94 |
| L. dorsi muscle area | 1.282 | 0.078 | 0.02 | 0.94 |
| % flank yield | 1.277 | 0.385 | 0.00 | 0.84 |

$R^{2}$ = 0.95 Standard error of estimate = 6.42

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AS. Coefficient of determination between percent carcass retail yield and a combination of carcass measurements, scores and percent flank yield and the regression coefficient for each of the variables (combined weight groups).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 26.430 | | 0.00 | |
| Carcass wt. | -.027 | -.548 | 0.00 | 0.78 |
| Round score | 0.430 | 0.144 | 0.03 | 0.84 |
| Length of round | 1.006 | 0.426 | 0.00 | 0.81 |
| L. dorsi muscle area | 0.389 | 0.142 | 0.02 | 0.84 |
| % flank yield | 0.410 | 0.737 | 0.00 | 0.46 |

$R^{2}$ = 0.85 Standard error of estimate = 1.84

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AT. Coefficient of determination between weight of carcass retail yield and a combination of objective carcass measurements and percent flank fat trim, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -78.146 | | 0.13 | |
| Carcass wt. | 0.323 | 0.388 | 0.00 | 0.73 |
| Length of round | 4.059 | 0.358 | 0.00 | 0.76 |
| L. dorsi muscle area | 2.360 | 0.230 | 0.00 | 0.80 |
| % flank fat trim | -1.050 | -.773 | 0.00 | 0.49 |

$R^{2}$ = 0.84 Standard error of estimate = 5.82

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AU. Coefficient of determination between percent carcass retail yield and a combination of objective carcass measurements and percent flank fat trim, and the regression coefficient for each of the variables (500 to 550 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 34.099 | | 0.07 | |
| Carcass wt. | 0.006 | 0.019 | 0.77 | 0.88 |
| Length of round | 1.401 | 0.316 | 0.00 | 0.82 |
| L. dorsi muscle area | 1.010 | 0.251 | 0.00 | 0.82 |
| % flank fat trim | -.379 | -.713 | 0.00 | 0.58 |

$R^{2}$ = 0.88 Standard error of estimate = 2.00

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AV. Coefficient of determination between weight of carcass retail yield and a combination of carcass weight and percent flank yield, and the regression coefficient for each variable (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | -85.807 | | 0.03 | |
| Carcass wt. | 0.320 | 0.465 | 0.00 | 0.58 |
| % flank yield | 1.879 | 0.758 | 0.00 | 0.22 |

$R^2$ = 0.79 Standard error of estimate = 6.28

[1]Value of coefficient of determination if that variable was deleted from the analysis.

Table AW. Coefficient of determination between percent carcass retail yield and a combination of carcass weight, percent flank yield and percent kidney knob, and the regression coefficient for each of the variables (700 to 750 lb. weight group).

| Independent variables | Regression coefficients | Beta weights | Level of sig. | $R^{2}$[1] deletes |
|---|---|---|---|---|
| Constant | 47.476 | | 0.00 | |
| Carcass wt. | -.0002 | -.001 | 0.94 | 0.74 |
| % flank yield | 0.436 | 0.774 | 0.00 | 0.20 |
| % kidney knob-right side | -.677 | -.213 | 0.02 | 0.70 |

$R^2$ = 0.74 Standard error of estimate = 1.60

[1]Value of coefficient of determination if that variable was deleted from the analysis.

# APPENDIX

## APPENDIX I A CARCASS EVALUATION - SUBJECTIVE SCORES

| Steer No. | Breed | Round Score | Overall Conf. | Conf. Hind-Quarter | Conf. Fore-Quarter | Maturity Score | Marbling Score | Final Carcass Grade |
|---|---|---|---|---|---|---|---|---|
| Group I .26-.50 | | | | | | | | |
| 1 | 1 | 06 | 06 | 06 | 06 | 4 | 09 | 03 |
| 2 | 3 | 06 | 06 | 06 | 06 | 3 | 12 | 05 |
| 3 | 1 | 08 | 09 | 08 | 09 | 2 | 14 | 07 |
| 4 | 2 | 08 | 07 | 08 | 06 | 2 | 14 | 07 |
| 5 | 1 | 09 | 09 | 09 | 08 | 2 | 15 | 07 |
| 6 | 1 | 11 | 10 | 11 | 09 | 3 | 14 | 07 |
| 7 | 2 | 06 | 05 | 05 | 04 | 3 | 11 | 05 |
| 8 | 2 | 06 | 05 | 06 | 05 | 4 | 10 | 04 |
| 9 | 2 | 04 | 04 | 04 | 04 | 4 | 08 | 03 |
| 10 | 2 | 07 | 07 | 07 | 06 | 4 | 10 | 04 |
| Eng. Mean | | 7.1 | 6.8 | 7.0 | 6.3 | 3.1 | 11.7 | 5.2 |
| Metric Mean | | 7.1 | 6.8 | 7.0 | 6.3 | 3.1 | 11.7 | 5.2 |
| Group II .51-.75" | | | | | | | | |
| 11 | 1 | 08 | 07 | 07 | 07 | 2 | 17 | 08 |
| 12 | 1 | 11 | 10 | 10 | 08 | 2 | 20 | 09 |
| 13 | 1 | 08 | 08 | 09 | 08 | 2 | 21 | 09 |
| 14 | 1 | 08 | 08 | 08 | 09 | 2 | 18 | 08 |
| 15 | 1 | 07 | 07 | 07 | 08 | 3 | 16 | 07 |
| 16 | 1 | 05 | 04 | 05 | 04 | 4 | 15 | 05 |
| 17 | 3 | 06 | 05 | 06 | 05 | 3 | 13 | 06 |
| 18 | 3 | 05 | 04 | 04 | 03 | 4 | 15 | 05 |
| 19 | 1 | 08 | 08 | 09 | 07 | 2 | 21 | 09 |
| 20 | 2 | 05 | 05 | 05 | 05 | 3 | 11 | 04 |
| Eng. Mean | | 7.1 | 6.6 | 7.0 | 6.4 | 2.7 | 16.7 | 7.0 |
| Metric Mean | | 7.1 | 6.6 | 7.0 | 6.4 | 2.7 | 16.7 | 7.0 |
| Group III .76-1.00" | | | | | | | | |
| 21 | 1 | 08 | 07 | 08 | 07 | 3 | 18 | 08 |
| 22 | 2 | 08 | 08 | 08 | 08 | 3 | 14 | 07 |
| 23 | 1 | 08 | 09 | 09 | 08 | 2 | 14 | 07 |
| 24 | 1 | 11 | 10 | 11 | 09 | 2 | 20 | 09 |
| 25 | 1 | 10 | 09 | 09 | 08 | 3 | 15 | 07 |
| 26 | 1 | 07 | 07 | 07 | 06 | 2 | 17 | 08 |
| 27 | 1 | 08 | 08 | 08 | 07 | 3 | 18 | 08 |
| 28 | 1 | 10 | 09 | 09 | 08 | 3 | 22 | 09 |
| 29 | 1 | 10 | 09 | 09 | 07 | 3 | 16 | 07 |
| 30 | 1 | 08 | 07 | 08 | 07 | 3 | 21 | 09 |
| Eng. Mean | | 8.8 | 8.3 | 8.6 | 7.5 | 2.7 | 17.5 | 7.9 |
| Metric Mean | | 8.8 | 8.3 | 8.6 | 7.5 | 2.7 | 17.5 | 7.9 |

APPENDIX I A (Continued)

| Steer No. | Breed | Round Score | Overall Conf. | Conf. Hind-Quarter | Conf. Fore-Quarter | Maturity Score | Marbling Score | Final Carcass Grade |
|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | |
| 31 | 1 | 09 | 09 | 10 | 08 | 3 | 18 | 08 |
| 32 | 1 | 10 | 10 | 11 | 09 | 3 | 20 | 09 |
| 33 | 1 | 09 | 08 | 08 | 07 | 3 | 21 | 09 |
| 34 | 1 | 06 | 07 | 06 | 08 | 2 | 24 | 09 |
| 35 | 2 | 06 | 07 | 06 | 07 | 2 | 16 | 07 |
| 36 | 1 | 07 | 07 | 08 | 07 | 3 | 17 | 07 |
| 37 | 1 | 07 | 08 | 07 | 08 | 4 | 16 | 08 |
| 38 | 2 | 08 | 08 | 08 | 08 | 2 | 13 | 06 |
| 39 | 1 | 10 | 09 | 10 | 08 | 3 | 21 | 09 |
| 40 | 1 | 07 | 08 | 08 | 08 | 3 | 17 | 08 |
| Eng. Mean | | 7.9 | 8.1 | 8.2 | 7.8 | 2.8 | 18.3 | 8.0 |
| Metric Mean | | 7.9 | 8.1 | 8.2 | 7.8 | 2.8 | 18.3 | 8.0 |
| Group V .26-.50" | | | | | | | | |
| 41 | 1 | 03 | 03 | 04 | 03 | 7 | 14 | 06 |
| 42 | 2 | 07 | 07 | 07 | 07 | 5 | 20 | 08 |
| 43 | 1 | 07 | 07 | 07 | 06 | 8 | 20 | 07 |
| 44 | 1 | 07 | 06 | 07 | 05 | 4 | 18 | 06 |
| 45 | 2 | 08 | 07 | 07 | 08 | 3 | 15 | 07 |
| 46 | 2 | 08 | 08 | 08 | 10 | 3 | 21 | 09 |
| 47 | 2 | 07 | 07 | 07 | 06 | 4 | 15 | 06 |
| 48 | 2 | 07 | 06 | 07 | 06 | 5 | 13 | 05 |
| 49 | 1 | 09 | 08 | 08 | 08 | 4 | 20 | 08 |
| 50 | 2 | 07 | 07 | 07 | 08 | 4 | 16 | 07 |
| Eng. Mean | | 7.0 | 6.6 | 6.9 | 6.7 | 4.7 | 17.2 | 6.9 |
| Metric Mean | | 7.0 | 6.6 | 6.9 | 6.7 | 4.7 | 17.2 | 6.9 |
| Group VI .51-.75" | | | | | | | | |
| 51 | 2 | 08 | 08 | 08 | 07 | 4 | 20 | 08 |
| 52 | 1 | 07 | 06 | 07 | 05 | 5 | 17 | 07 |
| 53 | 1 | 08 | 08 | 08 | 08 | 4 | 19 | 08 |
| 54 | 2 | 08 | 09 | 09 | 08 | 3 | 17 | 08 |
| 55 | 2 | 07 | 07 | 07 | 07 | 4 | 13 | 06 |
| 56 | 2 | 08 | 08 | 08 | 08 | 4 | 20 | 08 |
| 57 | 2 | 05 | 05 | 06 | 05 | 4 | 17 | 06 |
| 58 | 2 | 08 | 08 | 08 | 08 | 4 | 16 | 07 |
| 59 | 1 | 09 | 09 | 09 | 10 | 3 | 23 | 09 |
| 60 | 2 | 08 | 07 | 08 | 06 | 4 | 16 | 07 |
| Eng. Mean | | 7.6 | 7.5 | 7.8 | 7.2 | 3.9 | 17.8 | 7.4 |
| Metric Mean | | 7.6 | 7.5 | 7.8 | 7.2 | 3.9 | 17.8 | 7.4 |

APPENDIX I A (Continued)

| Steer No. | Breed | Round Score | Overall Conf. | Conf. Hind-Quarter | Conf. Fore-Quarter | Maturity Score | Marbling Score | Final Carcass Grade |
|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | |
| 61 | 2 | 07 | 07 | 07 | 08 | 4 | 16 | 07 |
| 62 | 1 | 09 | 10 | 10 | 10 | 5 | 16 | 07 |
| 63 | 2 | 07 | 07 | 07 | 08 | 4 | 14 | 06 |
| 64 | 3 | 06 | 07 | 07 | 07 | 2 | 15 | 07 |
| 65 | 2 | 07 | 06 | 07 | 06 | 3 | 15 | 06 |
| 66 | 1 | 11 | 10 | 11 | 09 | 3 | 29 | 12 |
| 67 | ? | 09 | 08 | 09 | 08 | 3 | 16 | 07 |
| 68 | 2 | 08 | 08 | 08 | 07 | 4 | 20 | 08 |
| 69 | 2 | 09 | 08 | 08 | 07 | 3 | 24 | 09 |
| 70 | 2 | 08 | 07 | 07 | 07 | 4 | 18 | 07 |
| Eng. Mean | | 8.1 | 7.8 | 8.1 | 7.7 | 3.5 | 18.3 | 7.6 |
| Metric Mean | | 8.1 | 7.8 | 8.1 | 7.7 | 3.5 | 18.3 | 7.6 |
| Group VIII 1.01-1.25" | | | | | | | | |
| 71 | 2 | 08 | 08 | 07 | 08 | 4 | 20 | 08 |
| 72 | 2 | 08 | 07 | 08 | 07 | 5 | 14 | 06 |
| 73 | 2 | 08 | 07 | 08 | 07 | 3 | 15 | 07 |
| 74 | 2 | 08 | 08 | 08 | 07 | 4 | 20 | 08 |
| 75 | 2 | 07 | 07 | 07 | 06 | 4 | 20 | 08 |
| 76 | 1 | 08 | 08 | 08 | 08 | 4 | 15 | 06 |
| 77 | 2 | 08 | 08 | 09 | 07 | 4 | 16 | 07 |
| 78 | 2 | 08 | 08 | 08 | 09 | 4 | 22 | 09 |
| 79 | 2 | 07 | 07 | 06 | 07 | 4 | 16 | 07 |
| 80 | 1 | 08 | 09 | 08 | 10 | 4 | 26 | 10 |
| Eng. Mean | | 7.8 | 7.7 | 7.7 | 7.6 | 4.0 | 18.4 | 7.3 |
| Metric Mean | | 7.8 | 7.7 | 7.7 | 7.6 | 4.0 | 18.4 | 7.6 |

APPENDIX I B CARCASS EVALUATION - OBJECTIVE FAT MEASURES

| Steer No. | Carc. Wt. | 5th Thor. 4 in. | 5th Thor. 8 in. | 5th Thor. 12 in. | 5th Thor. Avg. | 8th Thor. 4 in. | 8th Thor. 8 in. | 8th Thor. 12 in. | 8th Thor. Avg. |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 518 | 04 | 20 | 10 | 11.33 | 08 | 14 | 08 | 10.00 |
| 2 | 522 | 09 | 06 | 15 | 10.00 | 11 | 17 | 12 | 13.33 |
| 3 | 530 | 12 | 24 | 15 | 17.00 | 15 | 14 | 09 | 12.67 |
| 4 | 512 | 04 | 11 | 10 | 08.33 | 04 | 10 | 08 | 07.33 |
| 5 | 527 | 07 | 20 | 13 | 13.33 | 07 | 10 | 09 | 08.67 |
| 6 | 531 | 04 | 09 | 10 | 07.67 | 07 | 11 | 09 | 09.00 |
| 7 | 500 | 07 | 21 | 18 | 15.33 | 11 | 18 | 12 | 13.67 |
| 8 | 534 | 04 | 24 | 15 | 14.33 | 10 | 16 | 12 | 12.67 |
| 9 | 516 | 00 | 03 | 08 | 03.67 | 02 | 09 | 07 | 06.00 |
| 10 | 514 | 08 | 17 | 14 | 13.00 | 06 | 15 | 10 | 10.33 |
| Eng. Mean | 520 | .23 | .61 | .50 | .45 | .32 | .53 | .38 | .41 |
| Metric Mean | 236 | 5.9 | 15.5 | 12.8 | 11.4 | 8.1 | 13.4 | 9.6 | 10.4 |
| Group II .51-.75" | | | | | | | | | |
| 11 | 541 | 10 | 22 | 18 | 16.67 | 13 | 14 | 11 | 12.67 |
| 12 | 528 | 09 | 21 | 12 | 14.00 | 13 | 12 | 15 | 13.33 |
| 13 | 544 | 10 | 26 | 19 | 18.00 | 13 | 13 | 10 | 12.00 |
| 14 | 541 | 07 | 23 | 14 | 14.67 | 07 | 08 | 09 | 08.00 |
| 15 | 528 | 11 | 21 | 16 | 16.00 | 13 | 16 | 06 | 11.67 |
| 16 | 545 | 11 | 25 | 20 | 18.67 | 14 | 12 | 11 | 12.33 |
| 17 | 516 | 09 | 18 | 17 | 14.67 | 09 | 14 | 13 | 12.00 |
| 18 | 540 | 09 | 18 | 12 | 13.00 | 08 | 15 | 15 | 12.67 |
| 19 | 540 | 09 | 16 | 17 | 14.00 | 14 | 14 | 11 | 13.00 |
| 20 | 503 | 10 | 16 | 14 | 13.33 | 14 | 17 | 15 | 15.33 |
| Eng. Mean | 533 | .37 | .61 | .63 | .60 | .46 | .53 | .46 | .48 |
| Metric Mean | 242 | 9.5 | 20.6 | 15.9 | 15.3 | 11.8 | 13.5 | 11.6 | 12.3 |
| Group III .76-1.00" | | | | | | | | | |
| 21 | 563 | 12 | 24 | 17 | 17.67 | 15 | 16 | 12 | 14.33 |
| 22 | 543 | 11 | 23 | 19 | 17.67 | 09 | 16 | 17 | 14.00 |
| 23 | 528 | 09 | 23 | 13 | 15.00 | 09 | 12 | 17 | 12.67 |
| 24 | 548 | 14 | 18 | 18 | 16.67 | 10 | 17 | 12 | 13.00 |
| 25 | 538 | 13 | 29 | 25 | 22.33 | 14 | 15 | 13 | 14.00 |
| 26 | 544 | 08 | 20 | 12 | 13.33 | 11 | 12 | 08 | 10.33 |
| 27 | 551 | 13 | 24 | 14 | 17.00 | 16 | 17 | 14 | 15.67 |
| 28 | 540 | 15 | 17 | 17 | 16.33 | 15 | 22 | 20 | 19.00 |
| 29 | 549 | 12 | 21 | 20 | 17.67 | 10 | 15 | 13 | 12.67 |
| 30 | 559 | 19 | 18 | 28 | 21.67 | 12 | 16 | 12 | 13.33 |
| Eng. Mean | 546.3 | .50 | .55 | .72 | .59 | .48 | .62 | .54 | .55 |
| Metric Mean | 247.8 | 12.6 | 21.7 | 18.3 | 17.5 | 12.1 | 15.8 | 13.8 | 13.9 |

APPENDIX I B (Continued)

| Steer No. | Carc. Wt. | 5th Thor. 4 in. | 5th Thor. 8 in. | 5th Thor. 12 in. | 5th Thor. Avg. | 8th Thor. 4 in. | 8th Thor. 8 in. | 8th Thor. 12 in. | 8th Thor. Avg. |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 557 | 14 | 38 | 24 | 25.33 | 18 | 24 | 21 | 21.00 |
| 32 | 540 | 20 | 30 | 25 | 25.00 | 31 | 27 | 21 | 26.33 |
| 33 | 550 | 12 | 25 | 17 | 18.00 | 13 | 14 | 17 | 14.67 |
| 34 | 554 | 15 | 13 | 17 | 15.00 | 14 | 15 | 16 | 15.00 |
| 35 | 533 | 14 | 26 | 27 | 22.33 | 18 | 31 | 23 | 24.00 |
| 36 | 541 | 15 | 23 | 22 | 20.00 | 19 | 15 | 18 | 17.33 |
| 37 | 562 | 18 | 32 | 17 | 22.33 | 19 | 19 | 19 | 19.00 |
| 38 | 499 | 15 | 27 | 22 | 21.33 | 10 | 17 | 14 | 13.67 |
| 39 | 532 | 12 | 32 | 24 | 22.67 | 20 | 19 | 12 | 17.00 |
| 40 | 516 | 12 | 28 | 20 | 20.00 | 19 | 17 | 13 | 16.33 |
| Eng. Mean | 538 | .58 | 1.08 | .85 | .83 | .71 | .78 | .68 | .72 |
| Metric Mean | 244 | 14.7 | 27.4 | 21.5 | 21.2 | 18.1 | 19.8 | 17.4 | 18.4 |
| Group V .26-.50" | | | | | | | | | |
| 41 | 740 | 14 | 23 | 19 | 18.67 | 10 | 16 | 12 | 12.67 |
| 42 | 717 | 09 | 11 | 20 | 13.33 | 05 | 13 | 12 | 10.00 |
| 43 | 729 | 09 | 20 | 28 | 19.00 | 11 | 15 | 13 | 13.00 |
| 44 | 702 | 08 | 17 | 16 | 13.67 | 08 | 09 | 10 | 09.00 |
| 45 | 703 | 16 | 13 | 26 | 18.33 | 10 | 19 | 15 | 14.67 |
| 46 | 704 | 08 | 16 | 13 | 12.33 | 04 | 15 | 10 | 09.67 |
| 47 | 693 | 09 | 19 | 14 | 14.00 | 06 | 12 | 09 | 09.00 |
| 48 | 693 | 08 | 20 | 17 | 15.00 | 07 | 13 | 11 | 10.33 |
| 49 | 708 | 11 | 12 | 18 | 13.67 | 11 | 17 | 16 | 14.67 |
| 50 | 698 | 11 | 23 | 14 | 16.00 | 11 | 15 | 12 | 12.67 |
| Eng. Mean | 709 | .40 | .68 | .73 | .61 | .33 | .57 | .47 | .46 |
| Metric Mean | 321.5 | 10.3 | 17.4 | 18.5 | 15.4 | 8.3 | 14.4 | 12.0 | 11.6 |
| Group VI .51-.75" | | | | | | | | | |
| 51 | 737 | 11 | 28 | 17 | 18.67 | 05 | 17 | 14 | 12.00 |
| 52 | 723 | 10 | 28 | 16 | 18.00 | 12 | 11 | 11 | 11.33 |
| 53 | 701 | 22 | 16 | 18 | 18.67 | 10 | 10 | 10 | 10.00 |
| 54 | 728 | 11 | 31 | 21 | 21.00 | 10 | 15 | 12 | 12.33 |
| 55 | 732 | 12 | 21 | 21 | 18.00 | 14 | 14 | 17 | 15.00 |
| 56 | 730 | 15 | 25 | 24 | 21.33 | 16 | 26 | 19 | 20.33 |
| 57 | 758 | 06 | 17 | 17 | 13.33 | 12 | 13 | 14 | 13.00 |
| 58 | 735 | 17 | 24 | 22 | 21.00 | 13 | 21 | 16 | 16.67 |
| 59 | 696 | 15 | 28 | 18 | 20.33 | 12 | 17 | 16 | 15.00 |
| 60 | 700 | 08 | 18 | 13 | 13.00 | 11 | 20 | 18 | 16.33 |
| Eng. Mean | 724 | .50 | .93 | .74 | .72 | .45 | .84 | .68 | .66 |
| Metric Mean | 328.3 | 12.7 | 23.6 | 18.7 | 18.3 | 11.5 | 16.4 | 14.7 | 14.2 |

APPENDIX I B (Continued)

| Steer No. | Carc. Wt. | 5th Thor. 4 in. | 5th Thor. 8 in. | 5th Thor. 12 in. | 5th Thor. Avg. | 8th Thor. 4 in. | 8th Thor. 8 in. | 8th Thor. 12 in. | 8th Thor. Avg. |
|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | |
| 61 | 716 | 12 | 15 | 25 | 17.33 | 11 | 23 | 18 | 17.33 |
| 62 | 738 | 13 | 12 | 20 | 15.00 | 13 | 12 | 10 | 11.67 |
| 63 | 696 | 15 | 31 | 22 | 22.67 | 12 | 19 | 18 | 16.33 |
| 64 | 692 | 15 | 31 | 32 | 26.00 | 16 | 24 | 17 | 19.00 |
| 65 | 732 | 09 | 20 | 27 | 18.67 | 07 | 21 | 18 | 15.33 |
| 66 | 712 | 20 | 41 | 32 | 31.00 | 21 | 28 | 22 | 23.67 |
| 67 | 722 | 16 | 23 | 13 | 17.33 | 14 | 27 | 22 | 21.00 |
| 68 | 701 | 09 | 14 | 13 | 12.00 | 12 | 16 | 16 | 14.67 |
| 69 | 726 | 17 | 33 | 24 | 24.67 | 13 | 22 | 18 | 17.67 |
| 70 | 703 | 12 | 26 | 26 | 21.33 | 18 | 17 | 19 | 18.00 |
| Eng. Mean | 714 | .54 | .97 | .92 | .81 | .54 | .82 | .70 | .69 |
| Metric Mean | 323.8 | 13.8 | 24.6 | 23.4 | 20.6 | 13.7 | 20.9 | 17.8 | 17.5 |
| Group VIII 1.01-1.25" | | | | | | | | | |
| 71 | 694 | 17 | 16 | 22 | 18.33 | 16 | 22 | 21 | 19.67 |
| 72 | 738 | 17 | 20 | 27 | 21.33 | 12 | 21 | 21 | 18.00 |
| 73 | 758 | 16 | 19 | 18 | 17.67 | 14 | 24 | 20 | 19.33 |
| 74 | 738 | 11 | 21 | 30 | 20.67 | 12 | 22 | 19 | 17.67 |
| 75 | 718 | 11 | 27 | 27 | 21.67 | 19 | 25 | 28 | 24.00 |
| 76 | 702 | 11 | 32 | 22 | 21.67 | 15 | 13 | 13 | 13.67 |
| 77 | 758 | 12 | 29 | 25 | 22.00 | 06 | 20 | 23 | 16.33 |
| 78 | 700 | 17 | 16 | 23 | 18.67 | 15 | 23 | 18 | 18.67 |
| 79 | 728 | 13 | 26 | 24 | 21.00 | 14 | 18 | 16 | 16.00 |
| 80 | 702 | 14 | 18 | 26 | 19.33 | 12 | 21 | 21 | 18.00 |
| Eng. Mean | 724 | .55 | .88 | .96 | .80 | .53 | .82 | .79 | .71 |
| Metric Mean | 328.3 | 13.9 | 22.4 | 24.4 | 20.2 | 13.5 | 20.9 | 20.0 | 18.1 |

APPENDIX I B (Continued)

| Steer No. | 11th Thor. 4 in. | 11th Thor. 8 in. | 11th Thor. 12 in. | 11th Thor. Avg. | 1st Lumb. 4 in. | 1st Lumb. 8 in. | 1st Lumb. 12 in. | 1st Lumb. Avg. | 4th Lumb. 4 in. |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 08 | 10 | 10 | 09.33 | 07 | 14 | 06 | 09.00 | 07 |
| 2 | 11 | 11 | 12 | 11.33 | 10 | 26 | 19 | 18.33 | 22 |
| 3 | 09 | 09 | 10 | 09.33 | 06 | 25 | 09 | 13.33 | 10 |
| 4 | 08 | 09 | 09 | 08.67 | 06 | 18 | 07 | 10.33 | 06 |
| 5 | 09 | 10 | 11 | 10.00 | 09 | 17 | 17 | 14.33 | 08 |
| 6 | 06 | 08 | 08 | 07.33 | 06 | 13 | 06 | 08.33 | 06 |
| 7 | 12 | 11 | 11 | 11.33 | 10 | 17 | 21 | 16.00 | 16 |
| 8 | 13 | 12 | 15 | 13.33 | 06 | 13 | 19 | 12.33 | 11 |
| 9 | 06 | 05 | 01 | 04.00 | 05 | 10 | 10 | 08.33 | 07 |
| 10 | 09 | 12 | 13 | 11.33 | 09 | 21 | 15 | 15.00 | 12 |
| Eng. Mean | .36 | .38 | .39 | .38 | .29 | .68 | .51 | .49 | .41 |
| Metric Mean | 9.1 | 9.7 | 10.0 | 9.6 | 7.4 | 17.4 | 12.9 | 12.5 | 10.5 |
| Group II .51-.75" | | | | | | | | | |
| 11 | 10 | 13 | 10 | 11.00 | 14 | 21 | 16 | 17.00 | 11 |
| 12 | 12 | 12 | 15 | 13.00 | 16 | 22 | 17 | 18.33 | 18 |
| 13 | 11 | 11 | 08 | 10.00 | 09 | 30 | 13 | 17.33 | 07 |
| 14 | 09 | 11 | 10 | 10.00 | 13 | 24 | 13 | 16.67 | 13 |
| 15 | 09 | 15 | 08 | 10.67 | 10 | 16 | 13 | 13.00 | 08 |
| 16 | 11 | 10 | 08 | 09.67 | 09 | 19 | 16 | 14.67 | 12 |
| 17 | 11 | 16 | 11 | 12.67 | 10 | 18 | 16 | 14.67 | 10 |
| 18 | 10 | 11 | 12 | 11.00 | 10 | 19 | 12 | 13.67 | 11 |
| 19 | 13 | 11 | 12 | 12.00 | 11 | 23 | 13 | 15.67 | 08 |
| 20 | 10 | 12 | 11 | 11.00 | 10 | 20 | 13 | 14.33 | 08 |
| Eng. Mean | .42 | .48 | .41 | .44 | .44 | .83 | .56 | .61 | .42 |
| Metric Mean | 10.6 | 12.2 | 10.5 | 11.1 | 11.2 | 21.2 | 14.2 | 15.5 | 10.6 |
| Group III .76-1.00" | | | | | | | | | |
| 21 | 14 | 17 | 17 | 16.00 | 11 | 19 | 18 | 16.00 | 13 |
| 22 | 14 | 18 | 16 | 16.00 | 12 | 21 | 27 | 20.00 | 17 |
| 23 | 10 | 09 | 11 | 10.00 | 07 | 12 | 11 | 10.00 | 07 |
| 24 | 15 | 14 | 14 | 14.33 | 12 | 28 | 20 | 20.00 | 14 |
| 25 | 13 | 15 | 10 | 12.67 | 15 | 33 | 23 | 23.67 | 18 |
| 26 | 09 | 11 | 10 | 10.00 | 10 | 22 | 18 | 16.67 | 09 |
| 27 | 11 | 14 | 19 | 13.67 | 12 | 15 | 15 | 13.00 | 11 |
| 28 | 29 | 22 | 16 | 22.33 | 20 | 26 | 28 | 24.67 | 18 |
| 29 | 11 | 11 | 15 | 12.33 | 11 | 22 | 26 | 19.67 | 14 |
| 30 | 14 | 15 | 14 | 14.33 | 15 | 27 | 18 | 20.00 | 25 |
| Eng. Mean | .55 | .57 | .56 | .56 | .49 | .88 | .80 | .72 | .57 |
| Metric Mean | 14.0 | 14.6 | 14.2 | 14.2 | 12.5 | 22.5 | 20.4 | 18.4 | 14.6 |

APPENDIX I B (Continued)

| Steer No. | 11th Thor. 4 in. | 11th Thor. 8 in. | 11th Thor. 12 in. | 11th Thor. Avg. | 1st Lumb. 4 in. | 1st Lumb. 8 in. | 1st Lumb. 12 in. | 1st Lumb. Avg. | 4th Lumb. 4 in. |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 17 | 22 | 11 | 16.67 | 15 | 46 | 32 | 31.00 | 15 |
| 32 | 27 | 23 | 23 | 24.33 | 17 | 31 | 24 | 24.00 | 32 |
| 33 | 13 | 16 | 18 | 15.67 | 11 | 31 | 18 | 20.00 | 12 |
| 34 | 20 | 28 | 16 | 21.33 | 23 | 22 | 26 | 23.67 | 18 |
| 35 | 22 | 21 | 24 | 22.33 | 23 | 41 | 32 | 32.00 | 30 |
| 36 | 17 | 12 | 13 | 14.00 | 07 | 29 | 27 | 21.00 | 18 |
| 37 | 16 | 17 | 19 | 17.33 | 12 | 45 | 27 | 28.00 | 08 |
| 38 | 20 | 19 | 15 | 18.00 | 19 | 33 | 22 | 24.67 | 26 |
| 39 | 21 | 15 | 10 | 15.33 | 17 | 27 | 23 | 22.33 | 13 |
| 40 | 12 | 20 | 19 | 17.00 | 14 | 28 | 20 | 20.67 | 19 |
| Eng. Mean | .73 | .76 | .66 | .72 | .62 | 1.31 | .99 | .97 | .75 |
| Metric Mean | 18.5 | 19.3 | 16.8 | 18.2 | 15.8 | 33.3 | 25.1 | 24.7 | 19.1 |
| Group V .26-.50" | | | | | | | | | |
| 41 | 09 | 10 | 14 | 11.00 | 07 | 19 | 24 | 16.67 | 12 |
| 42 | 10 | 10 | 09 | 09.67 | 08 | 21 | 20 | 16.33 | 09 |
| 43 | 08 | 12 | 11 | 10.33 | 09 | 14 | 19 | 14.00 | 11 |
| 44 | 09 | 10 | 13 | 10.67 | 07 | 26 | 22 | 18.33 | 10 |
| 45 | 10 | 11 | 14 | 11.67 | 13 | 28 | 20 | 20.33 | 18 |
| 46 | 11 | 14 | 12 | 12.33 | 08 | 16 | 20 | 14.67 | 10 |
| 47 | 08 | 11 | 14 | 11.00 | 11 | 26 | 23 | 20.00 | 14 |
| 48 | 08 | 13 | 12 | 11.00 | 07 | 22 | 11 | 13.33 | 13 |
| 49 | 10 | 16 | 12 | 12.67 | 17 | 25 | 24 | 22.00 | 16 |
| 50 | 11 | 12 | 10 | 11.00 | 09 | 14 | 19 | 14.00 | 13 |
| Eng. Mean | .37 | .47 | .48 | .44 | .38 | .83 | .80 | .67 | .50 |
| Metric Mean | 9.4 | 11.9 | 12.1 | 11.1 | 9.6 | 21.1 | 20.2 | 17.0 | 12.6 |
| Group VI .51-.75 | | | | | | | | | |
| 51 | 13 | 12 | 14 | 13.00 | 10 | 34 | 30 | 24.67 | 10 |
| 52 | 10 | 10 | 10 | 10.00 | 08 | 15 | 23 | 15.33 | 07 |
| 53 | 07 | 08 | 10 | 08.33 | 06 | 16 | 13 | 11.67 | 09 |
| 54 | 09 | 16 | 13 | 12.67 | 12 | 35 | 26 | 24.33 | 25 |
| 55 | 16 | 17 | 15 | 16.00 | 15 | 26 | 18 | 19.67 | 13 |
| 56 | 10 | 19 | 17 | 15.33 | 14 | 34 | 38 | 28.67 | 18 |
| 57 | 12 | 12 | 13 | 12.33 | 11 | 16 | 26 | 17.67 | 15 |
| 58 | 12 | 14 | 16 | 14.00 | 21 | 27 | 26 | 24.67 | 22 |
| 59 | 12 | 14 | 17 | 14.33 | 11 | 30 | 24 | 21.67 | 15 |
| 60 | 13 | 14 | 15 | 14.00 | 11 | 25 | 26 | 20.67 | 20 |
| Eng. Mean | .45 | .54 | .55 | .51 | .47 | 1.02 | .98 | .82 | .61 |
| Metric Mean | 11.4 | 13.6 | 14.0 | 13.0 | 11.9 | 25.8 | 25.0 | 20.9 | 15.4 |

APPENDIX I B (Continued)

| Steer No. | 11th Thor. 4 in. | 11th Thor. 8 in. | 11th Thor. 12 in. | 11th Thor. Avg. | 1st Lumb. 4 in. | 1st Lumb. 8 in. | 1st Lumb. 12 in | 1st Lumb. Avg. | 4th Lumb. 4 in. |
|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | |
| 61 | 14 | 15 | 17 | 15.33 | 14 | 34 | 32 | 26.67 | 17 |
| 62 | 18 | 16 | 17 | 16.00 | 19 | 24 | 22 | 21.67 | 14 |
| 63 | 15 | 16 | 15 | 15.33 | 12 | 24 | 16 | 17.33 | 18 |
| 64 | 19 | 23 | 12 | 18.00 | 14 | 24 | 22 | 20.00 | 13 |
| 65 | 14 | 19 | 15 | 16.00 | 12 | 24 | 33 | 23.00 | 15 |
| 66 | 19 | 21 | 26 | 22.00 | 21 | 32 | 32 | 28.33 | 20 |
| 67 | 20 | 23 | 30 | 24.33 | 20 | 35 | 35 | 30.00 | 33 |
| 68 | 12 | 15 | 17 | 14.67 | 13 | 19 | 21 | 17.67 | 19 |
| 69 | 15 | 18 | 21 | 18.00 | 17 | 34 | 30 | 27.00 | 25 |
| 70 | 15 | 17 | 20 | 17.33 | 14 | 40 | 25 | 26.33 | 20 |
| Eng. Mean | .63 | .72 | .75 | .73 | .61 | 1.14 | 1.06 | .94 | .76 |
| Metric Mean | 16.1 | 18.3 | 19.0 | 17.7 | 15.6 | 29.0 | 26.8 | 23.8 | 19.4 |
| Group VIII 1.01-1.25" | | | | | | | | | |
| 71 | 14 | 22 | 22 | 19.33 | 18 | 26 | 23 | 22.33 | 23 |
| 72 | 18 | 18 | 18 | 18.00 | 12 | 38 | 30 | 26.67 | 20 |
| 73 | 18 | 17 | 19 | 18.00 | 18 | 26 | 29 | 24.33 | 25 |
| 74 | 19 | 17 | 25 | 20.33 | 15 | 39 | 25 | 26.33 | 23 |
| 75 | 22 | 21 | 23 | 22.00 | 18 | 42 | 32 | 30.67 | 22 |
| 76 | 14 | 19 | 19 | 17.33 | 14 | 27 | 37 | 26.00 | 20 |
| 77 | 16 | 16 | 21 | 17.67 | 14 | 22 | 23 | 19.67 | 12 |
| 78 | 11 | 19 | 18 | 16.00 | 12 | 15 | 26 | 17.67 | 18 |
| 79 | 22 | 20 | 22 | 21.33 | 15 | 36 | 34 | 28.33 | 20 |
| 80 | 12 | 22 | 21 | 18.33 | 19 | 26 | 30 | 25.00 | 20 |
| Eng. Mean | .65 | .75 | .82 | .74 | .61 | 1.17 | 1.14 | .97 | .80 |
| Metric Mean | 16.6 | 19.1 | 20.8 | 18.8 | 15.5 | 29.7 | 28.9 | 24.7 | 20.3 |

APPENDIX I B (Continued)

| Steer No. | 4th Lumb. 8 in. | 4th Lumb. 12 in. | 4th Lumb. Avg. | 6th Lumb. 4 in. | 6th Lumb. 8 in. | 6th Lumb. 12 in. | 6th Lumb. Avg. | 3rd Sac. 4 in. | 3rd Sac. 8 in. | 3rd Sac. 12 in. |
|---|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | | |
| 1 | 15 | 11 | 11.00 | 03 | 13 | 10 | 08.67 | 07 | 04 | 04 |
| 2 | 23 | 24 | 23.00 | 16 | 08 | 12 | 12.00 | 18 | 24 | 25 |
| 3 | 20 | 06 | 12.00 | 06 | 05 | 15 | 08.67 | 08 | 03 | 02 |
| 4 | 18 | 13 | 12.33 | 05 | 10 | 08 | 07.67 | 11 | 03 | 05 |
| 5 | 20 | 07 | 11.67 | 07 | 09 | 09 | 08.33 | 10 | 05 | 10 |
| 6 | 12 | 11 | 09.67 | 06 | 05 | 08 | 06.33 | 06 | 04 | 03 |
| 7 | 24 | 14 | 18.00 | 07 | 29 | 15 | 17.00 | 12 | 09 | 07 |
| 8 | 23 | 14 | 16.00 | 14 | 18 | 17 | 16.33 | 10 | 08 | 03 |
| 9 | 10 | 06 | 07.67 | 01 | 05 | 04 | 03.33 | 08 | 07 | 12 |
| 10 | 23 | 17 | 17.33 | 08 | 18 | 23 | 16.33 | 10 | 07 | 04 |
| Eng. Mean | .74 | .48 | .55 | .29 | .47 | .48 | .41 | .39 | .29 | .30 |
| Metric Mean | 18.8 | 12.3 | 13.9 | 7.3 | 12.0 | 12.1 | 10.5 | 10.0 | 7.4 | 7.5 |
| Group II .51-.75" | | | | | | | | | | |
| 11 | 30 | 19 | 20.00 | 13 | 22 | 20 | 18.33 | 13 | 10 | 12 |
| 12 | 22 | 10 | 16.67 | 11 | 33 | 27 | 23.67 | 17 | 12 | 14 |
| 13 | 21 | 17 | 15.00 | 06 | 16 | 12 | 11.67 | 08 | 06 | 10 |
| 14 | 30 | 16 | 19.67 | 10 | 16 | 16 | 14.00 | 13 | 07 | 07 |
| 15 | 18 | 07 | 11.00 | 07 | 21 | 10 | 12.67 | 10 | 09 | 08 |
| 16 | 21 | 11 | 14.67 | 07 | 14 | 13 | 11.33 | 11 | 09 | 08 |
| 17 | 16 | 15 | 13.67 | 12 | 27 | 10 | 16.33 | 18 | 19 | 14 |
| 18 | 20 | 16 | 15.67 | 13 | 13 | 23 | 16.33 | 20 | 14 | 10 |
| 19 | 23 | 14 | 15.00 | 08 | 10 | 13 | 10.33 | 14 | 10 | 09 |
| 20 | 18 | 17 | 14.33 | 13 | 15 | 13 | 13.67 | 13 | 14 | 11 |
| Eng. Mean | .86 | .56 | .61 | .39 | .74 | .62 | .58 | .54 | .43 | .40 |
| Metric Mean | 21.9 | 14.2 | 15.6 | 10.0 | 18.7 | 15.7 | 14.8 | 13.7 | 11.0 | 10.3 |
| Group III .76-1.00" | | | | | | | | | | |
| 21 | 22 | 18 | 17.67 | 12 | 32 | 24 | 22.67 | 15 | 13 | 15 |
| 22 | 28 | 30 | 25.00 | 13 | 29 | 23 | 21.67 | 12 | 02 | 09 |
| 23 | 17 | 10 | 11.33 | 07 | 11 | 11 | 09.67 | 10 | 10 | 17 |
| 24 | 23 | 16 | 17.67 | 14 | 22 | 09 | 15.00 | 20 | 13 | 11 |
| 25 | 28 | 20 | 22.00 | 16 | 22 | 22 | 20.00 | 19 | 10 | 13 |
| 26 | 29 | 09 | 15.67 | 12 | 12 | 27 | 17.00 | 18 | 11 | 11 |
| 27 | 30 | 19 | 20.00 | 10 | 35 | 12 | 19.00 | 11 | 14 | 30 |
| 28 | 25 | 16 | 19.67 | 14 | 25 | 22 | 20.33 | 19 | 10 | 05 |
| 29 | 18 | 20 | 17.33 | 10 | 21 | 24 | 18.33 | 15 | 08 | 09 |
| 30 | 23 | 22 | 23.33 | 30 | 22 | 27 | 26.33 | 18 | 17 | 10 |
| Eng. Mean | .76 | .71 | .75 | .54 | .81 | .69 | .75 | .62 | .42 | .51 |
| Metric Mean | 24.3 | 18.0 | 19.0 | 13.8 | 23.1 | 20.1 | 19.0 | 15.7 | 10.8 | 13.0 |

APPENDIX I B (Continued)

| Steer No. | 4th Lumb. 8 in. | 4th Lumb. 12 in. | 4th Lumb. Avg. | 6th Lumb. 4 in. | 6th Lumb. 8 in. | 6th Lumb. 12 in. | 6th Lumb. Avg. | 3rd Sac. 4 in. | 3rd Sac. 8 in. | 3rd Sac. 12 in. |
|---|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | | |
| 31 | 34 | 25 | 24.67 | 20 | 40 | 33 | 31.00 | 21 | 20 | 16 |
| 32 | 32 | 23 | 29.00 | 17 | 17 | 25 | 19.67 | 24 | 15 | 16 |
| 33 | 22 | 17 | 17.00 | 11 | 17 | 23 | 17.00 | 09 | 04 | 03 |
| 34 | 28 | 22 | 22.67 | 14 | 28 | 27 | 23.00 | 16 | 13 | 14 |
| 35 | 34 | 23 | 29.00 | 23 | 34 | 42 | 33.00 | 23 | 20 | 23 |
| 36 | 34 | 26 | 26.00 | 11 | 21 | 18 | 16.67 | 16 | 11 | 21 |
| 37 | 26 | 24 | 19.33 | 17 | 28 | 20 | 21.67 | 10 | 15 | 51 |
| 38 | 22 | 27 | 25.00 | 17 | 16 | 19 | 17.33 | 17 | 15 | 14 |
| 39 | 26 | 20 | 19.67 | 12 | 24 | 15 | 17.00 | 11 | 17 | 11 |
| 40 | 28 | 15 | 20.67 | 12 | 26 | 21 | 19.67 | 12 | 24 | 16 |
| Eng. Mean | 1.12 | .87 | .92 | .61 | .99 | .96 | .85 | .63 | .61 | .73 |
| Metric Mean | 28.6 | 22.2 | 23.3 | 15.4 | 25.1 | 24.3 | 21.60 | 15.9 | 15.4 | 18.5 |
| Group V .26-.50" | | | | | | | | | | |
| 41 | 18 | 17 | 16.67 | 09 | 21 | 26 | 16.67 | 10 | 12 | 11 |
| 42 | 10 | 15 | 11.33 | 06 | 14 | 20 | 13.33 | 10 | 10 | 04 |
| 43 | 16 | 13 | 13.33 | 10 | 20 | 19 | 16.33 | 13 | 09 | 05 |
| 44 | 15 | 15 | 13.33 | 07 | 12 | 15 | 11.33 | 09 | 05 | 04 |
| 45 | 21 | 31 | 23.33 | 12 | 23 | 37 | 24.00 | 17 | 09 | 10 |
| 46 | 18 | 12 | 13.33 | 10 | 22 | 20 | 17.33 | 14 | 11 | 07 |
| 47 | 20 | 12 | 15.33 | 12 | 17 | 14 | 11.33 | 15 | 08 | 04 |
| 48 | 12 | 16 | 13.67 | 10 | 17 | 24 | 17.00 | 12 | 10 | 04 |
| 49 | 21 | 25 | 20.67 | 11 | 19 | 23 | 17.67 | 13 | 13 | 10 |
| 50 | 14 | 07 | 11.33 | 08 | 07 | 19 | 11.33 | 04 | 10 | 08 |
| Eng. Mean | .65 | .64 | .60 | .37 | .68 | .85 | .63 | .46 | .38 | .26 |
| Metric Mean | 16.5 | 16.3 | 15.2 | 9.5 | 17.2 | 21.7 | 15.93 | 11.7 | 9.7 | 6.7 |
| Group VI .51-.75" | | | | | | | | | | |
| 51 | 12 | 18 | 13.33 | 22 | 22 | 24 | 22.67 | 16 | 12 | 08 |
| 52 | 15 | 08 | 10.00 | 07 | 19 | 19 | 15.00 | 11 | 09 | 05 |
| 53 | 14 | 10 | 11.00 | 08 | 09 | 16 | 11.00 | 09 | 07 | 07 |
| 54 | 26 | 23 | 24.67 | 18 | 30 | 39 | 29.00 | 23 | 18 | 15 |
| 55 | 22 | 24 | 19.67 | 19 | 23 | 32 | 24.67 | 16 | 18 | 10 |
| 56 | 24 | 34 | 25.33 | 19 | 35 | 42 | 32.00 | 21 | 12 | 10 |
| 57 | 27 | 21 | 21.00 | 12 | 18 | 18 | 16.00 | 14 | 12 | 10 |
| 58 | 20 | 28 | 23.33 | 21 | 30 | 27 | 26.00 | 24 | 26 | 12 |
| 59 | 20 | 20 | 18.33 | 20 | 25 | 26 | 23.67 | 15 | 19 | 10 |
| 60 | 21 | 22 | 21.00 | 17 | 20 | 25 | 20.67 | 18 | 09 | 09 |
| Eng. Mean | .79 | .82 | .74 | .54 | .91 | 1.06 | .87 | .66 | .56 | .38 |
| Metric Mean | 20.1 | 20.8 | 18.8 | 16.3 | 23.1 | 26.8 | 22.07 | 16.7 | 14.2 | 9.6 |

APPENDIX I B (Continued)

| Steer No. | 4th Lumb. 8 in. | 4th Lumb. 12 in. | 4th Lumb. Avg. | 6th Lumb. 4 in. | 6th Lumb. 8 in. | 6th Lumb. 12 in. | 6th Lumb. Avg. | 3rd Sac. 4 in. | 3rd Sac. 8 in. | 3rd Sac. 12 in. |
|---|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | | |
| 61 | 26 | 20 | 21.00 | 17 | 18 | 26 | 20.33 | 22 | 23 | 13 |
| 62 | 30 | 20 | 21.33 | 21 | 20 | 15 | 18.67 | 15 | 08 | 11 |
| 63 | 19 | 24 | 20.33 | 20 | 21 | 28 | 23.00 | 20 | 18 | 10 |
| 64 | 40 | 25 | 26.00 | 19 | 31 | 25 | 25.00 | 26 | 25 | 15 |
| 65 | 16 | 24 | 18.33 | 11 | 29 | 10 | 16.67 | 14 | 08 | 07 |
| 66 | 31 | 20 | 23.67 | 17 | 32 | 36 | 28.33 | 16 | 23 | 25 |
| 67 | 30 | 29 | 30.67 | 27 | 29 | 31 | 29.00 | 26 | 17 | 22 |
| 68 | 15 | 13 | 15.67 | 19 | 22 | 26 | 22.33 | 16 | 19 | 07 |
| 69 | 21 | 25 | 23.67 | 23 | 30 | 25 | 26.00 | 25 | 22 | 10 |
| 70 | 42 | 24 | 28.67 | 23 | 37 | 21 | 27.00 | 21 | 16 | 10 |
| Eng. Mean | 1.06 | .88 | .90 | .78 | 1.13 | .96 | .93 | .79 | .70 | .51 |
| Metric Mean | 27.0 | 22.4 | 22.9 | 19.7 | 26.9 | 24.3 | 23.63 | 20.1 | 17.9 | 13.0 |
| Group VIII 1.01-1.25" | | | | | | | | | | |
| 71 | 32 | 27 | 27.33 | 20 | 10 | 28 | 19.33 | 21 | 20 | 25 |
| 72 | 31 | 23 | 24.67 | 23 | 22 | 21 | 22.00 | 23 | 23 | 10 |
| 73 | 30 | 23 | 26.00 | 26 | 31 | 23 | 26.67 | 21 | 25 | 19 |
| 74 | 32 | 31 | 28.67 | 19 | 26 | 33 | 26.00 | 18 | 20 | 11 |
| 75 | 51 | 36 | 36.33 | 22 | 27 | 23 | 24.00 | 22 | 14 | 09 |
| 76 | 22 | 22 | 21.33 | 19 | 31 | 38 | 29.33 | 22 | 17 | 12 |
| 77 | 21 | 16 | 16.33 | 09 | 16 | 15 | 13.33 | 11 | 14 | 10 |
| 78 | 18 | 22 | 19.33 | 14 | 28 | 19 | 20.33 | 16 | 10 | 11 |
| 79 | 23 | 27 | 23.33 | 19 | 27 | 30 | 25.33 | 22 | 17 | 10 |
| 80 | 21 | 32 | 24.33 | 20 | 19 | 19 | 19.33 | 22 | 13 | 10 |
| Eng. Mean | 1.11 | 1.02 | .98 | .75 | .93 | .98 | .89 | .79 | .68 | .50 |
| Metric Mean | 28.1 | 25.9 | 24.8 | 19.1 | 23.7 | 24.9 | 22.56 | 19.8 | 17.3 | 12.7 |

APPENDIX I B (Continued)

| Steer No. | 3rd Sac. Avg. | 5th Sac. 4 in. | 5th Sac. 8 in. | 5th Sac. 12 in. | 5th Sac. Avg. | Fat Thick. A | Fat Thick B | Fat Thick. C |
|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | |
| 1 | 05.00 | 11 | 01 | 02 | 04.67 | 09 | 06 | 13 |
| 2 | 22.33 | 32 | 21 | 10 | 21.00 | 13 | 12 | 13 |
| 3 | 04.33 | 09 | 02 | 03 | 04.33 | 10 | 15 | 10 |
| 4 | 06.33 | 14 | 03 | 03 | 06.67 | 17 | 07 | 07 |
| 5 | 08.33 | 05 | 06 | 02 | 04.33 | 09 | 18 | 07 |
| 6 | 04.33 | 10 | 05 | 02 | 05.67 | 12 | 04 | 05 |
| 7 | 09.33 | 27 | 07 | 11 | 15.00 | 20 | 09 | 10 |
| 8 | 07.00 | 15 | 01 | 04 | 06.67 | 15 | 11 | 06 |
| 9 | 09.00 | 10 | 02 | 00 | 04.00 | 10 | 03 | 04 |
| 10 | 07.00 | 15 | 03 | 02 | 06.67 | 15 | 10 | 07 |
| Eng. Mean | .33 | .58 | .20 | .15 | .31 | .51 | .37 | .32 |
| Metric Mean | 8.3 | 14.8 | 5.1 | 3.9 | 7.9 | 13.0 | 9.5 | 8.2 |
| Group II .51-.75" | | | | | | | | |
| 11 | 11.67 | 18 | 05 | 05 | 09.33 | 14 | 27 | 08 |
| 12 | 14.33 | 26 | 13 | 06 | 15.00 | 15 | 20 | 14 |
| 13 | 08.00 | 12 | 04 | 05 | 07.00 | 17 | 27 | 11 |
| 14 | 09.00 | 17 | 10 | 07 | 11.33 | 11 | 24 | 13 |
| 15 | 09.00 | 16 | 10 | 03 | 09.67 | 14 | 24 | 13 |
| 16 | 09.33 | 19 | 09 | 07 | 11.67 | 23 | 12 | 12 |
| 17 | 17.00 | 26 | 17 | 18 | 20.33 | 06 | 26 | 12 |
| 18 | 14.67 | 23 | 13 | 14 | 16.67 | 07 | 28 | 14 |
| 19 | 11.00 | 17 | 07 | 07 | 10.33 | 20 | 14 | 13 |
| 20 | 12.67 | 17 | 11 | 11 | 13.00 | 20 | 14 | 11 |
| Eng. Mean | .46 | .75 | .33 | .33 | .49 | .58 | .85 | .48 |
| Metric Mean | 11.70 | 19.1 | 9.9 | 8.3 | 12.43 | 14.7 | 21.6 | 12.1 |
| Group III .76-1.00" | | | | | | | | |
| 21 | 14.33 | 21 | 18 | 09 | 16.00 | 16 | 35 | 17 |
| 22 | 07.67 | 21 | 08 | 10 | 13.00 | 29 | 19 | 21 |
| 23 | 12.33 | 14 | 09 | 10 | 11.00 | 12 | 29 | 15 |
| 24 | 14.67 | 19 | 13 | 17 | 16.33 | 27 | 23 | 17 |
| 25 | 14.00 | 23 | 14 | 06 | 14.33 | 23 | 21 | 20 |
| 26 | 13.33 | 29 | 13 | 07 | 16.33 | 22 | 27 | 11 |
| 27 | 18.33 | 17 | 06 | 03 | 08.67 | 28 | 26 | 18 |
| 28 | 11.33 | 33 | 16 | 06 | 18.33 | 31 | 19 | 21 |
| 29 | 10.67 | 28 | 10 | 18 | 18.67 | 24 | 29 | 15 |
| 30 | 15.00 | 35 | 17 | 18 | 23.33 | 15 | 30 | 17 |
| Eng. Mean | .52 | .94 | .49 | .41 | .61 | .69 | 1.02 | .68 |
| Metric Mean | 13.2 | 24.0 | 12.4 | 10.4 | 15.6 | 22.7 | 25.8 | 17.2 |

APPENDIX I B (Continued)

| Steer No. | 3rd Sac. Avg. | 5th Sac. 4 in. | 5th Sac. 8 in. | 5th Sac. 12 in. | 5th Sac. Avg. | Fat. Thick. A | Fat Thick. B | Fat Thick. C |
|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | |
| 31 | 19.00 | 32 | 12 | 09 | 17.67 | 26 | 30 | 25 |
| 32 | 18.33 | 33 | 13 | 11 | 19.00 | 18 | 42 | 23 |
| 33 | 05.33 | 16 | 07 | 04 | 09.00 | 21 | 43 | 26 |
| 34 | 14.33 | 22 | 22 | 13 | 19.00 | 20 | 33 | 24 |
| 35 | 22.00 | 31 | 21 | 11 | 21.00 | 29 | 37 | 22 |
| 36 | 16.00 | 16 | 12 | 10 | 12.67 | 18 | 37 | 22 |
| 37 | 25.33 | 17 | 07 | 12 | 12.67 | 21 | 34 | 22 |
| 38 | 15.33 | 28 | 10 | 08 | 15.33 | 42 | 18 | 18 |
| 39 | 13.00 | 30 | 14 | 10 | 18.00 | 21 | 37 | 19 |
| 40 | 17.33 | 18 | 14 | 12 | 14.67 | 27 | 36 | 17 |
| Eng. Mean | .65 | .76 | .52 | .39 | .63 | .76 | 1.37 | .66 |
| Metric Mean | 16.6 | 24.3 | 13.2 | 10.0 | 15.90 | 24.3 | 34.7 | 21.8 |
| Group V .26-.50" | | | | | | | | |
| 41 | 11.00 | 15 | 12 | 07 | 11.33 | 12 | 07 | 04 |
| 42 | 08.00 | 19 | 06 | 04 | 09.67 | 17 | 15 | 06 |
| 43 | 09.00 | 18 | 07 | 07 | 10.67 | 06 | 16 | 10 |
| 44 | 06.00 | 21 | 07 | 06 | 11.33 | 08 | 16 | 10 |
| 45 | 12.00 | 29 | 15 | 18 | 20.67 | 07 | 18 | 12 |
| 46 | 10.67 | 36 | 08 | 19 | 21.00 | 17 | 10 | 08 |
| 47 | 09.00 | 25 | 08 | 05 | 12.67 | 13 | 09 | 06 |
| 48 | 08.67 | 15 | 11 | 08 | 11.33 | 10 | 16 | 06 |
| 49 | 12.00 | 30 | 09 | 09 | 16.00 | 08 | 21 | 08 |
| 50 | 07.33 | 22 | 10 | 10 | 14.00 | 08 | 30 | 12 |
| Eng. Mean | .37 | .90 | .37 | .37 | .55 | .42 | .82 | .32 |
| Metric Mean | 9.37 | 23.0 | 9.3 | 9.3 | 13.87 | 10.6 | 15.8 | 8.2 |
| Group VI .51-.75" | | | | | | | | |
| 51 | 12.00 | 10 | 11 | 10 | 10.33 | 23 | 14 | 13 |
| 52 | 08.33 | 24 | 11 | 07 | 14.00 | 30 | 09 | 06 |
| 53 | 07.67 | 19 | 05 | 06 | 10.00 | 22 | 15 | 08 |
| 54 | 18.67 | 28 | 08 | 08 | 14.67 | 22 | 13 | 11 |
| 55 | 14.67 | 21 | 16 | 09 | 15.33 | 23 | 16 | 12 |
| 56 | 14.33 | 31 | 22 | 09 | 20.67 | 15 | 29 | 13 |
| 57 | 12.00 | 21 | 10 | 08 | 13.00 | 16 | 18 | 10 |
| 58 | 20.67 | 31 | 29 | 18 | 26.00 | 15 | 21 | 14 |
| 59 | 14.67 | 31 | 16 | 11 | 19.33 | 11 | 28 | 17 |
| 60 | 12.00 | 29 | 14 | 10 | 17.67 | 14 | 12 | 15 |
| Eng. Mean | .53 | .96 | .56 | .38 | .63 | .75 | .89 | .47 |
| Metric Mean | 13.5 | 24.5 | 14.2 | 9.6 | 16.10 | 19.1 | 17.5 | 11.9 |

APPENDIX I B (Continued)

| Steer No. | 3rd Sac. Avg. | 5th Sac. 4 in. | 5th Sac. 8 in. | 5th Sac. 12 in. | 5th Sac. Avg. | Fat Thick. A | Fat Thick. B | Fat Thick. C |
|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | |
| 61 | 19.33 | 35 | 25 | 11 | 23.67 | 33 | 14 | 14 |
| 62 | 11.33 | 15 | 13 | 05 | 11.00 | 22 | 25 | 21 |
| 63 | 16.00 | 29 | 16 | 10 | 18.33 | 18 | 24 | 17 |
| 64 | 22.00 | 23 | 22 | 10 | 18.33 | 17 | 35 | 15 |
| 65 | 09.67 | 18 | 06 | 06 | 10.00 | 31 | 12 | 15 |
| 66 | 21.33 | 23 | 18 | 15 | 18.67 | 22 | 30 | 24 |
| 67 | 21.67 | 35 | 11 | 19 | 21.67 | 37 | 20 | 16 |
| 68 | 14.00 | 23 | 14 | 04 | 13.67 | 24 | 22 | 12 |
| 69 | 19.00 | 34 | 18 | 13 | 21.67 | 32 | 22 | 17 |
| 70 | 15.67 | 26 | 14 | 13 | 17.67 | 23 | 30 | 17 |
| Eng. Mean | .67 | 1.03 | .62 | .42 | .69 | 1.02 | .92 | .66 |
| Metric Mean | 17.00 | 26.1 | 15.7 | 10.6 | 17.47 | 25.9 | 23.4 | 16.8 |
| Group VIII 1.01-1.25" | | | | | | | | |
| 71 | 22.00 | 28 | 12 | 15 | 18.33 | 37 | 34 | 20 |
| 72 | 18.67 | 24 | 15 | 15 | 18.00 | 40 | 28 | 20 |
| 73 | 21.67 | 22 | 20 | 16 | 19.33 | 45 | 32 | 22 |
| 74 | 16.33 | 19 | 16 | 11 | 15.33 | 34 | 36 | 19 |
| 75 | 15.00 | 34 | 14 | 11 | 19.67 | 40 | 26 | 18 |
| 76 | 17.00 | 38 | 25 | 12 | 25.00 | 27 | 33 | 17 |
| 77 | 11.67 | 25 | 12 | 07 | 14.67 | 20 | 36 | 21 |
| 78 | 12.33 | 17 | 11 | 08 | 12.00 | 29 | 30 | 20 |
| 79 | 16.33 | 39 | 27 | 13 | 26.33 | 32 | 26 | 19 |
| 80 | 15.00 | 35 | 21 | 18 | 24.67 | 25 | 30 | 23 |
| Eng. Mean | .65 | 1.11 | .68 | .50 | .76 | 1.30 | 1.22 | .78 |
| Metric Mean | 16.6 | 28.1 | 17.3 | 12.6 | 19.33 | 32.9 | 31.1 | 19.9 |

APPENDIX I B (Continued)

| Steer No. | Fat Thick. D | Fat Thick. E | Fat Thick. F | Fat Thick. G | Average A,B,C |
|---|---|---|---|---|---|
| Group I .26-.50" | | | | | |
| 1 | 07 | 07 | 04 | 06 | 09.33 |
| 2 | 12 | 11 | 12 | 15 | 12.67 |
| 3 | 10 | 11 | 15 | 13 | 11.67 |
| 4 | 09 | 09 | 08 | 13 | 10.33 |
| 5 | 08 | 10 | 10 | 13 | 11.33 |
| 6 | 07 | 08 | 04 | 05 | 07.00 |
| 7 | 12 | 13 | 16 | 20 | 13.00 |
| 8 | 10 | 09 | 10 | 10 | 10.67 |
| 9 | 06 | 04 | 05 | 05 | 05.67 |
| 10 | 08 | 09 | 14 | 12 | 10.67 |
| Eng. Mean | .35 | .36 | .38 | .44 | .40 |
| Metric Mean | 8.9 | 9.1 | 9.8 | 11.2 | 10.23 |
| Group II .51-.75" | | | | | |
| 11 | 11 | 13 | 09 | 06 | 16.33 |
| 12 | 15 | 14 | 11 | 18 | 16.33 |
| 13 | 11 | 12 | 15 | 13 | 18.33 |
| 14 | 15 | 20 | 15 | 11 | 16.00 |
| 15 | 09 | 08 | 10 | 10 | 17.00 |
| 16 | 10 | 12 | 17 | 17 | 15.67 |
| 17 | 12 | 11 | 12 | 18 | 14.67 |
| 18 | 11 | 09 | 20 | 17 | 16.33 |
| 19 | 25 | 24 | 19 | 07 | 15.67 |
| 20 | 10 | 08 | 11 | 12 | 15.00 |
| Eng. Mean | .51 | .52 | .55 | .51 | .63 |
| Metric Mean | 12.9 | 13.1 | 13.9 | 12.9 | 16.1 |
| Group III .76-1.00" | | | | | |
| 21 | 14 | 11 | 18 | 23 | 22.67 |
| 22 | 19 | 20 | 20 | 15 | 23.00 |
| 23 | 06 | 08 | 07 | 07 | 18.67 |
| 24 | 15 | 36 | 35 | 31 | 22.33 |
| 25 | 20 | 18 | 27 | 26 | 21.33 |
| 26 | 11 | 15 | 18 | 20 | 20.00 |
| 27 | 16 | 18 | 17 | 15 | 24.00 |
| 28 | 15 | 24 | 40 | 41 | 23.67 |
| 29 | 14 | 16 | 13 | 14 | 22.67 |
| 30 | 13 | 13 | 18 | 15 | 20.67 |
| Eng. Mean | .56 | .70 | .84 | .81 | .86 |
| Metric Mean | 14.3 | 17.9 | 21.3 | 20.7 | 21.9 |

APPENDIX I B (Continued)

| Steer No. | Fat Thick. D | Fat Thick. E | Fat Thick. F | Fat Thick. G | Average A,B,C |
|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | |
| 31 | 31 | 41 | 40 | 29 | 27.00 |
| 32 | 13 | 16 | 17 | 21 | 27.67 |
| 33 | 17 | 25 | 20 | 17 | 30.00 |
| 34 | 09 | 14 | 22 | 20 | 25.67 |
| 35 | 27 | 33 | 27 | 28 | 29.33 |
| 36 | 16 | 18 | 18 | 15 | 25.67 |
| 37 | 14 | 13 | 14 | 24 | 25.67 |
| 38 | 15 | 35 | 40 | 31 | 25.00 |
| 39 | 18 | 29 | 28 | 22 | 25.67 |
| 40 | 15 | 13 | 15 | 18 | 26.67 |
| Eng. Mean | .89 | .89 | .95 | .88 | 1.08 |
| Metric Mean | 17.5 | 22.7 | 24.1 | 22.5 | 26.9 |
| Group V .26-.50" | | | | | |
| 41 | 09 | 09 | 09 | 17 | 07.67 |
| 42 | 09 | 12 | 12 | 17 | 12.67 |
| 43 | 03 | 09 | 13 | 12 | 10.67 |
| 44 | 08 | 07 | 06 | 15 | 11.33 |
| 45 | 14 | 16 | 19 | 31 | 12.33 |
| 46 | 14 | 14 | 14 | 11 | 11.67 |
| 47 | 11 | 08 | 08 | 09 | 09.33 |
| 48 | 11 | 11 | 14 | 14 | 10.67 |
| 49 | 08 | 09 | 11 | 16 | 12.33 |
| 50 | 10 | 05 | 06 | 06 | 16.67 |
| Eng. Mean | .38 | .39 | .44 | .58 | .45 |
| Metric Mean | 9.7 | 10.0 | 11.2 | 14.8 | 11.53 |
| Group VI .51-.75" | | | | | |
| 51 | 15 | 29 | 30 | 26 | 16.67 |
| 52 | 09 | 08 | 09 | 12 | 15.00 |
| 53 | 07 | 22 | 23 | 17 | 15.00 |
| 54 | 13 | 30 | 26 | 18 | 15.33 |
| 55 | 15 | 15 | 13 | 22 | 17.00 |
| 56 | 25 | 22 | 16 | 10 | 19.00 |
| 57 | 10 | 09 | 08 | 13 | 14.67 |
| 58 | 10 | 15 | 16 | 17 | 16.67 |
| 59 | 12 | 20 | 17 | 18 | 18.67 |
| 60 | 14 | 12 | 15 | 25 | 17.00 |
| Eng. Mean | .51 | .72 | .68 | .79 | .65 |
| Metric Mean | 13.0 | 18.2 | 17.3 | 17.8 | 16.50 |

APPENDIX I B (Continued)

| Steer No. | Fat Thick. D | Fat Thick. E | Fat Thick. F | Fat Thick. G | Average A,B,C |
|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | |
| 61 | 15 | 22 | 25 | 22 | 20.33 |
| 62 | 15 | 13 | 19 | 24 | 22.67 |
| 63 | 22 | 19 | 26 | 31 | 19.67 |
| 64 | 16 | 21 | 18 | 22 | 22.33 |
| 65 | 19 | 17 | 30 | 19 | 19.33 |
| 66 | 19 | 40 | 40 | 34 | 25.33 |
| 67 | 34 | 34 | 38 | 43 | 24.33 |
| 68 | 17 | 15 | 17 | 15 | 19.33 |
| 69 | 15 | 18 | 20 | 31 | 23.67 |
| 70 | 17 | 26 | 25 | 29 | 23.33 |
| Eng. Mean | .74 | .88 | 1.02 | 1.06 | .87 |
| Metric Mean | 18.9 | 22.5 | 25.8 | 27.00 | 22.0 |
| Group VIII 1.01-1.25" | | | | | |
| 71 | 19 | 20 | 21 | 26 | 30.33 |
| 72 | 22 | 30 | 39 | 33 | 29.33 |
| 73 | 18 | 21 | 22 | 26 | 33.00 |
| 74 | 21 | 25 | 23 | 27 | 29.67 |
| 75 | 23 | 20 | 16 | 24 | 28.00 |
| 76 | 16 | 16 | 19 | 29 | 25.67 |
| 77 | 14 | 16 | 16 | 17 | 25.67 |
| 78 | 21 | 21 | 17 | 14 | 26.33 |
| 79 | 22 | 22 | 22 | 29 | 25.67 |
| 80 | 19 | 27 | 32 | 25 | 26.00 |
| Eng. Mean | .76 | .86 | .89 | .98 | 1.18 |
| Metric Mean | 19.4 | 21.8 | 22.7 | 25.0 | 28.0 |

APPENDIX I C CARCASS EVALUATION - OBJECTIVE MEASUREMENTS

| Steer No. | Depth at 10th Rib | Depth at 12th Rib | Depth at Brisket | Length of Round | Circ. of Round | L.D. Area |
|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | |
| 1 | 6.90 | 08.10 | 3.10 | 27.8 | 31.9 | 09.04 |
| 2 | 5.75 | 07.50 | 5.50 | 28.9 | 32.5 | 07.80 |
| 3 | 6.90 | 07.70 | 3.90 | 27.2 | 32.0 | 12.36 |
| 4 | 5.40 | 06.40 | 3.10 | 29.0 | 33.5 | 09.24 |
| 5 | 6.60 | 11.70 | 4.90 | 28.2 | 33.0 | 11.62 |
| 6 | 6.75 | 07.50 | 5.20 | 27.8 | 35.4 | 12.62 |
| 7 | 6.80 | 07.00 | 4.40 | 28.0 | 31.5 | 09.42 |
| 8 | 6.40 | 07.10 | 3.80 | 29.0 | 32.1 | 09.52 |
| 9 | 6.60 | 08.50 | 3.20 | 29.6 | 33.0 | 08.64 |
| 10 | 7.00 | 08.10 | 4.10 | 27.0 | 32.4 | 10.52 |
| Eng. Mean | 6.51 | 7.96 | 4.10 | 28.25 | 32.73 | 10.78 |
| Metric Mean | 16.54 | 20.22 | 10.41 | 71.76 | 83.13 | 69.53 |
| Group II .51-.75" | | | | | | |
| 11 | 8.10 | 08.90 | 5.40 | 28.6 | 32.1 | 09.54 |
| 12 | 6.40 | 08.10 | 4.50 | 26.3 | 35.6 | 11.15 |
| 13 | 7.40 | 08.40 | 5.30 | 26.5 | 34.3 | 09.97 |
| 14 | 7.60 | 08.30 | 4.30 | 27.0 | 33.2 | 12.26 |
| 15 | 7.30 | 07.50 | 4.70 | 28.5 | 32.5 | 07.98 |
| 16 | 7.20 | 07.50 | 4.60 | 28.9 | 31.1 | 08.71 |
| 17 | 6.90 | 07.75 | 4.95 | 28.5 | 33.1 | 07.71 |
| 18 | 6.40 | 07.60 | 4.60 | 29.0 | 32.4 | 08.83 |
| 19 | 8.70 | 09.40 | 4.60 | 27.0 | 31.8 | 13.36 |
| 20 | 6.00 | 07.75 | 4.50 | 28.9 | 31.5 | 09.73 |
| Eng. Mean | 7.20 | 8.12 | 4.74 | 27.92 | 32.76 | 9.92 |
| Metric Mean | 18.29 | 20.62 | 12.04 | 70.92 | 83.21 | 63.98 |
| Group III .76-1.00" | | | | | | |
| 21 | 6.75 | 08.80 | 3.45 | 27.4 | 32.1 | 11.10 |
| 22 | 6.00 | 06.90 | 4.10 | 26.8 | 34.5 | 09.41 |
| 23 | 7.40 | 08.10 | 4.20 | 26.7 | 31.7 | 10.33 |
| 24 | 8.70 | 09.20 | 5.10 | 26.0 | 34.3 | 10.19 |
| 25 | 6.80 | 07.90 | 4.60 | 27.1 | 34.4 | 10.34 |
| 26 | 8.50 | 09.40 | 4.80 | 27.2 | 32.1 | 10.17 |
| 27 | 7.30 | 08.70 | 5.20 | 26.0 | 33.5 | 09.30 |
| 28 | 7.20 | 07.80 | 4.80 | 25.5 | 35.1 | 09.62 |
| 29 | 7.80 | 07.20 | 5.40 | 25.1 | 34.2 | 10.78 |
| 30 | 6.80 | 07.50 | 4.60 | 26.3 | 32.0 | 09.56 |
| Eng. Mean | 7.32 | 8.15 | 4.62 | 26.41 | 33.40 | 10.08 |
| Metric Mean | 18.59 | 20.70 | 11.73 | 67.08 | 84.84 | 65.02 |

APPENDIX I C (Continued)

| Steer No. | Depth at 10th Rib | Depth at 12th Rib | Depth at Brisket | Length of Round | Circ. of Round | L.D. Area |
|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | |
| 31 | 7.20 | 08.10 | 5.50 | 26.6 | 31.2 | 10.15 |
| 32 | 6.10 | 07.80 | 5.50 | 24.9 | 35.8 | 09.33 |
| 33 | 7.60 | 08.60 | 5.10 | 25.8 | 32.5 | 12.27 |
| 34 | 6.50 | 07.20 | 5.00 | 27.4 | 31.0 | 10.05 |
| 35 | 6.00 | 06.90 | 5.20 | 26.2 | 30.5 | 08.43 |
| 36 | 7.50 | 08.50 | 4.70 | 26.0 | 33.4 | 09.15 |
| 37 | 5.60 | 07.20 | 5.10 | 26.5 | 34.7 | 08.73 |
| 38 | 6.20 | 07.20 | 6.75 | 26.9 | 33.7 | 10.06 |
| 39 | 6.50 | 07.70 | 4.80 | 26.3 | 34.6 | 11.19 |
| 40 | 7.40 | 08.00 | 5.80 | 26.3 | 33.8 | 09.92 |
| Eng. Mean | 6.66 | 7.72 | 5.34 | 26.29 | 33.12 | 9.93 |
| Metric Mean | 16.92 | 19.61 | 13.56 | 66.78 | 84.12 | 64.05 |
| Group V .26-.50" | | | | | | |
| 41 | 7.50 | 09.00 | 4.75 | 33.0 | 33.6 | 14.09 |
| 42 | 7.80 | 08.80 | 4.50 | 30.9 | 34.3 | 12.54 |
| 43 | 8.10 | 09.10 | 3.70 | 30.9 | 35.2 | 13.63 |
| 44 | 8.30 | 09.00 | 5.00 | 32.1 | 38.8 | 11.40 |
| 45 | 6.60 | 07.70 | 5.60 | 29.5 | 35.8 | 12.20 |
| 46 | 5.30 | 06.30 | 6.20 | 30.1 | 35.9 | 15.15 |
| 47 | 7.90 | 08.10 | 5.60 | 31.0 | 34.8 | 12.34 |
| 48 | 7.10 | 08.20 | 5.00 | 31.8 | 35.0 | 14.39 |
| 49 | 6.40 | 07.90 | 5.50 | 29.4 | 34.4 | 11.32 |
| 50 | 7.00 | 08.10 | 5.80 | 31.0 | 34.6 | 14.67 |
| Eng. Mean | 7.20 | 8.22 | 5.16 | 30.97 | 35.23 | 13.17 |
| Metric Mean | 18.29 | 20.88 | 13.11 | 78.66 | 89.48 | 84.95 |
| Group VI .51-.75" | | | | | | |
| 51 | 7.10 | 08.40 | 5.10 | 31.5 | 34.8 | 12.41 |
| 52 | 7.15 | 08.30 | 5.00 | 29.6 | 36.8 | 12.36 |
| 53 | 7.60 | 08.30 | 4.40 | 29.5 | 34.2 | 12.00 |
| 54 | 7.50 | 08.40 | 5.10 | 31.3 | 38.3 | 13.71 |
| 55 | 7.70 | 08.40 | 4.10 | 31.4 | 36.4 | 11.53 |
| 56 | 6.40 | 07.60 | 7.40 | 30.4 | 39.4 | 10.12 |
| 57 | 7.80 | 08.30 | 4.75 | 32.5 | 35.7 | 09.33 |
| 58 | 7.30 | 08.40 | 5.50 | 29.8 | 39.3 | 10.47 |
| 59 | 7.00 | 08.50 | 5.50 | 27.1 | 36.8 | 12.50 |
| 60 | 7.30 | 07.90 | 4.50 | 30.3 | 35.9 | 12.13 |
| Eng. Mean | 7.22 | 8.25 | 5.11 | 30.34 | 36.76 | 11.83 |
| Metric Mean | 18.34 | 20.96 | 13.06 | 77.06 | 93.37 | 75.21 |

APPENDIX I C (Continued)

| Steer No. | Depth at 10th Rib | Depth at 12th Rib | Depth at Brisket | Length of Round | Circ. of Round | L.D. Area |
|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | |
| 61 | 8.00 | 08.40 | 4.50 | 30.6 | 34.3 | 10.04 |
| 62 | 8.00 | 08.40 | 5.30 | 29.8 | 36.3 | 12.03 |
| 63 | 6.30 | 07.50 | 5.60 | 29.3 | 37.7 | 11.44 |
| 64 | 6.50 | 07.70 | 5.90 | 29.5 | 35.7 | 09.11 |
| 65 | 8.20 | 09.60 | 4.40 | 31.3 | 35.7 | 13.51 |
| 66 | 8.30 | 09.50 | 6.50 | 28.3 | 38.1 | 11.23 |
| 67 | 9.80 | 08.40 | 7.00 | 28.2 | 38.3 | 13.63 |
| 68 | 7.30 | 08.10 | 5.40 | 30.9 | 37.2 | 10.70 |
| 69 | 6.30 | 08.10 | 7.50 | 30.1 | 40.5 | 10.30 |
| 70 | 6.90 | 08.25 | 5.10 | 30.8 | 35.4 | 11.02 |
| Eng. Mean | 7.61 | 8.40 | 5.72 | 29.88 | 36.92 | 11.38 |
| Metric Mean | 19.33 | 21.34 | 14.53 | 75.90 | 93.78 | 73.40 |
| Group VIII 1.01-1.25" | | | | | | |
| 71 | 7.20 | 07.90 | 4.80 | 28.6 | 37.6 | 11.65 |
| 72 | 9.20 | 10.40 | 3.60 | 29.8 | 34.7 | 12.18 |
| 73 | 8.00 | 09.00 | 6.00 | 30.0 | 40.2 | 10.25 |
| 74 | 6.80 | 07.80 | 6.10 | 30.5 | 37.1 | 12.70 |
| 75 | 7.40 | 08.30 | 5.20 | 30.5 | 36.9 | 11.75 |
| 76 | 8.00 | 08.70 | 5.70 | 30.5 | 34.9 | 10.59 |
| 77 | 8.60 | 09.50 | 4.30 | 29.5 | 35.0 | 10.22 |
| 78 | 6.80 | 07.50 | 5.40 | 29.5 | 34.2 | 11.55 |
| 79 | 7.60 | 08.50 | 4.90 | 30.5 | 35.6 | 10.29 |
| 80 | 6.80 | 07.40 | 6.10 | 29.0 | 36.2 | 11.00 |
| Eng. Mean | 7.64 | 8.50 | 5.21 | 29.84 | 36.24 | 11.21 |
| Metric Mean | 19.40 | 21.59 | 13.23 | 75.79 | 92.05 | 72.30 |

APPENDIX II A RIGHT SIDE - WHOLESALE CUT YIELD

| Steer No. | Rt. Side Wt. | Wt. Untrmd. Round | Wt. Trmd. Round | Wt. Untrmd. Loin | Wt. Trmd. Loin | Wt. Untrmd. Rib | Wt. Trmd. Rib | Wt. Untrmd. Chuck | Wt. Trmd. Chuck |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 259.50 | 62.00 | 61.70 | 35.10 | 34.20 | 22.80 | 22.10 | 64.60 | 64.20 |
| 2 | 260.90 | 60.00 | 59.00 | 36.60 | 33.80 | 20.00 | 18.35 | 63.50 | 63.00 |
| 3 | 260.75 | 58.90 | 58.50 | 35.40 | 35.10 | 26.20 | 25.50 | 70.00 | 70.00 |
| 4 | 253.00 | 64.00 | 61.70 | 38.30 | 37.35 | 21.80 | 21.40 | 65.30 | 65.30 |
| 5 | 259.90 | 61.10 | 59.10 | 35.10 | 33.70 | 24.20 | 23.70 | 69.00 | 69.00 |
| 6 | 256.20 | 64.00 | 62.80 | 32.50 | 32.30 | 22.00 | 21.90 | 76.50 | 76.50 |
| 7 | 247.00 | 55.00 | 55.00 | 37.50 | 37.50 | 20.70 | 20.50 | 63.40 | 63.20 |
| 8 | 264.90 | 65.70 | 65.70 | 40.10 | 39.10 | 22.40 | 22.30 | 68.20 | 68.00 |
| 9 | 260.30 | 67.60 | 64.90 | 36.80 | 35.80 | 21.20 | 21.00 | 72.75 | 72.00 |
| 10 | 252.90 | 59.30 | 58.50 | 37.80 | 37.80 | 22.00 | 21.40 | 70.60 | 70.60 |
| Eng. Mean | 257.52 | 61.76 | 60.69 | 36.52 | 35.66 | 22.33 | 21.82 | 68.38 | 68.18 |
| Metric Mean | 116.79 | 28.01 | 27.52 | 16.56 | 16.17 | 10.13 | 9.90 | 31.01 | 30.92 |
| Group II .51-.75" | | | | | | | | | |
| 11 | 263.70 | 57.10 | 54.10 | 37.70 | 35.60 | 27.20 | 26.70 | 64.70 | 64.70 |
| 12 | 258.80 | 60.40 | 56.50 | 37.50 | 34.20 | 22.60 | 21.55 | 64.40 | 63.20 |
| 13 | 267.10 | 56.00 | 54.10 | 37.20 | 35.40 | 25.40 | 23.80 | 71.50 | 70.80 |
| 14 | 265.60 | 59.40 | 57.80 | 37.10 | 35.30 | 25.80 | 24.40 | 71.20 | 70.90 |
| 15 | 260.70 | 54.90 | 52.00 | 41.90 | 39.20 | 18.40 | 18.40 | 64.70 | 64.00 |
| 16 | 273.70 | 59.40 | 59.10 | 38.90 | 38.70 | 24.00 | 24.00 | 72.80 | 72.20 |
| 17 | 259.10 | 56.90 | 56.50 | 36.10 | 35.90 | 19.30 | 18.90 | 63.90 | 62.90 |
| 18 | 270.70 | 60.70 | 60.70 | 43.70 | 42.20 | 22.20 | 22.10 | 62.80 | 62.50 |
| 19 | 265.05 | 58.10 | 55.10 | 32.60 | 29.30 | 25.10 | 23.80 | 75.10 | 74.60 |
| 20 | 249.85 | 52.50 | 52.50 | 36.50 | 35.50 | 21.40 | 21.20 | 64.30 | 64.30 |
| Eng. Mean | 263.43 | 58.24 | 56.34 | 37.92 | 36.13 | 23.14 | 22.48 | 67.54 | 67.01 |
| Metric Mean | 119.47 | 26.41 | 25.55 | 17.20 | 16.38 | 10.49 | 10.20 | 30.63 | 30.39 |
| Group III .76-1.00" | | | | | | | | | |
| 21 | 276.70 | 57.80 | 57.20 | 43.20 | 41.20 | 25.10 | 23.40 | 69.10 | 68.50 |
| 22 | 271.90 | 57.10 | 52.90 | 39.00 | 34.90 | 24.80 | 22.40 | 65.20 | 62.20 |
| 23 | 260.80 | 54.80 | 53.90 | 37.20 | 36.10 | 26.80 | 25.00 | 64.70 | 64.70 |
| 24 | 270.15 | 59.00 | 55.90 | 34.40 | 30.10 | 26.60 | 24.20 | 78.50 | 76.90 |
| 25 | 265.55 | 57.00 | 53.90 | 37.70 | 34.20 | 23.60 | 22.10 | 68.40 | 67.70 |
| 26 | 263.50 | 57.60 | 54.70 | 38.30 | 36.60 | 22.40 | 21.10 | 70.20 | 69.80 |
| 27 | 270.40 | 53.55 | 49.20 | 36.20 | 31.30 | 26.50 | 22.60 | 65.70 | 62.50 |
| 28 | 263.90 | 53.90 | 51.00 | 39.10 | 36.40 | 26.60 | 25.00 | 69.30 | 67.90 |
| 29 | 262.55 | 56.20 | 52.30 | 37.35 | 34.30 | 22.40 | 20.15 | 75.50 | 73.50 |
| 30 | 268.50 | 56.80 | 52.70 | 38.50 | 34.05 | 24.20 | 21.80 | 70.50 | 68.50 |
| Eng. Mean | 276.40 | 56.38 | 53.37 | 38.10 | 34.92 | 24.90 | 22.78 | 69.71 | 68.22 |
| Metric Mean | 121.27 | 25.57 | 24.20 | 17.28 | 15.84 | 11.29 | 10.33 | 31.61 | 30.94 |

APPENDIX II A (Continued)

| Steer No. | Rt. Side Wt. | Wt. Untrmd. Round | Wt. Trmd. Round | Wt. Untrmd. Loin | Wt. Trmd. Loin | Wt. Untrmd. Rib | Wt. Trmd. Rib | Wt. Untrmd. Chuck | Wt. Trmd. Chuck |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 277.10 | 57.00 | 53.30 | 37.90 | 33.70 | 26.80 | 22.60 | 68.20 | 64.90 |
| 32 | 269.80 | 57.20 | 52.10 | 37.30 | 32.90 | 25.50 | 23.20 | 67.40 | 65.50 |
| 33 | 277.00 | 55.80 | 52.40 | 39.20 | 36.45 | 27.00 | 25.30 | 73.10 | 70.50 |
| 34 | 268.65 | 52.65 | 49.35 | 40.50 | 36.00 | 25.60 | 22.40 | 74.10 | 71.60 |
| 35 | 256.55 | 49.80 | 44.30 | 41.50 | 33.90 | 26.80 | 21.75 | 66.10 | 61.50 |
| 36 | 265.80 | 54.20 | 49.20 | 40.00 | 33.30 | 24.70 | 20.70 | 71.10 | 65.40 |
| 37 | 272.60 | 56.20 | 51.40 | 37.00 | 31.40 | 25.90 | 21.90 | 71.30 | 67.00 |
| 38 | 244.35 | 54.00 | 47.70 | 31.50 | 27.20 | 22.00 | 18.70 | 62.50 | 59.00 |
| 39 | 265.40 | 58.00 | 53.80 | 35.80 | 31.60 | 24.30 | 21.20 | 70.00 | 67.90 |
| 40 | 253.00 | 55.40 | 51.40 | 36.60 | 31.80 | 24.20 | 21.20 | 68.00 | 66.10 |
| Eng. Mean | 264.92 | 55.02 | 50.55 | 37.73 | 32.84 | 25.28 | 21.90 | 69.15 | 65.94 |
| Metric Mean | 120.14 | 24.95 | 22.90 | 17.11 | 14.89 | 11.46 | 9.93 | 31.37 | 29.90 |
| Group V .26-.50" | | | | | | | | | |
| 41 | 364.60 | 72.50 | 68.90 | 49.50 | 45.20 | 33.10 | 30.30 | 97.70 | 96.70 |
| 42 | 357.70 | 76.00 | 71.50 | 50.10 | 46.60 | 33.20 | 31.70 | 99.00 | 97.20 |
| 43 | 355.00 | 80.00 | 77.50 | 51.50 | 49.80 | 32.20 | 31.00 | 95.40 | 95.40 |
| 44 | 344.30 | 76.60 | 73.40 | 48.20 | 45.60 | 30.90 | 29.30 | 89.10 | 86.90 |
| 45 | 337.50 | 76.00 | 71.60 | 49.10 | 43.40 | 30.50 | 27.05 | 85.40 | 83.00 |
| 46 | 339.45 | 77.70 | 74.40 | 51.20 | 45.70 | 33.60 | 31.70 | 83.60 | 82.40 |
| 47 | 335.20 | 74.00 | 70.70 | 46.30 | 42.50 | 28.90 | 27.20 | 91.20 | 87.60 |
| 48 | 336.40 | 82.10 | 79.80 | 47.00 | 44.90 | 28.00 | 27.30 | 93.10 | 92.20 |
| 49 | 345.80 | 76.60 | 73.40 | 47.40 | 43.90 | 30.90 | 27.75 | 95.20 | 93.30 |
| 50 | 344.90 | 78.60 | 75.40 | 45.90 | 43.50 | 30.50 | 28.30 | 100.80 | 98.90 |
| Eng. Mean | 346.00 | 77.01 | 73.66 | 48.62 | 45.02 | 31.15 | 29.13 | 92.95 | 91.36 |
| Metric Mean | 156.95 | 34.92 | 33.40 | 2.20 | 20.42 | 14.14 | 13.21 | 42.15 | 41.43 |
| Group VI .51-.75" | | | | | | | | | |
| 51 | 363.40 | 78.60 | 76.60 | 53.60 | 50.70 | 32.80 | 30.80 | 101.30 | 99.90 |
| 52 | 352.30 | 75.50 | 71.50 | 45.00 | 42.00 | 31.40 | 29.10 | 91.00 | 91.00 |
| 53 | 347.90 | 74.40 | 71.90 | 41.70 | 39.70 | 29.80 | 28.50 | 94.60 | 93.60 |
| 54 | 355.10 | 78.60 | 72.50 | 49.70 | 44.40 | 29.40 | 27.50 | 92.50 | 91.30 |
| 55 | 364.80 | 81.30 | 76.00 | 52.20 | 47.00 | 30.60 | 27.00 | 99.80 | 97.20 |
| 56 | 356.70 | 78.30 | 69.80 | 49.20 | 43.10 | 30.20 | 26.10 | 94.00 | 90.90 |
| 57 | 372.15 | 83.00 | 78.60 | 51.30 | 47.80 | 29.00 | 26.20 | 99.20 | 97.60 |
| 58 | 353.80 | 84.60 | 73.45 | 49.40 | 41.00 | 32.40 | 28.90 | 86.30 | 84.00 |
| 59 | 337.95 | 67.80 | 62.50 | 52.00 | 45.70 | 28.90 | 25.45 | 87.80 | 84.50 |
| 60 | 339.70 | 78.80 | 76.25 | 44.00 | 41.30 | 28.90 | 26.85 | 90.80 | 89.70 |
| Eng. Mean | 354.38 | 78.09 | 72.91 | 48.81 | 44.27 | 30.34 | 27.64 | 93.73 | 91.97 |
| Metric Mean | 160.72 | 35.41 | 33.06 | 22.14 | 20.08 | 13.76 | 12.54 | 42.51 | 41.71 |

APPENDIX II A (Continued)

| Steer No. | Rt. Side Wt. | Wt. Untrmd. Round | Wt. Trmd. Round | Wt. Untrmd. Loin | Wt. Trmd. Loin | Wt. Untrmd. Rib | Wt. Trmd. Rib | Wt. Untrmd. Chuck | Wt. Trmd. Chuck |
|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | |
| 61 | 352.10 | 79.20 | 74.20 | 47.00 | 42.70 | 31.50 | 29.70 | 94.30 | 94.30 |
| 62 | 365.40 | 71.90 | 67.20 | 54.90 | 48.50 | 29.20 | 27.20 | 104.30 | 102.30 |
| 63 | 337.85 | 78.10 | 71.70 | 50.70 | 44.95 | 31.20 | 28.20 | 93.50 | 91.85 |
| 64 | 341.40 | 71.00 | 65.40 | 47.80 | 42.10 | 30.60 | 26.80 | 90.30 | 87.20 |
| 65 | 363.80 | 81.80 | 78.00 | 51.10 | 47.40 | 32.40 | 30.10 | 92.50 | 89.80 |
| 66 | 352.70 | 71.20 | 66.40 | 44.40 | 38.95 | 32.30 | 28.00 | 93.00 | 87.40 |
| 67 | 353.00 | 77.40 | 69.50 | 44.20 | 36.10 | 30.50 | 25.00 | 86.30 | 82.50 |
| 68 | 343.60 | 68.30 | 64.60 | 47.70 | 44.10 | 28.10 | 25.90 | 91.60 | 89.60 |
| 69 | 362.50 | 80.00 | 76.00 | 45.70 | 40.80 | 33.60 | 30.00 | 93.90 | 91.65 |
| 70 | 345.10 | 74.80 | 68.45 | 49.95 | 44.10 | 28.30 | 25.30 | 94.60 | 92.60 |
| Eng. Mean | 351.74 | 75.37 | 70.14 | 48.34 | 42.97 | 30.77 | 27.62 | 93.43 | 90.92 |
| Metric Mean | 159.52 | 34.18 | 31.81 | 21.92 | 19.49 | 13.95 | 12.53 | 42.37 | 41.23 |
| Group VIII 1.01-1.25" | | | | | | | | | |
| 71 | 351.40 | 77.10 | 70.70 | 47.50 | 39.70 | 28.60 | 25.60 | 89.90 | 87.40 |
| 72 | 369.90 | 77.80 | 71.40 | 57.00 | 47.50 | 35.10 | 32.00 | 98.00 | 96.00 |
| 73 | 365.70 | 74.00 | 66.50 | 49.70 | 42.20 | 32.90 | 29.20 | 94.60 | 90.60 |
| 74 | 365.25 | 80.20 | 74.00 | 49.30 | 44.00 | 33.00 | 28.60 | 97.40 | 93.40 |
| 75 | 352.75 | 76.50 | 70.75 | 45.60 | 39.70 | 31.50 | 27.40 | 94.00 | 92.25 |
| 76 | 346.60 | 78.30 | 69.00 | 60.20 | 50.20 | 24.80 | 22.50 | 87.90 | 85.90 |
| 77 | 380.75 | 81.40 | 77.00 | 49.80 | 45.40 | 32.25 | 28.50 | 98.10 | 95.60 |
| 78 | 340.20 | 72.40 | 66.00 | 48.60 | 43.40 | 32.10 | 29.00 | 91.45 | 89.40 |
| 79 | 358.15 | 78.40 | 70.70 | 50.70 | 43.90 | 29.50 | 25.30 | 88.00 | 85.20 |
| 80 | 335.35 | 65.70 | 59.60 | 55.30 | 47.60 | 33.80 | 28.75 | 84.60 | 80.10 |
| Eng. Mean | 356.60 | 76.18 | 69.96 | 51.37 | 44.36 | 31.36 | 27.68 | 92.40 | 89.58 |
| Metric Mean | 161.72 | 34.55 | 31.55 | 23.30 | 20.12 | 14.22 | 12.55 | 41.90 | 40.62 |

APPENDIX II A (Continued)

| Steer No. | Wt. Shank | Wt. Brisket | Wt. Plate | Wt. Flank | Wt. K.K. | Wt. of Intrmd. Lean Cuts | Wt. of Belly Cuts + K.K. | Trmd. Lean Cuts | Ext. Fat Trim |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 11.20 | 16.40 | 22.30 | 16.80 | 08.30 | 184.50 | 75.00 | 182.20 | 2.30 |
| 2 | 10.20 | 14.60 | 24.20 | 21.50 | 10.20 | 180.10 | 80.70 | 174.05 | 5.95 |
| 3 | 08.05 | 10.70 | 21.90 | 19.00 | 10.60 | 190.50 | 70.25 | 189.10 | 1.40 |
| 4 | 09.70 | 11.00 | 17.90 | 18.30 | 06.70 | 189.40 | 63.60 | 185.75 | 3.65 |
| 5 | 08.20 | 10.90 | 20.70 | 21.70 | 09.00 | 189.40 | 70.50 | 185.50 | 3.90 |
| 6 | 09.40 | 11.10 | 17.50 | 17.40 | 05.80 | 195.00 | 61.20 | 193.50 | 1.50 |
| 7 | 09.60 | 11.20 | 21.30 | 18.80 | 09.50 | 176.60 | 70.40 | 176.20 | 0.40 |
| 8 | 12.70 | 12.70 | 20.50 | 15.10 | 07.50 | 196.40 | 68.50 | 195.10 | 1.30 |
| 9 | 11.30 | 11.30 | 19.40 | 15.40 | 04.55 | 198.35 | 61.95 | 193.70 | 4.65 |
| 10 | 08.40 | 12.80 | 18.40 | 17.60 | 06.00 | 189.70 | 63.20 | 188.30 | 1.40 |
| Eng. Mean | 9.88 | 12.27 | 20.41 | 18.18 | 7.82 | 189.00 | 68.50 | 186.30 | 2.64 |
| Met. Mean | 4.48 | 5.56 | 9.26 | 8.24 | 3.55 | 85.71 | 31.06 | 84.48 | 1.20 |
| Group II .51-.75" | | | | | | | | | |
| 11 | 08.40 | 14.30 | 24.40 | 18.70 | 11.20 | 186.70 | 77.00 | 181.10 | 5.60 |
| 12 | 08.50 | 13.80 | 24.40 | 20.20 | 07.00 | 184.90 | 73.90 | 175.45 | 9.45 |
| 13 | 07.10 | 10.80 | 22.50 | 22.70 | 13.90 | 190.10 | 77.00 | 184.10 | 6.00 |
| 14 | 08.00 | 12.80 | 20.50 | 22.50 | 10.00 | 193.50 | 73.80 | 188.40 | 5.10 |
| 15 | 10.60 | 12.30 | 20.50 | 26.80 | 10.60 | 179.90 | 80.80 | 173.60 | 6.30 |
| 16 | 10.10 | 14.00 | 25.20 | 16.10 | 13.20 | 195.10 | 78.60 | 194.00 | 1.10 |
| 17 | 08.90 | 12.00 | 24.50 | 22.90 | 14.60 | 176.20 | 82.90 | 174.20 | 2.00 |
| 18 | 10.00 | 12.20 | 23.10 | 22.40 | 13.60 | 189.40 | 81.30 | 187.50 | 1.90 |
| 19 | 06.30 | 11.20 | 21.90 | 20.15 | 14.60 | 190.90 | 74.15 | 182.80 | 8.10 |
| 20 | 10.80 | 12.80 | 20.00 | 17.25 | 07.30 | 181.70 | 68.15 | 178.50 | 3.20 |
| Eng. Mean | 8.87 | 12.62 | 22.70 | 20.97 | 11.60 | 188.64 | 76.76 | 181.96 | 4.68 |
| Met. Mean | 4.02 | 5.72 | 10.29 | 9.51 | 5.26 | 84.73 | 34.81 | 82.52 | 2.21 |
| Group III .76-1.00" | | | | | | | | | |
| 21 | 08.70 | 12.20 | 23.10 | 27.00 | 10.50 | 195.20 | 81.50 | 179.00 | 04.60 |
| 22 | 12.30 | 16.10 | 21.80 | 23.40 | 12.20 | 186.10 | 85.80 | 172.40 | 13.70 |
| 23 | 08.30 | 15.80 | 23.30 | 18.70 | 11.20 | 193.50 | 77.30 | 179.70 | 03.80 |
| 24 | 08.60 | 09.50 | 22.90 | 22.60 | 10.05 | 198.50 | 71.65 | 187.10 | 11.40 |
| 25 | 07.30 | 11.70 | 22.30 | 27.20 | 10.35 | 186.70 | 78.95 | 177.90 | 08.80 |
| 26 | 08.00 | 13.30 | 20.60 | 21.40 | 11.70 | 188.50 | 75.00 | 182.20 | 06.30 |
| 27 | 08.50 | 17.00 | 23.85 | 24.20 | 14.90 | 181.95 | 88.45 | 165.60 | 16.35 |
| 28 | 07.40 | 11.20 | 19.70 | 23.40 | 13.30 | 188.90 | 75.00 | 180.30 | 08.60 |
| 29 | 06.70 | 09.20 | 21.70 | 22.00 | 11.50 | 191.45 | 71.10 | 180.25 | 10.85 |
| 30 | 07.20 | 11.10 | 21.90 | 24.90 | 10.50 | 190.00 | 78.50 | 177.05 | 12.95 |
| Eng. Mean | 08.10 | 12.71 | 22.40 | 23.48 | 11.62 | 189.10 | 78.30 | 178.30 | 05.70 |
| Met. Mean | 3.67 | 5.76 | 10.16 | 10.65 | 5.27 | 85.75 | 35.51 | 80.91 | 4.40 |

APPENDIX II A (Continued)

| Steer No. | Wt. Chuck | Wt. Brisket | Wt. Plate | Wt. Flank | Wt. K.K. | Wt. of Untrmd. Lean Cuts | Wt. of Belly Cuts + K.K. | Trmd. Lean Cuts | Ext. Fat Trim |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 7.90 | 14.10 | 23.70 | 26.70 | 14.80 | 189.90 | 87.20 | 174.50 | 15.40 |
| 32 | 7.20 | 16.20 | 25.10 | 20.80 | 13.10 | 187.40 | 82.40 | 173.70 | 13.70 |
| 33 | 7.20 | 13.00 | 27.25 | 21.80 | 12.65 | 195.10 | 81.90 | 184.65 | 09.50 |
| 34 | 7.60 | 08.50 | 23.80 | 23.40 | 12.50 | 192.85 | 75.80 | 179.35 | 13.40 |
| 35 | 7.70 | 14.35 | 21.10 | 19.40 | 09.80 | 184.20 | 72.35 | 161.45 | 22.50 |
| 36 | 6.80 | 14.50 | 21.40 | 22.90 | 10.20 | 190.00 | 75.80 | 168.60 | 21.40 |
| 37 | 7.80 | 17.30 | 23.40 | 20.00 | 13.70 | 190.40 | 82.20 | 171.70 | 19.60 |
| 38 | 7.05 | 15.95 | 18.00 | 24.35 | 09.00 | 170.00 | 74.35 | 152.60 | 17.25 |
| 39 | 8.00 | 12.40 | 20.70 | 23.60 | 12.60 | 188.10 | 77.30 | 174.70 | 13.30 |
| 40 | 7.00 | 11.80 | 19.20 | 20.20 | 09.60 | 184.20 | 67.80 | 170.50 | 13.70 |
| Eng. Mean | 7.42 | 13.81 | 22.36 | 22.32 | 11.80 | 187.21 | 77.71 | 171.15 | 15.88 |
| Met. Mean | 3.36 | 6.26 | 10.14 | 10.12 | 5.35 | 84.90 | 35.24 | 77.63 | 7.20 |
| Group V .26-.50" | | | | | | | | | |
| 41 | 11.90 | 18.50 | 37.60 | 31.00 | 12.80 | 252.80 | 111.80 | 241.10 | 11.70 |
| 42 | 10.00 | 13.60 | 32.80 | 27.20 | 16.80 | 257.30 | 100.40 | 247.00 | 10.10 |
| 43 | 10.70 | 18.50 | 33.90 | 25.40 | 07.40 | 259.10 | 095.90 | 253.70 | 05.40 |
| 44 | 10.80 | 17.20 | 29.20 | 26.80 | 15.50 | 244.80 | 099.50 | 235.20 | 09.60 |
| 45 | 10.60 | 20.70 | 29.20 | 26.80 | 09.20 | 241.00 | 096.50 | 225.05 | 15.75 |
| 46 | 10.35 | 12.40 | 31.30 | 25.20 | 14.10 | 246.10 | 093.35 | 234.20 | 11.90 |
| 47 | 11.00 | 17.30 | 27.90 | 25.30 | 13.30 | 240.40 | 094.80 | 228.00 | 12.30 |
| 48 | 10.60 | 16.10 | 27.00 | 23.10 | 09.40 | 250.20 | 086.20 | 244.20 | 06.00 |
| 49 | 10.80 | 18.20 | 31.10 | 24.80 | 10.80 | 250.10 | 095.70 | 237.45 | 12.65 |
| 50 | 11.30 | 12.60 | 29.50 | 23.10 | 12.60 | 255.80 | 089.10 | 245.80 | 09.90 |
| Eng. Mean | 10.80 | 16.51 | 30.95 | 25.97 | 12.19 | 249.76 | 096.32 | 239.17 | 10.53 |
| Met. Mean | 4.90 | 7.49 | 14.04 | 11.73 | 5.53 | 113.27 | 43.68 | 108.47 | 4.78 |
| Group VI .51-.75" | | | | | | | | | |
| 51 | 11.60 | 16.40 | 29.60 | 27.70 | 11.80 | 266.30 | 097.10 | 258.00 | 08.30 |
| 52 | 10.80 | 18.60 | 33.00 | 27.40 | 19.60 | 242.90 | 109.40 | 233.60 | 09.30 |
| 53 | 10.80 | 17.40 | 33.00 | 25.60 | 20.60 | 240.50 | 107.40 | 233.70 | 06.80 |
| 54 | 10.90 | 18.00 | 29.20 | 31.00 | 15.80 | 250.20 | 104.90 | 235.70 | 14.50 |
| 55 | 11.40 | 19.70 | 31.80 | 27.00 | 11.00 | 263.90 | 100.90 | 247.20 | 16.40 |
| 56 | 10.80 | 18.95 | 29.25 | 28.75 | 17.35 | 251.70 | 087.65 | 229.90 | 21.80 |
| 57 | 12.35 | 18.80 | 31.00 | 26.00 | 21.50 | 262.50 | 109.65 | 250.20 | 11.70 |
| 58 | 11.20 | 16.00 | 30.40 | 29.40 | 14.10 | 252.70 | 101.10 | 227.35 | 25.35 |
| 59 | 09.15 | 14.30 | 33.20 | 31.00 | 13.80 | 236.50 | 101.45 | 218.15 | 18.05 |
| 60 | 11.25 | 20.15 | 27.20 | 27.90 | 10.70 | 242.50 | 097.20 | 234.10 | 08.40 |
| Eng. Mean | 11.02 | 17.82 | 30.76 | 28.18 | 15.62 | 250.97 | 101.68 | 236.79 | 14.06 |
| Met. Mean | 5.00 | 8.08 | 13.95 | 12.78 | 7.08 | 113.82 | 46.11 | 107.39 | 6.38 |

APPENDIX II A (Continued)

| Steer No. | Wt. Shank | Wt. Brisket | Wt. Plate | Wt. Flank | Wt. K.K. | Wt. of Untrmd Lean Cuts | Wt. of Belly Cuts + K.K. | Trmd. Lean Cuts | Ext. Fat Trim |
|---|---|---|---|---|---|---|---|---|---|
| Group VII | | | | | | | | | |
| 61 | 10.40 | 16.50 | 33.60 | 26.90 | 12.70 | 252.00 | 100.10 | 240.90 | 11.10 |
| 62 | 08.70 | 14.30 | 30.50 | 37.80 | 13.80 | 260.30 | 105.10 | 245.20 | 15.10 |
| 63 | 09.80 | 12.60 | 26.70 | 25.75 | 09.50 | 253.50 | 084.35 | 236.70 | 16.70 |
| 64 | 10.80 | 15.40 | 30.90 | 31.35 | 13.25 | 239.70 | 101.70 | 221.50 | 18.20 |
| 65 | 13.30 | 18.20 | 36.40 | 25.90 | 12.20 | 257.80 | 106.00 | 245.30 | 12.50 |
| 66 | 10.70 | 18.60 | 33.60 | 33.60 | 15.30 | 240.90 | 111.80 | 220.75 | 20.15 |
| 67 | 09.60 | 20.50 | 31.90 | 33.60 | 19.00 | 238.40 | 114.60 | 213.10 | 25.30 |
| 68 | 10.40 | 15.30 | 31.50 | 27.10 | 23.60 | 235.70 | 107.90 | 224.20 | 11.50 |
| 69 | 10.30 | 17.40 | 36.00 | 31.00 | 14.60 | 253.20 | 109.30 | 238.45 | 14.75 |
| 70 | 10.00 | 14.60 | 30.50 | 26.85 | 15.50 | 247.65 | 097.45 | 230.45 | 17.05 |
| Eng. Mean | 10.40 | 16.34 | 32.16 | 29.98 | 14.95 | 247.92 | 103.83 | 231.66 | 16.24 |
| Met. Mean | 4.72 | 7.41 | 14.58 | 13.60 | 6.78 | 112.44 | 47.09 | 105.06 | 7.36 |
| Group VIII 1.01-1.25 | | | | | | | | | |
| 71 | 12.00 | 18.00 | 30.00 | 35.50 | 12.80 | 243.10 | 108.30 | 223.40 | 19.60 |
| 72 | 09.40 | 13.70 | 35.60 | 27.50 | 15.80 | 267.90 | 102.00 | 246.90 | 21.00 |
| 73 | 08.80 | 15.70 | 32.80 | 39.50 | 17.70 | 251.20 | 114.50 | 228.50 | 22.70 |
| 74 | 10.40 | 16.85 | 34.20 | 30.60 | 13.30 | 259.90 | 105.35 | 240.00 | 19.85 |
| 75 | 10.95 | 16.40 | 34.35 | 31.25 | 12.60 | 247.60 | 105.15 | 230.10 | 17.35 |
| 76 | 10.20 | 14.70 | 28.80 | 29.90 | 14.80 | 251.20 | 098.40 | 227.60 | 23.20 |
| 77 | 14.80 | 22.00 | 32.00 | 33.30 | 17.10 | 261.55 | 119.20 | 246.50 | 14.55 |
| 78 | 10.65 | 15.25 | 27.65 | 26.90 | 15.20 | 244.55 | 095.65 | 227.80 | 16.65 |
| 79 | 10.85 | 19.70 | 33.30 | 31.10 | 16.60 | 246.60 | 111.55 | 225.10 | 21.40 |
| 80 | 10.70 | 16.20 | 28.00 | 28.20 | 12.85 | 239.40 | 095.95 | 216.05 | 22.95 |
| Eng. Mean | 10.84 | 16.85 | 31.67 | 31.38 | 14.88 | 251.30 | 105.60 | 231.20 | 19.92 |
| Met. Mean | 4.92 | 7.64 | 14.36 | 14.23 | 6.75 | 113.97 | 47.89 | 104.85 | 9.03 |

## APPENDIX II B RETAIL CUTOUT - RIGHT SIDE

| Steer No. | Round Yield | Fat Round | Bone Round | Loin Yield | Fat Loin | Bone Loin | Rib Yield | Fat Rib | Bone Rib | Chuck Yield | Fat Chuck | Bone Chuck | Shank Yield | Fat Shank | Bone Shank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | | | | | | | |
| 1 | 51.00 | 0.80 | 09.90 | 27.60 | 3.30 | 3.30 | 17.60 | 0.20 | 4.30 | 52.00 | 2.80 | 09.40 | 6.90 | 0.00 | 4.10 |
| 2 | 44.00 | 3.80 | 11.20 | 25.00 | 2.50 | 6.30 | 14.15 | 0.10 | 4.10 | 48.20 | 4.40 | 10.40 | 5.80 | 0.20 | 4.20 |
| 3 | 48.70 | 1.70 | 08.10 | 28.75 | 2.00 | 4.30 | 20.70 | 0.30 | 4.35 | 57.80 | 3.40 | 08.80 | 5.00 | 0.00 | 2.90 |
| 4 | 48.50 | 2.70 | 10.05 | 29.45 | 1.10 | 6.10 | 15.90 | 0.60 | 4.50 | 50.15 | 4.80 | 09.70 | 5.10 | 0.55 | 3.80 |
| 5 | 47.90 | 1.70 | 09.50 | 26.40 | 1.20 | 6.00 | 18.20 | 1.00 | 4.50 | 53.60 | 5.60 | 09.80 | 4.10 | 0.70 | 3.25 |
| 6 | 50.20 | 1.50 | 10.50 | 26.20 | 1.40 | 4.70 | 17.30 | 0.30 | 4.30 | 62.70 | 3.10 | 10.60 | 5.30 | 0.30 | 3.80 |
| 7 | 44.00 | 1.60 | 09.40 | 29.00 | 1.60 | 6.90 | 15.80 | 0.50 | 3.80 | 50.80 | 2.20 | 09.90 | 6.10 | 0.00 | 3.50 |
| 8 | 50.80 | 4.60 | 10.30 | 31.00 | 2.60 | 5.50 | 17.50 | 0.40 | 4.40 | 52.80 | 5.70 | 09.50 | 8.00 | 0.50 | 4.20 |
| 9 | 51.90 | 2.00 | 10.90 | 27.40 | 3.40 | 4.10 | 14.50 | 2.30 | 3.50 | 55.20 | 5.50 | 10.60 | 7.10 | 1.00 | 3.20 |
| 10 | 45.60 | 2.80 | 09.80 | 29.00 | 3.80 | 4.80 | 16.60 | 0.80 | 4.00 | 53.90 | 6.40 | 10.10 | 4.00 | 1.00 | 3.30 |
| Eng. Mean | 48.26 | 2.32 | 09.98 | 27.90 | 2.29 | 5.20 | 16.62 | 0.65 | 4.18 | 53.72 | 4.39 | 09.88 | 5.74 | 0.42 | 3.62 |
| Metric Mean | 21.89 | 1.05 | 04.52 | 12.69 | 1.04 | 2.36 | 07.63 | 0.29 | 1.90 | 02.44 | 1.99 | 04.48 | 2.60 | 0.19 | 1.64 |
| Group II .51-.75" | | | | | | | | | | | | | | | |
| 11 | 43.95 | 1.80 | 08.85 | 26.20 | 4.60 | 4.50 | 18.60 | 2.60 | 5.10 | 50.00 | 4.85 | 09.20 | 4.40 | 0.50 | 3.35 |
| 12 | 45.40 | 2.70 | 08.20 | 26.70 | 2.55 | 4.80 | 16.30 | 1.40 | 3.70 | 48.90 | 6.50 | 07.80 | 4.45 | 1.00 | 2.90 |
| 13 | 43.15 | 2.75 | 08.20 | 27.00 | 4.00 | 4.25 | 16.70 | 3.10 | 4.00 | 54.50 | 7.20 | 09.00 | 3.85 | 0.30 | 2.80 |
| 14 | 44.30 | 3.80 | 09.30 | 26.50 | 3.40 | 5.20 | 18.50 | 1.65 | 4.00 | 53.50 | 6.85 | 10.50 | 3.90 | 0.60 | 3.25 |
| 15 | 42.40 | 2.50 | 07.10 | 30.80 | 2.20 | 6.20 | 14.60 | 0.50 | 3.30 | 50.80 | 4.20 | 09.30 | 7.00 | 0.30 | 3.60 |
| 16 | 46.60 | 3.90 | 08.60 | 31.10 | 1.40 | 6.20 | 18.40 | 0.90 | 4.70 | 55.70 | 5.00 | 11.50 | 6.40 | 0.00 | 3.60 |
| 17 | 44.50 | 1.20 | 10.80 | 27.10 | 3.80 | 5.00 | 15.00 | 1.00 | 2.90 | 50.60 | 4.60 | 07.70 | 5.40 | 0.00 | 3.50 |
| 18 | 47.80 | 2.20 | 10.70 | 34.60 | 1.50 | 5.90 | 17.50 | 0.80 | 3.80 | 49.90 | 2.80 | 09.60 | 6.20 | 0.00 | 3.70 |
| 19 | 43.50 | 3.00 | 08.30 | 22.80 | 2.80 | 3.70 | 19.00 | 1.30 | 3.30 | 58.20 | 5.65 | 09.40 | 3.00 | 0.40 | 2.80 |
| 20 | 44.45 | 3.30 | 09.75 | 27.80 | 2.20 | 5.40 | 16.00 | 0.50 | 4.60 | 50.40 | 3.20 | 10.50 | 6.60 | 0.30 | 3.70 |
| Eng. Mean | 44.50 | 2.72 | 08.98 | 28.08 | 2.74 | 5.12 | 17.06 | 1.35 | 3.94 | 52.25 | 5.02 | 09.92 | 5.12 | 0.34 | 3.32 |
| Metric Mean | 20.18 | 1.23 | 04.07 | 12.73 | 1.24 | 2.32 | 07.74 | 0.62 | 1.79 | 23.70 | 2.28 | 04.23 | 2.32 | 0.15 | 1.50 |
| Group III .76-1.00" | | | | | | | | | | | | | | | |
| 21 | 46.60 | 2.30 | 8.30 | 32.60 | 2.90 | 5.70 | 19.00 | 0.40 | 4.00 | 55.10 | 05.70 | 7.70 | 5.60 | 0.00 | 3.00 |
| 22 | 41.90 | 2.20 | 8.80 | 28.90 | 0.80 | 5.20 | 16.80 | 0.70 | 4.90 | 47.70 | 05.20 | 9.30 | 7.70 | 1.00 | 3.60 |
| 23 | 43.00 | 1.50 | 9.10 | 29.20 | 1.50 | 5.40 | 19.80 | 0.00 | 5.20 | 48.50 | 07.20 | 9.00 | 4.80 | 0.00 | 3.50 |
| 24 | 44.60 | 3.60 | 7.80 | 24.45 | 1.05 | 4.60 | 17.80 | 2.20 | 4.20 | 58.90 | 08.40 | 9.60 | 2.50 | 1.70 | 2.40 |
| 25 | 42.20 | 3.10 | 7.95 | 27.40 | 2.20 | 4.05 | 16.20 | 2.40 | 3.50 | 53.20 | 06.10 | 7.40 | 3.50 | 0.80 | 2.80 |
| 26 | 43.10 | 2.85 | 8.20 | 29.30 | 3.20 | 4.00 | 16.00 | 3.10 | 2.00 | 53.40 | 06.80 | 9.50 | 3.50 | 1.90 | 2.60 |
| 27 | 37.80 | 3.80 | 7.60 | 28.40 | 4.70 | 4.20 | 14.20 | 4.85 | 3.55 | 42.50 | 12.30 | 7.60 | 4.10 | 1.50 | 2.90 |
| 28 | 41.10 | 2.80 | 7,10 | 28.80 | 3.30 | 3.90 | 18.85 | 2.60 | 3.40 | 50.30 | 09.30 | 7.80 | 3.70 | 1.00 | 2.60 |
| 29 | 39.40 | 4.60 | 8.20 | 25.60 | 4.20 | 4.40 | 14.05 | 2.10 | 3.85 | 52.10 | 11.65 | 9.60 | 3.10 | 0.95 | 2.60 |
| 30 | 40.90 | 3.35 | 8.35 | 26.00 | 3.35 | 4.70 | 15.10 | 2.55 | 4.00 | 49.60 | 10.20 | 8.70 | 3.45 | 0.85 | 2.90 |
| Eng. Mean | 42.36 | 3.13 | 8.14 | 27.48 | 2.72 | 4.82 | 16.78 | 2.09 | 3.76 | 51.13 | 08.28 | 8.32 | 4.23 | 0.97 | 2.89 |
| Metric Mean | 19.07 | 1.36 | 3.69 | 12.45 | 1.23 | 2.10 | 07.61 | 0.95 | 1.75 | 23.19 | 3.76 | 3.91 | 1.90 | 0.44 | 1.31 |

| Steer No. | Round Yield | Fat Round | Bone Round | Loin Yield | Fat Loin | Bone Loin | Rib Yield | Fat Rib | Bone Rib | Chuck Yield | Fat Chuck | Bone Chuck | Shank Yield | Fat Shank | Bone Shank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | | | | | | | |
| 31 | 42.70 | 2.60 | 8.00 | 24.70 | 4.50 | 4.35 | 18.40 | 0.90 | 3.30 | 47.30 | 09.70 | 7.80 | 3.80 | 0.90 | 3.00 |
| 32 | 40.70 | 4.00 | 7.00 | 25.70 | 2.85 | 3.95 | 17.00 | 2.80 | 3.40 | 48.60 | 09.30 | 7.50 | 3.40 | 1.20 | 2.60 |
| 33 | 43.20 | 1.70 | 7.50 | 28.80 | 3.40 | 4.25 | 18.55 | 3.35 | 3.40 | 53.40 | 08.65 | 8.20 | 3.40 | 0.80 | 2.60 |
| 34 | 36.70 | 4.65 | 7.80 | 26.70 | 4.00 | 5.00 | 15.20 | 3.00 | 4.15 | 53.50 | 08.70 | 9.30 | 3.80 | 0.80 | 2.95 |
| 35 | 32.10 | 4.90 | 7.25 | 24.90 | 2.75 | 6.05 | 13.90 | 3.30 | 4.55 | 46.00 | 06.60 | 8.60 | 3.35 | 1.60 | 2.70 |
| 36 | 38.40 | 3.40 | 7.35 | 25.60 | 3.90 | 3.70 | 13.20 | 4.80 | 2.70 | 47.50 | 10.70 | 7.20 | 3.10 | 1.20 | 2.40 |
| 37 | 39.45 | 4.90 | 7.00 | 24.30 | 3.50 | 3.60 | 13.00 | 4.60 | 4.20 | 48.70 | 11.25 | 7.05 | 3.50 | 1.50 | 2.70 |
| 38 | 37.40 | 2.30 | 7.90 | 22.00 | 0.50 | 4.70 | 13.35 | 1.75 | 3.60 | 42.90 | 07.90 | 8.20 | 3.30 | 0.90 | 2.85 |
| 39 | 39.80 | 5.40 | 8.50 | 24.80 | 3.00 | 3.90 | 14.70 | 2.70 | 3.80 | 49.10 | 10.20 | 8.40 | 3.70 | 1.20 | 3.00 |
| 40 | 38.10 | 3.90 | 8.30 | 24.20 | 3.10 | 4.50 | 15.00 | 2.50 | 3.70 | 49.00 | 08.70 | 8.40 | 3.10 | 1.00 | 2.70 |
| Eng. Mean | 38.96 | 3.78 | 7.66 | 25.17 | 3.15 | 4.40 | 15.23 | 2.97 | 3.68 | 48.60 | 09.17 | 8.06 | 3.44 | 1.10 | 2.77 |
| Metric Mean | 17.67 | 1.71 | 3.47 | 11.41 | 1.43 | 2.00 | 06.91 | 1.35 | 1.67 | 22.04 | 4.16 | 3.66 | 1.56 | 0.50 | 1.26 |
| Group V .26-.50" | | | | | | | | | | | | | | | |
| 41 | 53.30 | 2.80 | 12.50 | 34.40 | 2.20 | 8.30 | 22.20 | 2.05 | 5.90 | 72.60 | 09.30 | 14.40 | 6.10 | 0.50 | 5.10 |
| 42 | 56.20 | 3.00 | 11.80 | 36.50 | 2.30 | 7.80 | 24.60 | 0.60 | 5.90 | 74.80 | 08.90 | 13.00 | 5.00 | 0.70 | 4.30 |
| 43 | 63.10 | 1.90 | 12.50 | 40.00 | 2.50 | 7.10 | 24.70 | 0.30 | 5.70 | 77.50 | 04.00 | 13.10 | 5.90 | 0.30 | 4.50 |
| 44 | 57.60 | 2.10 | 13.40 | 36.00 | 3.10 | 6.00 | 20.20 | 3.20 | 5.20 | 62.00 | 12.70 | 12.10 | 5.10 | 0.90 | 4.40 |
| 45 | 56.15 | 3.00 | 12.30 | 32.90 | 4.20 | 6.10 | 19.15 | 2.70 | 5.05 | 60.70 | 10.65 | 11.50 | 5.00 | 1.50 | 4.10 |
| 46 | 56.10 | 6.10 | 11.90 | 34.80 | 3.90 | 7.00 | 21.60 | 3.80 | 6.20 | 61.10 | 09.80 | 11.40 | 5.00 | 1.20 | 4.10 |
| 47 | 53.30 | 4.80 | 12.50 | 32.30 | 3.00 | 7.20 | 19.00 | 2.60 | 5.60 | 65.70 | 09.20 | 12.40 | 5.50 | 1.10 | 4.40 |
| 48 | 61.50 | 3.80 | 13.90 | 34.55 | 2.40 | 7.55 | 18.80 | 2.85 | 5.50 | 69.15 | 08.30 | 14.30 | 5.40 | 0.80 | 4.40 |
| 49 | 56.25 | 5.00 | 11.80 | 32.90 | 3.50 | 6.30 | 19.00 | 3.20 | 5.55 | 69.80 | 09.80 | 13.00 | 5.30 | 1.40 | 4.10 |
| 50 | 58.00 | 5.10 | 12.30 | 32.90 | 4.00 | 6.50 | 20.10 | 2.20 | 5.60 | 73.50 | 10.00 | 15.30 | 5.30 | 1.40 | 4.60 |
| Eng. Mean | 57.15 | 3.76 | 12.49 | 34.72 | 3.11 | 6.98 | 20.94 | 2.35 | 5.62 | 68.68 | 09.26 | 13.05 | 5.36 | 0.98 | 4.40 |
| Metric Mean | 25.92 | 1.70 | 5.66 | 15.75 | 1.41 | 3.16 | 9.50 | 1.06 | 2.55 | 31.15 | 4.20 | 5.92 | 2.43 | 0.44 | 2.00 |
| Group VI .51-.75" | | | | | | | | | | | | | | | |
| 51 | 58.30 | 5.85 | 12.30 | 40.00 | 3.80 | 6.75 | 22.40 | 2.90 | 5.40 | 78.20 | 07.60 | 14.00 | 6.20 | 0.70 | 4.50 |
| 52 | 58.50 | 1.90 | 11.10 | 33.90 | 1.20 | 6.70 | 22.10 | 1.80 | 5.20 | 68.00 | 09.95 | 12.50 | 5.60 | 1.10 | 4.05 |
| 53 | 58.00 | 2.00 | 11.09 | 32.20 | 1.00 | 6.50 | 21.30 | 2.20 | 5.00 | 71.40 | 10.40 | 11.70 | 5.90 | 0.40 | 4.30 |
| 54 | 57.25 | 2.60 | 12.40 | 35.70 | 2.10 | 6.60 | 19.70 | 2.10 | 5.10 | 66.00 | 11.90 | 12.30 | 5.35 | 1.10 | 4.40 |
| 55 | 59.70 | 1.10 | 14.60 | 36.50 | 1.90 | 7.20 | 20.30 | 0.90 | 5.00 | 72.65 | 11.50 | 12.50 | 5.50 | 1.20 | 4.60 |
| 56 | 53.40 | 4.85 | 11.55 | 32.10 | 4.60 | 6.40 | 18.00 | 3.10 | 5.00 | 65.55 | 13.00 | 12.20 | 5.55 | 1.05 | 4.15 |
| 57 | 59.15 | 4.60 | 14.70 | 34.30 | 5.20 | 7.80 | 17.90 | 2.20 | 6.00 | 72.40 | 09.60 | 15.40 | 5.85 | 1.25 | 4.95 |
| 58 | 55.80 | 5.00 | 12.00 | 29.10 | 4.60 | 7.00 | 20.40 | 3.15 | 5.10 | 60.40 | 11.95 | 11.30 | 5.20 | 2.00 | 4.00 |
| 59 | 47.40 | 5.90 | 09.20 | 35.90 | 3.50 | 6.10 | 17.00 | 3.85 | 4.50 | 62.00 | 12.00 | 10.50 | 4.30 | 1.70 | 3.10 |
| 60 | 59.40 | 5.15 | 11.70 | 31.50 | 2.90 | 6.85 | 18.30 | 2.80 | 5.60 | 70.40 | 07.00 | 11.90 | 5.70 | 1.10 | 4.30 |
| Eng. Mean | 56.69 | 3.90 | 12.14 | 34.12 | 3.08 | 6.79 | 19.74 | 2.55 | 5.19 | 68.70 | 10.49 | 12.43 | 5.52 | 1.16 | 4.24 |
| Metric Mean | 25.71 | 1.77 | 5.50 | 15.47 | 1.40 | 3.08 | 8.95 | 1.13 | 2.35 | 31.16 | 4.76 | 5.64 | 2.50 | 0.52 | 1.92 |

APPENDIX II B (Continued)

| Steer No. | Round Yield | Fat Round | Bone Round | Loin Yield | Fat Loin | Bone Loin | Rib Yield | Fat Rib | Bone Rib | Chuck Yield | Fat Chuck | Bone Chuck | Shank Yield | Fat Shank | Bone Shank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | | | | | | | |
| 61 | 59.50 | 3.00 | 11.60 | 32.50 | 3.50 | 6.70 | 22.40 | 2.30 | 4.90 | 71.80 | 10.60 | 11.45 | 4.80 | 1.20 | 4.30 |
| 62 | 53.00 | 3.90 | 09.90 | 37.30 | 4.45 | 6.05 | 20.60 | 2.50 | 3.80 | 73.40 | 16.60 | 12.00 | 4.20 | 0.70 | 3.50 |
| 63 | 54.60 | 5.90 | 11.20 | 34.95 | 3.45 | 6.55 | 19.40 | 3.40 | 5.40 | 69.55 | 10.75 | 11.70 | 4.25 | 1.50 | 3.80 |
| 64 | 51.60 | 3.00 | 10.80 | 32.00 | 4.00 | 6.10 | 18.30 | 3.85 | 4.55 | 61.85 | 14.65 | 10.70 | 6.10 | 0.30 | 4.40 |
| 65 | 61.90 | 4.00 | 12.00 | 37.90 | 1.70 | 7.80 | 23.40 | 1.40 | 5.30 | 68.20 | 08.20 | 13.35 | 7.40 | 1.00 | 4.90 |
| 66 | 52.20 | 4.30 | 09.30 | 30.80 | 3.20 | 4.30 | 19.70 | 4.00 | 3.70 | 64.10 | 13.10 | 09.70 | 5.20 | 1.60 | 3.60 |
| 67 | 56.40 | 3.80 | 09.30 | 29.10 | 2.20 | 4.10 | 17.25 | 3.40 | 4.00 | 60.70 | 12.10 | 09.30 | 5.60 | 0.20 | 3.60 |
| 68 | 49.50 | 2.70 | 12.10 | 35.40 | 1.40 | 6.70 | 19.80 | 1.20 | 4.60 | 67.00 | 10.40 | 12.20 | 4.60 | 1.10 | 4.50 |
| 69 | 58.60 | 5.05 | 12.35 | 31.80 | 3.00 | 6.00 | 21.70 | 3.20 | 5.10 | 69.00 | 09.85 | 12.00 | 4.60 | 1.00 | 4.40 |
| 70 | 50.40 | 7.00 | 10.60 | 32.60 | 4.25 | 6.90 | 17.70 | 2.00 | 5.20 | 66.90 | 12.65 | 12.30 | 4.80 | 1.15 | 3.95 |
| Eng. Mean | 54.77 | 4.26 | 10.92 | 33.44 | 3.12 | 6.12 | 20.02 | 2.72 | 4.66 | 67.25 | 11.99 | 11.47 | 5.16 | 0.98 | 4.10 |
| Metric Mean | 24.84 | 1.93 | 4.95 | 15.16 | 1.41 | 2.78 | 9.08 | 1.23 | 2.11 | 30.50 | 5.39 | 5.20 | 2.34 | 0.44 | 1.86 |
| Group VIII 1.01-1.25" | | | | | | | | | | | | | | | |
| 71 | 58.20 | 1.80 | 10.70 | 33.30 | 0.70 | 5.70 | 19.40 | 1.80 | 4.40 | 65.60 | 11.00 | 10.80 | 7.10 | 0.90 | 4.00 |
| 72 | 54.30 | 5.65 | 10.80 | 36.70 | 4.20 | 6.60 | 23.40 | 2.50 | 5.00 | 77.60 | 07.85 | 10.30 | 5.80 | 0.20 | 3.25 |
| 73 | 52.60 | 2.80 | 11.00 | 31.70 | 4.80 | 5.70 | 21.60 | 3.30 | 4.25 | 67.80 | 11.40 | 10.90 | 3.90 | 1.25 | 3.65 |
| 74 | 58.70 | 2.95 | 12.30 | 34.90 | 1.90 | 7.20 | 19.25 | 2.70 | 6.25 | 71.50 | 08.20 | 13.30 | 5.20 | 0.40 | 4.70 |
| 75 | 54.15 | 4.60 | 10.80 | 29.40 | 4.20 | 5.95 | 18.55 | 3.75 | 5.00 | 66.50 | 13.60 | 12.00 | 4.95 | 1.20 | 4.25 |
| 76 | 54.80 | 2.60 | 11.50 | 39.80 | 3.20 | 7.20 | 16.30 | 2.20 | 4.00 | 68.20 | 07.40 | 10.20 | 5.00 | 0.90 | 4.05 |
| 77 | 60.80 | 3.70 | 12.40 | 36.00 | 1.40 | 7.70 | 21.40 | 2.20 | 4.80 | 74.60 | 07.50 | 13.50 | 7.20 | 1.60 | 5.20 |
| 78 | 49.40 | 6.00 | 10.50 | 33.60 | 4.00 | 5.70 | 19.20 | 4.65 | 5.15 | 64.10 | 14.40 | 10.60 | 4.85 | 1.70 | 4.10 |
| 79 | 53.30 | 4.90 | 12.50 | 33.50 | 3.40 | 6.80 | 17.10 | 2.60 | 5.30 | 60.20 | 12.50 | 12.50 | 4.90 | 1.70 | 4.25 |
| 80 | 44.30 | 5.60 | 09.70 | 36.50 | 4.05 | 6.70 | 19.30 | 4.10 | 5.30 | 59.10 | 10.50 | 10.30 | 5.30 | 1.60 | 3.70 |
| Eng. Mean | 54.06 | 4.06 | 11.22 | 34.54 | 3.18 | 6.52 | 19.55 | 2.98 | 4.94 | 67.52 | 10.44 | 11.44 | 5.42 | 1.14 | 4.12 |
| Metric Mean | 24.52 | 1.84 | 5.09 | 15.66 | 1.44 | 2.96 | 8.87 | 1.35 | 2.24 | 30.62 | 4.73 | 5.19 | 2.46 | 0.52 | 1.87 |

APPENDIX II B (Continued)

| Steer No. | Brisket Yield | Fat Brisket | Bone Brisket | Plate Yield | Fat Plate | Bone Plate | Flank Yield | Fat Flank | Bone Flank | Yield Lean Cuts | Retail Yield | Int. Fat Trim | Total Bone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | | | | | |
| 1 | 9.40 | 4.00 | 2.70 | 10.60 | 9.00 | 2.50 | 11.60 | 05.00 | .10 | 148.20 | 186.70 | 25.10 | 36.30 |
| 2 | 6.50 | 6.20 | 1.90 | 12.30 | 8.10 | 3.80 | 08.40 | 12.80 | .30 | 131.35 | 164.35 | 38.10 | 42.20 |
| 3 | 5.50 | 3.90 | 1.20 | 13.10 | 6.20 | 2.50 | 08.60 | 10.15 | .05 | 155.95 | 188.15 | 27.65 | 32.20 |
| 4 | 5.95 | 3.45 | 1.40 | 10.00 | 4.95 | 2.60 | 10.35 | 07.35 | .10 | 144.00 | 175.40 | 25.50 | 30.25 |
| 5 | 5.70 | 3.35 | 1.75 | 12.90 | 5.30 | 2.30 | 09.65 | 11.75 | .05 | 146.10 | 178.45 | 34.10 | 33.65 |
| 6 | 7.20 | 2.50 | 1.40 | 10.00 | 4.70 | 2.60 | 09.80 | 07.50 | .10 | 156.40 | 188.70 | 21.30 | 38.00 |
| 7 | 6.80 | 3.00 | 1.30 | 11.30 | 8.20 | 2.00 | 11.20 | 07.40 | .10 | 139.60 | 175.00 | 24.50 | 36.90 |
| 8 | 6.40 | 4.60 | 1.70 | 10.00 | 7.90 | 2.60 | 08.80 | 06.20 | .10 | 152.10 | 185.30 | 32.50 | 38.30 |
| 9 | 6.80 | 2.25 | 2.10 | 10.10 | 6.90 | 2.40 | 08.10 | 07.15 | .15 | 149.00 | 181.10 | 30.50 | 36.95 |
| 10 | 6.20 | 5.10 | 1.40 | 10.10 | 5.90 | 2.40 | 08.80 | 08.70 | .10 | 145.10 | 174.20 | 34.50 | 35.90 |
| Eng. Mean | 6.64 | 3.84 | 1.68 | 11.04 | 6.72 | 2.57 | 9.53 | 8.40 | .12 | 146.78 | 179.74 | 29.38 | 36.16 |
| Metric Mean | 3.01 | 1.74 | .76 | 5.01 | 3.05 | 1.16 | 4.32 | 3.81 | .05 | 66.57 | 81.51 | 13.32 | 16.72 |
| Group II .51-.75" | | | | | | | | | | | | | |
| 11 | 6.30 | 5.90 | 1.80 | 11.60 | 9.60 | 2.70 | 06.40 | 12.10 | .10 | 137.75 | 166.45 | 41.35 | 34.60 |
| 12 | 6.90 | 5.70 | 1.15 | 12.50 | 9.60 | 2.20 | 09.00 | 10.95 | .10 | 137.30 | 170.15 | 40.40 | 30.85 |
| 13 | 4.80 | 4.90 | 0.90 | 10.20 | 0.20 | 2.00 | 08.80 | 13.80 | .10 | 141.35 | 169.00 | 46.25 | 31.25 |
| 14 | 6.50 | 4.60 | 1.50 | 11.60 | 6.00 | 2.55 | 09.50 | 12.90 | .10 | 142.80 | 174.30 | 39.80 | 36.40 |
| 15 | 7.20 | 3.70 | 1.20 | 11.50 | 6.30 | 2.10 | 12.70 | 13.60 | .50 | 138.60 | 177.00 | 33.30 | 33.00 |
| 16 | 8.00 | 4.00 | 2.00 | 12.40 | 0.20 | 2.30 | 08.00 | 08.00 | .10 | 151.80 | 186.60 | 33.40 | 34.00 |
| 17 | 5.80 | 4.50 | 1.60 | 14.50 | 7.40 | 2.60 | 09.40 | 13.40 | .10 | 137.20 | 172.30 | 35.90 | 34.20 |
| 18 | 6.90 | 4.00 | 1.20 | 12.40 | 7.90 | 2.60 | 10.80 | 11.20 | .10 | 150.00 | 186.30 | 30.40 | 37.60 |
| 19 | 6.10 | 4.00 | 1.00 | 12.80 | 6.80 | 2.10 | 09.40 | 10.70 | .05 | 143.50 | 174.80 | 34.65 | 30.65 |
| 20 | 5.50 | 5.10 | 2.10 | 07.50 | 9.65 | 2.60 | 06.65 | 10.50 | .10 | 138.65 | 164.90 | 34.75 | 38.75 |
| Eng. Mean | 6.40 | 4.84 | 1.44 | 11.70 | 8.36 | 2.30 | 9.06 | 11.72 | .14 | 141.90 | 174.18 | 37.02 | 34.83 |
| Metric Mean | 2.90 | 2.19 | .65 | 5.31 | 3.79 | 1.08 | 4.11 | 5.32 | .06 | 64.35 | 78.99 | 16.79 | 15.70 |
| Group III .76-1.00" | | | | | | | | | | | | | |
| 21 | 6.70 | 4.30 | 1.30 | 12.30 | 08.20 | 2.60 | 13.00 | 13.80 | .20 | 153.30 | 190.90 | 37.60 | 32.80 |
| 22 | 9.10 | 5.00 | 2.00 | 10.00 | 09.80 | 2.00 | 09.50 | 13.70 | .10 | 135.30 | 171.60 | 38.40 | 35.90 |
| 23 | 9.90 | 4.50 | 1.40 | 10.40 | 10.40 | 2.50 | 10.80 | 07.80 | .10 | 140.50 | 176.40 | 32.90 | 36.20 |
| 24 | 4.70 | 3.90 | 0.90 | 11.60 | 09.15 | 2.00 | 09.55 | 12.90 | .10 | 145.75 | 174.10 | 42.90 | 31.60 |
| 25 | 4.85 | 5.10 | 0.80 | 10.90 | 08.90 | 2.20 | 09.20 | 17.30 | .10 | 139.00 | 167.45 | 45.90 | 28.80 |
| 26 | 5.60 | 6.10 | 1.60 | 09.80 | 08.35 | 2.25 | 07.90 | 13.30 | .10 | 141.80 | 168.60 | 45.60 | 30.25 |
| 27 | 6.10 | 9.50 | 1.40 | 08.10 | 13.85 | 1.90 | 06.20 | 17.80 | .05 | 116.90 | 141.40 | 68.30 | 29.20 |
| 28 | 5.70 | 4.60 | 0.80 | 10.00 | 07.80 | 1.65 | 09.30 | 13.90 | .10 | 139.05 | 167.75 | 45.30 | 27.35 |
| 29 | 4.20 | 4.40 | 0.50 | 10.70 | 08.95 | 1.80 | 07.70 | 14.10 | .05 | 131.15 | 156.85 | 50.95 | 31.00 |
| 30 | 4.80 | 5.60 | 0.70 | 09.90 | 12.50 | 2.35 | 08.40 | 16.40 | .10 | 131.60 | 158.15 | 54.80 | 31.80 |
| Eng. Mean | 6.16 | 5.30 | 1.14 | 10.37 | 9.79 | 2.12 | 9.16 | 14.10 | .10 | 137.44 | 167.32 | 46.26 | 31.49 |
| Metric Mean | 2.79 | 2.40 | .52 | 4.70 | 4.44 | .96 | 4.15 | 6.39 | .04 | 62.33 | 75.90 | 20.98 | 14.28 |

APPENDIX II B (Continued)

| Steer No. | Brisket Yield | Fat Brisket | Bone Brisket | Plate Yield | Fat Plate | Bone Plate | Flank Yield | Fat Flank | Bone Flank | Yield Lean Cuts | Retail Yield | Int. Fat Trim | Total Bone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | | | | | |
| 31 | 5.40 | 7.70 | 0.85 | 09.25 | 12.20 | 2.00 | 08.40 | 18.10 | .10 | 133.10 | 159.95 | 56.60 | 29.40 |
| 32 | 5.70 | 9.10 | 1.10 | 11.90 | 11.00 | 2.20 | 07.30 | 13.30 | .10 | 132.00 | 160.30 | 53.55 | 27.85 |
| 33 | 6.30 | 5.70 | 0.90 | 13.80 | 11.10 | 2.00 | 08.90 | 12.70 | .10 | 143.95 | 176.35 | 47.40 | 29.15 |
| 34 | 3.90 | 3.80 | 0.70 | 11.10 | 10.10 | 2.40 | 08.10 | 15.20 | .10 | 132.10 | 159.00 | 50.25 | 32.40 |
| 35 | 5.90 | 7.00 | 1.45 | 07.90 | 10.90 | 2.10 | 06.10 | 13.10 | .10 | 116.90 | 140.15 | 50.15 | 32.80 |
| 36 | 4.90 | 8.40 | 0.95 | 08.40 | 11.30 | 1.60 | 06.10 | 16.50 | .05 | 124.70 | 147.20 | 60.20 | 25.95 |
| 37 | 6.30 | 9.90 | 1.10 | 08.70 | 12.90 | 1.70 | 05.15 | 14.80 | .05 | 125.45 | 149.10 | 63.35 | 27.40 |
| 38 | 4.95 | 9.25 | 1.75 | 08.50 | 07.60 | 1.80 | 08.50 | 15.70 | .12 | 115.65 | 140.90 | 45.90 | 30.92 |
| 39 | 5.10 | 6.30 | 0.95 | 10.10 | 08.60 | 2.00 | 08.60 | 14.90 | .10 | 128.40 | 155.90 | 52.30 | 30.65 |
| 40 | 4.80 | 6.00 | 0.90 | 09.20 | 07.90 | 1.90 | 07.20 | 12.80 | .05 | 127.30 | 151.60 | 45.90 | 30.45 |
| Eng. Mean | 5.32 | 7.32 | 1.06 | 09.88 | 10.36 | 1.97 | 07.44 | 14.71 | .09 | 127.96 | 154.04 | 52.56 | 29.70 |
| Metric Mean | 2.41 | 3.32 | .48 | 04.48 | 4.70 | .89 | 03.37 | 6.67 | .04 | 58.03 | 69.86 | 23.84 | 13.47 |
| Group V .26-.50" | | | | | | | | | | | | | |
| 41 | 8.80 | 7.15 | 2.20 | 15.90 | 17.00 | 4.10 | 12.10 | 18.25 | .15 | 182.50 | 225.40 | 59.25 | 52.65 |
| 42 | 6.50 | 5.70 | 1.40 | 12.70 | 15.90 | 4.00 | 14.20 | 12.80 | .20 | 192.10 | 230.50 | 49.90 | 48.40 |
| 43 | 10.50 | 5.50 | 2.40 | 15.20 | 13.10 | 5.30 | 13.00 | 12.00 | .10 | 205.30 | 249.90 | 39.60 | 50.70 |
| 44 | 7.34 | 7.60 | 2.10 | 11.60 | 14.20 | 3.10 | 08.80 | 16.80 | .10 | 175.80 | 208.64 | 60.60 | 46.40 |
| 45 | 8.50 | 10.40 | 1.80 | 12.10 | 14.20 | 2.70 | 09.45 | 17.20 | .10 | 168.90 | 203.95 | 63.85 | 43.65 |
| 46 | 5.70 | 5.40 | 1.15 | 14.75 | 13.10 | 3.30 | 09.60 | 15.30 | .10 | 173.60 | 208.65 | 58.60 | 45.15 |
| 47 | 8.10 | 7.30 | 1.70 | 13.45 | 11.25 | 2.95 | 09.70 | 15.20 | .10 | 170.30 | 207.05 | 54.45 | 46.85 |
| 48 | 8.30 | 5.90 | 1.90 | 13.50 | 09.55 | 3.85 | 10.10 | 12.80 | .10 | 184.00 | 221.30 | 46.40 | 51.50 |
| 49 | 8.00 | 8.40 | 1.70 | 16.05 | 11.80 | 3.05 | 10.05 | 14.40 | .10 | 177.95 | 217.35 | 57.50 | 45.60 |
| 50 | 6.85 | 4.40 | 1.20 | 15.00 | 10.70 | 3.50 | 10.90 | 11.90 | .10 | 184.50 | 222.55 | 49.70 | 49.10 |
| Eng. Mean | 7.86 | 6.78 | 1.76 | 14.02 | 13.08 | 3.58 | 10.79 | 14.66 | .12 | 181.50 | 219.53 | 53.98 | 48.60 |
| Metric Mean | 3.56 | 3.07 | .80 | 6.36 | 5.93 | 1.62 | 4.89 | 6.65 | .05 | 82.31 | 99.56 | 24.48 | 21.77 |
| Group VI .51-.75" | | | | | | | | | | | | | |
| 51 | 7.70 | 6.80 | 1.70 | 14.20 | 11.70 | 3.50 | 11.45 | 16.00 | .15 | 198.90 | 238.45 | 55.35 | 48.30 |
| 52 | 9.20 | 7.50 | 1.80 | 18.10 | 11.50 | 3.20 | 11.40 | 15.80 | .10 | 182.50 | 226.80 | 50.75 | 44.65 |
| 53 | 9.40 | 6.00 | 1.80 | 10.65 | 18.75 | 3.30 | 10.80 | 14.40 | .10 | 182.90 | 219.65 | 55.15 | 44.60 |
| 54 | 8.60 | 7.35 | 1.75 | 13.70 | 11.95 | 3.25 | 11.70 | 18.90 | .20 | 178.65 | 218.00 | 58.00 | 46.00 |
| 55 | 8.40 | 8.30 | 2.75 | 15.10 | 12.20 | 3.70 | 12.00 | 14.90 | .10 | 189.15 | 230.15 | 52.00 | 50.45 |
| 56 | 7.40 | 9.95 | 1.50 | 13.05 | 13.40 | 2.80 | 09.50 | 19.15 | .10 | 169.05 | 204.55 | 69.10 | 43.70 |
| 57 | 8.65 | 7.35 | 2.45 | 14.90 | 12.20 | 3.90 | 09.80 | 15.70 | .15 | 183.75 | 222.95 | 58.10 | 55.35 |
| 58 | 7.40 | 7.10 | 1.50 | 13.60 | 13.80 | 2.80 | 09.90 | 19.30 | .10 | 165.70 | 201.80 | 66.90 | 43.80 |
| 59 | 6.20 | 7.00 | 1.05 | 13.40 | 16.90 | 2.60 | 10.10 | 20.70 | .10 | 162.30 | 196.30 | 71.55 | 37.15 |
| 60 | 9.80 | 7.95 | 2.35 | 12.40 | 11.70 | 2.90 | 11.00 | 16.80 | .10 | 179.60 | 219.50 | 55.40 | 45.70 |
| Eng. Mean | 8.28 | 7.53 | 1.86 | 13.91 | 13.41 | 3.20 | 10.76 | 17.16 | .12 | 179.25 | 217.72 | 59.23 | 45.97 |
| Metric Mean | 3.76 | 3.41 | .84 | 6.31 | 6.08 | 1.45 | 4.88 | 7.78 | .05 | 81.29 | 98.74 | 26.86 | 20.85 |

APPENDIX II B (Continued)

| Steer No. | Brisket Yield | Fat Brisket | Bone Brisket | Plate Yield | Fat Plate | Bone Plate | Flank Yield | Fat Flank | Bone Flank | Yield Lean Cuts | Retail Yield | Int. Fat Trim | Total Bone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | | | | | |
| 61 | 7.60 | 7.20 | 1.55 | 13.90 | 16.20 | 3.30 | 09.95 | 16.75 | .15 | 186.20 | 222.45 | 60.75 | 43.95 |
| 62 | 6.40 | 6.40 | 1.50 | 13.95 | 13.55 | 2.70 | 15.15 | 22.00 | .20 | 184.30 | 224.00 | 70.10 | 39.65 |
| 63 | 5.70 | 5.70 | 1.05 | 11.85 | 12.20 | 2.60 | 09.85 | 15.70 | .10 | 178.50 | 210.15 | 58.60 | 42.40 |
| 64 | 5.45 | 8.70 | 1.15 | 13.50 | 14.65 | 2.40 | 13.40 | 17.70 | .10 | 163.75 | 202.20 | 66.85 | 40.20 |
| 65 | 8.45 | 7.20 | 2.40 | 12.10 | 19.55 | 4.60 | 10.40 | 15.40 | .10 | 191.40 | 229.75 | 58.45 | 50.45 |
| 66 | 7.50 | 9.70 | 1.05 | 14.50 | 16.10 | 2.40 | 11.15 | 21.75 | .05 | 166.80 | 205.15 | 73.75 | 34.10 |
| 67 | 9.60 | 9.30 | 1.50 | 15.70 | 13.20 | 2.50 | 13.10 | 20.00 | .10 | 163.45 | 207.45 | 64.20 | 34.40 |
| 68 | 5.90 | 7.80 | 1.30 | 10.50 | 18.10 | 2.40 | 08.80 | 17.90 | .10 | 171.70 | 201.50 | 60.60 | 43.90 |
| 69 | 7.20 | 8.30 | 1.40 | 16.70 | 15.50 | 3.10 | 11.20 | 19.60 | .20 | 181.10 | 220.80 | 65.50 | 44.55 |
| 70 | 6.70 | 5.80 | 1.90 | 12.80 | 14.20 | 3.30 | 09.35 | 17.15 | .13 | 167.60 | 201.25 | 64.20 | 44.28 |
| Eng. Mean | 7.05 | 7.61 | 1.48 | 13.55 | 15.32 | 2.93 | 11.24 | 18.46 | .12 | 175.45 | 212.47 | 64.35 | 41.72 |
| Metric Mean | 3.20 | 3.45 | .67 | 6.14 | 6.95 | 1.33 | 5.10 | 8.34 | .05 | 79.58 | 96.36 | 29.16 | 18.95 |
| Group VIII 1.01-1.25" | | | | | | | | | | | | | |
| 71 | 10.10 | 6.40 | 1.50 | 15.30 | 12.10 | 2.60 | 15.40 | 19.90 | .20 | 176.50 | 224.40 | 54.60 | 39.90 |
| 72 | 7.00 | 5.30 | 1.00 | 18.20 | 13.80 | 2.90 | 11.10 | 16.00 | .20 | 192.00 | 234.10 | 55.50 | 40.05 |
| 73 | 6.40 | 8.20 | 1.30 | 12.60 | 17.35 | 2.70 | 11.50 | 27.90 | .10 | 173.70 | 208.10 | 77.00 | 39.60 |
| 74 | 7.70 | 7.40 | 1.40 | 15.60 | 13.70 | 4.20 | 11.20 | 18.90 | .15 | 184.35 | 224.05 | 56.15 | 49.50 |
| 75 | 7.30 | 7.15 | 1.85 | 14.40 | 16.10 | 3.40 | 10.35 | 20.45 | .10 | 168.60 | 205.60 | 71.05 | 43.35 |
| 76 | 6.20 | 7.00 | 1.25 | 11.80 | 14.00 | 2.60 | 09.90 | 19.45 | .20 | 179.10 | 212.00 | 56.75 | 41.00 |
| 77 | 11.70 | 7.60 | 2.60 | 13.10 | 15.80 | 3.10 | 15.00 | 18.00 | .20 | 192.80 | 239.80 | 57.80 | 49.50 |
| 78 | 6.75 | 7.30 | 1.10 | 11.30 | 13.90 | 2.35 | 09.35 | 17.30 | .15 | 166.30 | 198.55 | 69.25 | 39.65 |
| 79 | 7.10 | 10.50 | 2.00 | 13.70 | 16.20 | 3.30 | 08.75 | 22.10 | .10 | 164.10 | 198.55 | 73.90 | 46.75 |
| 80 | 7.20 | 7.60 | 1.25 | 11.90 | 13.20 | 2.70 | 09.30 | 18.50 | .10 | 159.20 | 192.00 | 65.15 | 39.75 |
| Eng. Mean | 7.74 | 7.44 | 1.58 | 13.79 | 14.62 | 2.96 | 11.16 | 19.69 | .15 | 177.66 | 213.60 | 63.47 | 43.90 |
| Metric Mean | 3.51 | 3.37 | .69 | 6.25 | 6.63 | 1.35 | 5.07 | 8.93 | .07 | 79.66 | 96.96 | 28.90 | 19.96 |

PERIOD III - PHYSICAL SEPARATION OF WHOLESALE CUTS - LEFT SIDE

| Steer No. | Wt. Round | Lean Wt. Round | Wt. Fat Round | Wt. Bone Round | Wt. Rump | Wt. Lean Rump | Wt. Fat Rump | Wt. Bone Rump | Wt. Rnd. + Rump | Wt. Lean Rnd. + Rump |
|---|---|---|---|---|---|---|---|---|---|---|
| **Group I .26-.50"** | | | | | | | | | | |
| 1 | 43.00 | 31.00 | 05.40 | 6.40 | 18.70 | 12.90 | 3.10 | 2.60 | 61.70 | 43.90 |
| 2 | 44.50 | 27.00 | 10.40 | 7.00 | 15.80 | 08.30 | 5.10 | 2.40 | 60.30 | 35.30 |
| 3 | 42.90 | 29.70 | 06.40 | 6.65 | 14.80 | 09.30 | 3.20 | 2.10 | 57.70 | 39.00 |
| 4 | 45.40 | 29.90 | 08.50 | 6.65 | 17.20 | 10.15 | 4.00 | 2.80 | 62.60 | 40.05 |
| 5 | 44.30 | 29.80 | 08.30 | 6.20 | 13.75 | 09.00 | 2.55 | 2.20 | 58.05 | 38.80 |
| 6 | 44.70 | 30.50 | 07.10 | 6.60 | 17.70 | 11.40 | 3.05 | 2.90 | 62.40 | 41.90 |
| 7 | 41.20 | 26.70 | 09.10 | 5.00 | 14.80 | 08.75 | 3.70 | 2.15 | 56.00 | 35.45 |
| 8 | 51.45 | 36.00 | 07.60 | 7.40 | 11.65 | 06.50 | 2.65 | 2.30 | 63.10 | 42.50 |
| 9 | 51.10 | 34.40 | 07.60 | 8.00 | 16.20 | 09.90 | 2.85 | 3.30 | 67.30 | 44.30 |
| 10 | 45.60 | 31.25 | 07.15 | 6.65 | 16.20 | 09.80 | 3.50 | 2.40 | 61.80 | 41.05 |
| Eng. Mean | 45.42 | 30.62 | 7.76 | 6.66 | 15.68 | 09.60 | 3.37 | 2.52 | 61.10 | 40.22 |
| Metric Mean | 20.60 | 13.89 | 3.52 | 3.02 | 7.11 | 04.35 | 1.53 | 1.14 | 27.71 | 18.24 |
| **Group II .51-.75"** | | | | | | | | | | |
| 11 | 42.10 | 26.80 | 09.40 | 5.60 | 14.80 | 08.00 | 4.45 | 2.20 | 56.90 | 34.80 |
| 12 | 43.10 | 29.10 | 08.60 | 5.10 | 16.30 | 09.20 | 4.85 | 2.05 | 59.40 | 38.30 |
| 13 | 40.70 | 26.70 | 07.90 | 5.50 | 15.00 | 09.00 | 3.85 | 1.70 | 55.70 | 35.70 |
| 14 | 43.30 | 28.10 | 09.10 | 5.65 | 14.40 | 08.40 | 3.80 | 2.30 | 57.70 | 36.50 |
| 15 | 43.00 | 28.60 | 07.60 | 6.20 | 15.25 | 08.20 | 4.40 | 2.40 | 58.25 | 36.80 |
| 16 | 42.35 | 27.60 | 08.10 | 6.10 | 16.10 | 09.75 | 3.45 | 2.60 | 58.45 | 37.35 |
| 17 | 45.50 | 28.40 | 10.00 | 5.85 | 12.05 | 05.85 | 3.75 | 2.25 | 57.55 | 34.25 |
| 18 | 44.40 | 27.30 | 10.00 | 6.55 | 17.45 | 09.40 | 5.00 | 2.85 | 61.85 | 36.70 |
| 19 | 41.80 | 26.90 | 09.15 | 5.30 | 14.20 | 08.00 | 3.95 | 2.00 | 56.00 | 34.90 |
| 20 | 48.75 | 31.60 | 09.75 | 6.10 | 14.00 | 07.20 | 4.00 | 2.30 | 62.75 | 38.80 |
| Eng. Mean | 43.50 | 28.11 | 08.96 | 5.82 | 14.96 | 8.30 | 4.15 | 2.24 | 58.46 | 36.41 |
| Metric Mean | 19.73 | 12.75 | 04.06 | 2.64 | 6.78 | 3.76 | 1.88 | 1.02 | 26.51 | 16.51 |
| **Group III .76-1.00"** | | | | | | | | | | |
| 21 | 44.50 | 28.90 | 09.80 | 5.80 | 14.20 | 7.62 | 4.51 | 1.92 | 58.70 | 36.52 |
| 22 | 46.10 | 28.55 | 10.50 | 5.80 | 12.70 | 6.60 | 4.10 | 1.85 | 58.80 | 35.15 |
| 23 | 40.00 | 27.10 | 06.80 | 5.55 | 13.80 | 7.50 | 3.40 | 2.10 | 53.80 | 34.60 |
| 24 | 42.20 | 27.30 | 09.30 | 5.60 | 15.80 | 8.70 | 4.90 | 1.90 | 58.00 | 36.00 |
| 25 | 42.90 | 27.40 | 09.70 | 5.40 | 16.20 | 9.50 | 4.40 | 2.05 | 59.10 | 36.90 |
| 26 | 42.50 | 28.10 | 08.00 | 5.90 | 15.10 | 8.70 | 4.30 | 1.90 | 57.60 | 36.80 |
| 27 | 38.90 | 24.20 | 09.35 | 5.10 | 10.40 | 5.10 | 3.60 | 1.70 | 49.30 | 29.30 |
| 28 | 40.30 | 26.40 | 08.70 | 4.80 | 14.50 | 7.45 | 5.00 | 1.75 | 54.80 | 33.85 |
| 29 | 42.40 | 26.80 | 10.20 | 5.20 | 13.10 | 6.70 | 4.50 | 1.80 | 55.50 | 33.50 |
| 30 | 40.70 | 26.30 | 09.00 | 5.00 | 14.50 | 7.30 | 5.20 | 1.80 | 55.20 | 33.60 |
| Eng. Mean | 43.05 | 27.10 | 09.14 | 5.42 | 14.03 | 7.52 | 4.39 | 1.88 | 56.08 | 34.82 |
| Metric Mean | 19.07 | 12.29 | 04.14 | 2.46 | 6.36 | 3.41 | 1.99 | .85 | 25.43 | 15.70 |

APPENDIX III A (Continued)

| Steer No. | Wt. Round | Lean Wt. Round | Wt. Fat Round | Wt. Bone Round | Wt. Rump | Wt. Lean Rump | Wt. Fat Rump | Wt. Bone Rump | Wt. Rnd. + Rump | Wt. Lean Rnd. + Rump |
|---|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | | |
| 31 | 39.40 | 24.00 | 09.60 | 5.55 | 15.40 | 07.70 | 5.40 | 2.10 | 54.80 | 31.70 |
| 32 | 39.10 | 23.50 | 10.60 | 4.70 | 17.60 | 09.70 | 5.80 | 2.10 | 56.70 | 33.20 |
| 33 | 43.40 | 29.70 | 08.30 | 5.05 | 11.70 | 06.65 | 3.50 | 1.50 | 55.10 | 36.35 |
| 34 | 41.80 | 27.70 | 08.30 | 5.60 | 12.20 | 06.20 | 4.00 | 1.90 | 54.00 | 33.90 |
| 35 | 41.30 | 25.60 | 10.50 | 5.20 | 13.90 | 05.50 | 6.10 | 2.20 | 55.20 | 31.10 |
| 36 | 42.40 | 26.75 | 10.30 | 5.15 | 09.90 | 04.50 | 3.85 | 1.45 | 52.30 | 31.25 |
| 37 | 42.40 | 26.25 | 10.95 | 5.20 | 10.90 | 05.15 | 4.20 | 1.45 | 53.30 | 31.40 |
| 38 | 41.30 | 24.70 | 11.30 | 5.10 | 13.40 | 04.50 | 5.00 | 1.80 | 54.70 | 31.20 |
| 39 | 43.20 | 28.40 | 08.90 | 5.50 | 13.70 | 07.30 | 4.30 | 2.00 | 56.90 | 35.70 |
| 40 | 46.00 | 30.60 | 09.50 | 5.70 | 10.60 | 05.10 | 3.65 | 1.60 | 56.60 | 35.70 |
| Eng. Mean | 42.03 | 26.72 | 09.82 | 5.28 | 12.93 | 06.43 | 4.58 | 1.81 | 54.95 | 33.15 |
| Metric Mean | 19.06 | 12.12 | 04.45 | 2.39 | 5.86 | 02.92 | 2.08 | .82 | 24.92 | 15.03 |
| Group V .26-.50" | | | | | | | | | | |
| 41 | 53.85 | 35.85 | 09.40 | 8.40 | 22.70 | 13.60 | 5.40 | 3.70 | 76.55 | 49.45 |
| 42 | 54.50 | 38.05 | 08.55 | 7.60 | 20.00 | 11.30 | 5.25 | 3.25 | 74.50 | 49.35 |
| 43 | 60.00 | 41.10 | 10.85 | 7.70 | 21.70 | 13.30 | 4.95 | 3.25 | 81.70 | 54.40 |
| 44 | 58.80 | 38.70 | 11.20 | 8.40 | 17.90 | 09.80 | 4.70 | 3.20 | 76.70 | 48.50 |
| 45 | 54.60 | 36.60 | 10.00 | 7.70 | 16.10 | 07.90 | 5.20 | 2.80 | 70.70 | 44.50 |
| 46 | 60.00 | 41.40 | 10.10 | 8.30 | 17.00 | 08.50 | 5.55 | 2.80 | 77.00 | 49.90 |
| 47 | 60.00 | 41.50 | 09.70 | 8.60 | 13.70 | 07.00 | 3.80 | 2.80 | 63.70 | 48.50 |
| 48 | 63.60 | 44.90 | 09.20 | 9.20 | 17.00 | 09.70 | 3.65 | 3.65 | 80.60 | 54.60 |
| 49 | 59.50 | 41.10 | 10.60 | 7.50 | 16.10 | 08.05 | 4.80 | 3.10 | 75.60 | 49.15 |
| 50 | 60.00 | 41.30 | 09.80 | 8.40 | 15.30 | 08.50 | 3.70 | 3.00 | 75.30 | 49.80 |
| Eng. Mean | 58.48 | 40.05 | 09.94 | 8.18 | 17.75 | 09.76 | 4.70 | 3.16 | 75.24 | 49.82 |
| Metric Mean | 26.52 | 18.16 | 04.51 | 3.71 | 8.05 | 04.43 | 2.13 | 1.43 | 34.12 | 22.59 |
| Group VI .51-.75" | | | | | | | | | | |
| 51 | 57.30 | 37.40 | 11.50 | 8.20 | 21.50 | 11.35 | 5.95 | 3.70 | 78.80 | 48.75 |
| 52 | 53.30 | 35.10 | 10.80 | 7.10 | 21.50 | 11.40 | 6.50 | 3.20 | 74.80 | 46.50 |
| 53 | 55.80 | 38.00 | 10.55 | 7.20 | 18.40 | 10.10 | 5.20 | 2.95 | 74.20 | 48.10 |
| 54 | 57.10 | 35.40 | 13.20 | 7.90 | 20.50 | 10.50 | 6.40 | 3.40 | 77.60 | 45.90 |
| 55 | 65.00 | 42.45 | 12.90 | 9.35 | 16.40 | 08.10 | 4.40 | 2.90 | 81.40 | 50.55 |
| 56 | 58.95 | 35.90 | 15.10 | 7.60 | 19.35 | 08.90 | 7.50 | 2.70 | 78.30 | 44.80 |
| 57 | 64.20 | 42.70 | 11.70 | 9.50 | 17.40 | 08.80 | 5.00 | 3.40 | 81.60 | 51.50 |
| 58 | 59.70 | 34.75 | 16.90 | 7.60 | 18.60 | 08.80 | 6.70 | 2.90 | 78.30 | 43.55 |
| 59 | 52.80 | 33.75 | 11.90 | 6.10 | 18.50 | 09.05 | 6.50 | 2.55 | 70.50 | 42.80 |
| 60 | 61.70 | 42.45 | 11.00 | 8.00 | 15.90 | 06.10 | 4.80 | 2.85 | 77.60 | 50.55 |
| Eng. Mean | 57.57 | 37.72 | 12.55 | 7.80 | 18.98 | 09.51 | 5.79 | 3.00 | 77.51 | 47.23 |
| Metric Mean | 26.53 | 17.14 | 5.80 | 3.76 | 8.52 | 04.31 | 2.69 | 1.39 | 35.06 | 21.45 |

APPENDIX III A (Continued)

| Steer No. | Wt. Round | Lean Wt. Round | Wt. Fat Round | Wt. Bone Round | Wt. Rump | Wt. Lean Rump | Wt. Fat Rump | Wt. Bone Rump | Wt. Rnd. + Rump | Wt. Lean Rnd. + Rump |
|---|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | | |
| 61 | 55.10 | 35.60 | 11.65 | 7.70 | 19.90 | 09.70 | 6.90 | 3.05 | 75.00 | 45.30 |
| 62 | 54.50 | 35.00 | 12.40 | 6.80 | 21.20 | 11.80 | 6.40 | 2.85 | 75.70 | 46.80 |
| 63 | 56.80 | 34.90 | 13.20 | 7.40 | 20.30 | 10.60 | 7.00 | 2.50 | 77.10 | 45.50 |
| 64 | 55.35 | 33.30 | 14.10 | 7.30 | 16.75 | 08.20 | 6.20 | 2.20 | 72.10 | 41.50 |
| 65 | 56.80 | 37.60 | 10.75 | 8.30 | 18.00 | 09.70 | 5.10 | 3.10 | 74.80 | 47.30 |
| 66 | 50.20 | 29.00 | 14.60 | 6.10 | 20.20 | 11.20 | 6.30 | 2.30 | 70.40 | 40.20 |
| 67 | 53.20 | 30.80 | 16.10 | 5.70 | 20.90 | 10.10 | 8.35 | 2.45 | 74.10 | 40.90 |
| 68 | 55.70 | 34.45 | 11.50 | 8.60 | 20.40 | 10.80 | 6.00 | 3.10 | 76.10 | 45.25 |
| 69 | 60.00 | 35.50 | 15.50 | 8.10 | 19.80 | 09.30 | 6.90 | 3.00 | 79.50 | 45.10 |
| 70 | 61.05 | 39.30 | 14.10 | 7.40 | 15.15 | 07.20 | 5.40 | 2.45 | 76.20 | 46.50 |
| Eng. Mean | 55.77 | 34.56 | 13.32 | 7.34 | 19.23 | 09.58 | 6.28 | 2.66 | 75.15 | 44.44 |
| Metric Mean | 25.34 | 15.68 | 6.07 | 3.33 | 8.72 | 04.47 | 2.93 | 1.21 | 34.06 | 20.15 |
| Group VIII 1.01-1.25" | | | | | | | | | | |
| 71 | 58.90 | 31.80 | 14.60 | 6.50 | 19.10 | 10.20 | 6.60 | 2.30 | 72.00 | 42.00 |
| 72 | 55.20 | 32.30 | 15.60 | 6.60 | 19.60 | 09.15 | 7.90 | 2.35 | 74.80 | 41.45 |
| 73 | 56.50 | 33.00 | 15.80 | 7.10 | 21.50 | 10.70 | 7.60 | 2.60 | 78.00 | 43.70 |
| 74 | 59.60 | 37.65 | 13.70 | 7.95 | 20.20 | 11.20 | 5.50 | 3.20 | 80.00 | 46.85 |
| 75 | 57.80 | 36.30 | 12.90 | 8.15 | 16.00 | 08.80 | 4.60 | 2.40 | 73.80 | 45.10 |
| 76 | 54.60 | 32.75 | 14.40 | 7.20 | 22.70 | 12.00 | 7.50 | 3.05 | 77.30 | 44.75 |
| 77 | 55.30 | 35.60 | 12.30 | 7.35 | 22.50 | 13.00 | 6.00 | 3.30 | 77.80 | 48.60 |
| 78 | 56.75 | 35.00 | 14.35 | 6.95 | 17.50 | 08.05 | 6.85 | 2.40 | 74.25 | 43.05 |
| 79 | 60.20 | 37.00 | 14.80 | 7.80 | 19.60 | 08.60 | 7.70 | 3.00 | 79.80 | 45.60 |
| 80 | 54.30 | 35.65 | 11.20 | 7.30 | 15.50 | 07.00 | 6.00 | 2.50 | 69.80 | 42.65 |
| Eng. Mean | 56.34 | 34.70 | 13.96 | 7.29 | 19.42 | 09.87 | 6.62 | 2.73 | 75.76 | 44.58 |
| Metric Mean | 25.55 | 15.74 | 6.33 | 3.31 | 8.81 | 4.48 | 2.00 | 1.24 | 34.36 | 20.22 |

APPENDIX III A (Continued)

| Steer No. | Wt. Fat Rnd. + Rump | Wt. Bone Rnd. + Rump | Wt. Loin | Wt. Lean Loin | Wt. Fat Loin | Wt. Bone Loin | Wt. Rib | Wt. Lean Rib | Wt. Fat Rib | Wt. Bone Rib | Wt. Chuck |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | | | |
| 1 | 08.50 | 9.00 | 38.00 | 25.20 | 08.90 | 4.00 | 22.60 | 12.65 | 5.80 | 3.75 | 71.10 |
| 2 | 15.50 | 9.40 | 36.60 | 19.90 | 12.80 | 3.60 | 22.00 | 10.00 | 7.90 | 3.35 | 64.50 |
| 3 | 09.60 | 8.75 | 37.50 | 23.70 | 09.80 | 3.60 | 26.00 | 13.85 | 8.45 | 3.25 | 76.20 |
| 4 | 12.50 | 9.45 | 37.20 | 23.85 | 08.50 | 4.45 | 22.30 | 12.20 | 6.15 | 3.55 | 70.70 |
| 5 | 10.85 | 8.40 | 36.80 | 23.20 | 10.00 | 3.57 | 24.90 | 13.25 | 7.65 | 3.55 | 72.40 |
| 6 | 10.15 | 9.50 | 38.80 | 24.70 | 08.55 | 5.50 | 24.20 | 13.60 | 6.00 | 4.00 | 79.00 |
| 7 | 12.80 | 7.15 | 39.20 | 23.70 | 11.40 | 3.40 | 22.55 | 11.60 | 7.60 | 3.30 | 67.00 |
| 8 | 10.25 | 9.70 | 42.50 | 27.10 | 09.30 | 5.30 | 22.80 | 12.60 | 6.50 | 3.80 | 73.30 |
| 9 | 10.45 | 11.30 | 36.80 | 23.50 | 07.25 | 6.00 | 19.50 | 11.13 | 4.15 | 3.89 | 76.50 |
| 10 | 10.65 | 9.05 | 38.90 | 24.00 | 09.15 | 4.95 | 25.40 | 14.50 | 6.40 | 3.95 | 68.60 |
| Eng. Mean | 11.12 | 9.17 | 38.23 | 23.88 | 09.56 | 4.44 | 23.22 | 12.54 | 6.66 | 3.64 | 71.93 |
| Metric Mean | 5.04 | 4.16 | 17.33 | 10.83 | 04.34 | 2.01 | 10.53 | 5.69 | 3.02 | 1.65 | 32.62 |
| Group II .51-.75" | | | | | | | | | | | |
| 11 | 13.85 | 7.80 | 39.50 | 21.30 | 13.55 | 3.95 | 24.90 | 11.30 | 10.25 | 2.95 | 68.90 |
| 12 | 13.45 | 7.15 | 41.00 | 22.90 | 13.90 | 3.65 | 26.00 | 13.15 | 09.05 | 3.20 | 65.60 |
| 13 | 11.75 | 7.20 | 39.60 | 22.40 | 12.30 | 4.20 | 27.00 | 12.10 | 11.00 | 3.25 | 68.50 |
| 14 | 12.90 | 7.65 | 39.40 | 22.70 | 12.00 | 4.10 | 26.60 | 13.25 | 09.00 | 3.80 | 71.60 |
| 15 | 12.00 | 8.60 | 37.10 | 21.05 | 12.00 | 3.90 | 24.35 | 11.60 | 09.00 | 3.80 | 69.90 |
| 16 | 11.55 | 8.70 | 36.40 | 22.40 | 09.90 | 3.80 | 23.90 | 11.70 | 08.10 | 3.90 | 75.80 |
| 17 | 13.75 | 8.10 | 39.40 | 21.25 | 13.12 | 3.95 | 22.65 | 10.45 | 08.65 | 3.03 | 61.40 |
| 18 | 15.00 | 9.40 | 38.20 | 19.60 | 14.25 | 3.75 | 23.20 | 10.85 | 08.35 | 3.60 | 65.60 |
| 19 | 13.10 | 7.30 | 39.10 | 21.05 | 13.70 | 4.15 | 28.70 | 14.55 | 09.75 | 4.00 | 69.90 |
| 20 | 13.75 | 8.70 | 37.80 | 23.40 | 09.80 | 4.25 | 26.30 | 11.40 | 05.80 | 2.90 | 68.00 |
| Eng. Mean | 13.11 | 8.06 | 38.75 | 21.80 | 12.45 | 3.97 | 24.75 | 12.04 | 8.90 | 3.44 | 68.52 |
| Metric Mean | 5.49 | 3.66 | 17.57 | 9.89 | 5.65 | 1.80 | 11.23 | 5.46 | 4.04 | 1.56 | 31.07 |
| Group III .76-1.00" | | | | | | | | | | | |
| 21 | 14.31 | 7.72 | 41.60 | 22.90 | 14.60 | 3.60 | 25.30 | 11.30 | 10.45 | 3.00 | 73.00 |
| 22 | 14.60 | 7.65 | 38.50 | 21.80 | 12.20 | 3.30 | 25.70 | 11.90 | 10.02 | 3.43 | 66.20 |
| 23 | 10.20 | 7.65 | 37.40 | 22.60 | 09.90 | 3.70 | 26.20 | 13.66 | 09.00 | 3.43 | 70.40 |
| 24 | 14.20 | 7.50 | 39.30 | 20.40 | 14.20 | 4.20 | 27.40 | 12.25 | 11.55 | 3.15 | 72.30 |
| 25 | 14.10 | 7.45 | 38.40 | 20.25 | 13.70 | 3.60 | 27.00 | 12.45 | 10.80 | 3.20 | 66.45 |
| 26 | 12.30 | 7.80 | 37.60 | 21.90 | 11.00 | 3.80 | 23.50 | 11.70 | 07.75 | 3.30 | 69.50 |
| 27 | 12.95 | 6.80 | 43.20 | 22.30 | 16.75 | 3.90 | 27.70 | 10.55 | 13.55 | 3.30 | 65.70 |
| 28 | 13.70 | 6.55 | 39.00 | 20.70 | 14.00 | 3.30 | 29.50 | 13.60 | 12.05 | 3.25 | 63.10 |
| 29 | 14.70 | 7.00 | 40.00 | 22.80 | 13.50 | 3.40 | 25.75 | 12.40 | 09.95 | 3.15 | 74.90 |
| 30 | 14.20 | 6.80 | 39.00 | 21.40 | 13.80 | 3.30 | 25.70 | 12.00 | 10.40 | 3.25 | 77.40 |
| Eng. Mean | 13.53 | 7.29 | 39.50 | 21.70 | 13.36 | 3.61 | 26.36 | 12.16 | 10.55 | 3.25 | 69.90 |
| Metric Mean | 6.14 | 3.31 | 17.67 | 9.84 | 6.06 | 1.64 | 11.96 | 5.52 | 4.78 | 1.47 | 31.70 |

APPENDIX III A (Continued)

| Steer No. | Wt. Fat Rnd. + Rump | Wt. Bone Rnd. + Rump | Wt. Loin | Wt. Lean Loin | Wt. Fat Loin | Wt. Bone Loin | Wt. Rib | Wt. Lean Rib | Wt. Fat Rib | Wt. Bone Rib | Wt. Chuck |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | | | |
| 31 | 15.00 | 7.65 | 42.10 | 20.20 | 16.95 | 4.00 | 27.15 | 10.90 | 12.85 | 3.00 | 69.90 |
| 32 | 16.40 | 6.80 | 40.00 | 20.40 | 15.75 | 3.10 | 26.60 | 11.65 | 10.85 | 2.70 | 64.00 |
| 33 | 11.80 | 6.55 | 41.20 | 24.90 | 12.50 | 3.80 | 26.95 | 14.25 | 09.51 | 2.95 | 70.80 |
| 34 | 12.30 | 7.50 | 40.60 | 23.30 | 12.80 | 3.75 | 27.05 | 13.50 | 10.15 | 3.25 | 74.60 |
| 35 | 16.60 | 7.40 | 40.70 | 20.60 | 15.90 | 3.65 | 27.10 | 11.00 | 12.40 | 3.30 | 66.20 |
| 36 | 14.15 | 6.60 | 43.40 | 22.30 | 17.00 | 3.50 | 27.10 | 11.20 | 12.65 | 2.65 | 65.80 |
| 37 | 15.15 | 6.65 | 44.60 | 23.10 | 17.30 | 3.80 | 25.90 | 09.80 | 12.80 | 2.95 | 68.20 |
| 38 | 16.30 | 6.90 | 37.60 | 18.80 | 14.70 | 3.80 | 24.10 | 10.20 | 10.90 | 2.90 | 59.20 |
| 39 | 13.20 | 7.50 | 39.00 | 22.30 | 12.20 | 3.80 | 25.85 | 12.70 | 09.35 | 3.40 | 65.10 |
| 40 | 13.15 | 7.30 | 38.30 | 22.60 | 12.20 | 3.25 | 12.35 | 10.65 | 08.70 | 2.85 | 70.40 |
| Eng. Mean | 14.10 | 7.08 | 40.75 | 21.87 | 14.71 | 3.64 | 26.02 | 11.57 | 11.02 | 3.00 | 67.62 |
| Metric Mean | 6.53 | 3.21 | 18.48 | 9.92 | 6.67 | 1.65 | 11.80 | 5.25 | 5.00 | 1.36 | 30.67 |
| Group V .26-.50" | | | | | | | | | | | |
| 41 | 14.80 | 12.10 | 48.30 | 28.30 | 13.30 | 6.35 | 33.20 | 16.00 | 12.10 | 4.70 | 100.10 |
| 42 | 13.80 | 10.85 | 53.00 | 30.80 | 16.20 | 6.00 | 30.75 | 16.35 | 09.85 | 4.00 | 097.40 |
| 43 | 15.80 | 10.95 | 53.00 | 32.25 | 14.40 | 5.90 | 31.25 | 17.10 | 09.30 | 4.35 | 098.00 |
| 44 | 15.90 | 11.60 | 46.40 | 28.50 | 14.30 | 5.50 | 31.20 | 15.50 | 11.10 | 4.40 | 091.60 |
| 45 | 15.20 | 10.50 | 53.55 | 31.00 | 15.80 | 6.10 | 31.40 | 15.30 | 11.70 | 4.15 | 090.70 |
| 46 | 15.65 | 11.10 | 56.60 | 34.25 | 16.10 | 6.00 | 31.90 | 17.00 | 10.35 | 4.25 | 096.50 |
| 47 | 13.50 | 11.40 | 50.00 | 29.70 | 14.30 | 5.50 | 29.90 | 16.25 | 09.30 | 4.10 | 095.20 |
| 48 | 12.85 | 12.85 | 51.20 | 32.30 | 11.90 | 6.50 | 30.10 | 17.65 | 07.85 | 4.35 | 093.50 |
| 49 | 15.40 | 10.60 | 49.90 | 30.70 | 13.20 | 5.60 | 30.00 | 15.20 | 10.20 | 4.30 | 101.10 |
| 50 | 13.50 | 11.40 | 46.70 | 30.50 | 10.65 | 5.15 | 29.70 | 16.10 | 09.25 | 4.05 | 103.30 |
| Eng. Mean | 14.64 | 11.34 | 51.03 | 31.03 | 14.32 | 5.85 | 30.94 | 16.24 | 10.15 | 4.21 | 097.41 |
| Metric Mean | 6.64 | 5.14 | 23.16 | 13.98 | 6.36 | 2.66 | 14.03 | 7.36 | 4.59 | 1.94 | 043.42 |
| Group VI .51-.75" | | | | | | | | | | | |
| 51 | 17.45 | 11.90 | 55.50 | 33.20 | 15.70 | 6.30 | 34.90 | 17.65 | 12.85 | 4.55 | 99.40 |
| 52 | 17.30 | 10.30 | 49.40 | 28.60 | 14.70 | 5.65 | 32.30 | 16.50 | 11.15 | 4.60 | 90.00 |
| 53 | 15.75 | 10.15 | 46.40 | 26.70 | 14.00 | 5.15 | 34.50 | 19.10 | 10.50 | 4.70 | 91.40 |
| 54 | 19.60 | 11.30 | 54.60 | 30.50 | 17.70 | 6.00 | 30.50 | 14.40 | 11.65 | 4.10 | 95.20 |
| 55 | 17.30 | 12.25 | 52.40 | 30.60 | 14.70 | 6.40 | 30.50 | 14.70 | 11.10 | 4.60 | 91.60 |
| 56 | 22.60 | 10.30 | 53.70 | 28.50 | 18.50 | 5.30 | 29.70 | 13.10 | 12.90 | 3.50 | 92.70 |
| 57 | 16.70 | 12.90 | 55.00 | 30.00 | 17.30 | 6.95 | 32.35 | 14.70 | 10.95 | 4.35 | 97.20 |
| 58 | 23.60 | 10.50 | 55.50 | 28.70 | 19.90 | 5.40 | 32.00 | 15.10 | 12.50 | 4.00 | 94.10 |
| 59 | 18.40 | 08.65 | 49.00 | 27.50 | 16.55 | 4.50 | 33.05 | 15.55 | 13.35 | 3.00 | 90.90 |
| 60 | 15.80 | 10.85 | 50.80 | 30.70 | 12.60 | 5.10 | 30.10 | 15.45 | 10.10 | 3.95 | 95.10 |
| Eng. Mean | 18.00 | 10.71 | 52.17 | 29.47 | 16.09 | 5.60 | 31.70 | 15.63 | 11.57 | 4.18 | 93.53 |
| Metric Mean | 8.27 | 4.95 | 23.66 | 13.46 | 7.37 | 2.56 | 14.37 | 7.09 | 5.24 | 1.90 | 42.79 |

APPENDIX III A (Continued)

| Steer No. | Wt. Fat Rnd. + Rump | Wt. Bone Rnd. + Rump | Wt. Loin | Wt. Lean Loin | Wt. Fat Loin | Wt. Bone Loin | Wt. Rib | Wt. Lean Rib | Wt. Fat Rib | Wt. Bone Rib | Wt. Chuck |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | | | |
| 61 | 18.55 | 10.75 | 52.30 | 28.75 | 17.35 | 5.60 | 33.30 | 15.65 | 13.25 | 4.10 | 92.40 |
| 62 | 18.80 | 01.65 | 53.00 | 28.50 | 18.50 | 5.10 | 33.80 | 15.60 | 13.40 | 4.40 | 104.20 |
| 63 | 20.20 | 09.90 | 54.15 | 30.80 | 16.20 | 4.90 | 30.60 | 14.65 | 12.30 | 3.52 | 98.80 |
| 64 | 20.30 | 09.50 | 50.00 | 26.60 | 19.10 | 3.95 | 30.75 | 13.20 | 13.80 | 3.45 | 90.80 |
| 65 | 15.85 | 11.40 | 50.00 | 23.00 | 17.80 | 7.20 | 35.60 | 17.25 | 13.25 | 4.65 | 99.60 |
| 66 | 20.90 | 08.40 | 46.70 | 24.60 | 17.50 | 4.10 | 35.30 | 14.45 | 16.45 | 3.90 | 89.80 |
| 67 | 21.45 | 07.80 | 50.80 | 24.85 | 21.20 | 4.10 | 33.30 | 14.30 | 15.30 | 3.30 | 86.70 |
| 68 | 17.50 | 11.70 | 43.50 | 23.30 | 13.80 | 5.10 | 28.30 | 13.10 | 11.60 | 3.75 | 89.40 |
| 69 | 22.40 | 11.10 | 55.60 | 28.90 | 19.90 | 6.10 | 34.90 | 15.00 | 14.85 | 4.60 | 84.20 |
| 70 | 19.50 | 09.85 | 48.45 | 26.60 | 16.30 | 5.20 | 28.60 | 13.60 | 10.00 | 3.75 | 84.30 |
| Eng. Mean | 19.84 | 10.30 | 51.25 | 27.52 | 17.96 | 5.16 | 32.70 | 14.73 | 13.62 | 3.94 | 92.52 |
| Metric Mean | 9.00 | 4.54 | 23.24 | 12.51 | 8.14 | 2.34 | 14.83 | 6.68 | 6.18 | 1.79 | 41.96 |
| Group VIII 1.01-1.25" | | | | | | | | | | | |
| 71 | 21.20 | 08.80 | 49.70 | 26.75 | 17.70 | 4.60 | 30.60 | 13.65 | 12.90 | 3.60 | 87.70 |
| 72 | 23.50 | 08.95 | 51.00 | 26.55 | 19.70 | 4.20 | 37.00 | 16.30 | 16.45 | 3.95 | 94.10 |
| 73 | 23.40 | 09.90 | 52.20 | 27.10 | 19.50 | 5.30 | 29.80 | 12.45 | 13.10 | 3.60 | 91.40 |
| 74 | 19.20 | 11.15 | 52.20 | 28.95 | 16.75 | 5.80 | 33.40 | 14.90 | 13.40 | 4.60 | 94.90 |
| 75 | 17.50 | 10.55 | 53.00 | 28.80 | 18.35 | 5.30 | 33.10 | 14.85 | 13.90 | 4.00 | 91.70 |
| 76 | 21.90 | 10.25 | 51.00 | 25.20 | 20.00 | 5.10 | 31.30 | 13.50 | 13.20 | 3.95 | 93.30 |
| 77 | 18.30 | 10.65 | 57.80 | 32.90 | 17.60 | 6.20 | 34.65 | 16.95 | 12.70 | 4.75 | 103.90 |
| 78 | 21.20 | 09.35 | 52.10 | 27.50 | 19.05 | 4.75 | 34.50 | 15.05 | 15.65 | 3.40 | 94.00 |
| 79 | 22.50 | 10.80 | 51.60 | 28.10 | 18.50 | 4.50 | 29.30 | 12.70 | 12.35 | 4.00 | 88.90 |
| 80 | 17.20 | 09.80 | 52.00 | 28.35 | 18.35 | 5.20 | 34.75 | 14.90 | 15.50 | 4.05 | 91.80 |
| Eng. Mean | 20.58 | 10.02 | 52.28 | 28.02 | 18.35 | 5.10 | 32.84 | 14.52 | 13.92 | 3.99 | 93.17 |
| Metric Mean | 9.34 | 4.54 | 23.70 | 12.71 | 8.41 | 2.31 | 14.89 | 6.58 | 6.31 | 1.81 | 42.25 |

APPENDIX III A (Continued)

| Steer No. | Wt. Lean Chuck | Wt. Fat Chuck | Wt. Bone Chuck | Wt. Shank | Wt. Lean Shank | Wt. Fat Shank | Wt. Bone Shank | Wt. Brisket | Wt. Lean Brisket | Wt. Fat Brisket | Wt. Bone Brisket |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.52" | | | | | | | | | | | |
| 1 | 46.10 | 12.90 | 9.70 | 8.65 | 4.20 | 1.00 | 3.25 | 11.80 | 5.60 | 4.00 | 1.40 |
| 2 | 35.50 | 19.40 | 8.40 | 9.00 | 3.75 | 1.70 | 3.60 | 13.40 | 4.00 | 8.00 | 1.40 |
| 3 | 48.90 | 17.80 | 8.70 | 7.40 | 3.55 | 1.05 | 2.65 | 13.20 | 6.00 | 5.70 | 1.30 |
| 4 | 45.90 | 14.10 | 9.90 | 7.80 | 3.15 | 1.20 | 3.40 | 11.70 | 4.80 | 5.25 | 1.50 |
| 5 | 45.20 | 17.70 | 8.95 | 8.20 | 3.85 | 1.25 | 2.95 | 12.80 | 6.10 | 5.40 | 1.20 |
| 6 | 52.55 | 15.70 | 9.90 | 8.50 | 3.80 | 1.25 | 3.30 | 10.70 | 5.30 | 4.10 | 1.15 |
| 7 | 40.75 | 15.80 | 8.32 | 8.20 | 3.60 | 1.45 | 2.90 | 11.45 | 4.90 | 5.10 | 1.20 |
| 8 | 48.60 | 14.00 | 10.20 | 10.00 | 4.90 | 1.30 | 3.60 | 10.30 | 4.80 | 3.90 | 1.40 |
| 9 | 49.00 | 13.00 | 12.10 | 10.00 | 4.24 | 1.53 | 4.10 | 07.70 | 3.66 | 2.90 | 0.96 |
| 10 | 44.10 | 13.60 | 9.60 | 8.40 | 3.75 | 1.10 | 3.30 | 11.00 | 5.40 | 4.50 | 1.00 |
| Eng. Mean | 45.66 | 15.45 | 9.58 | 8.62 | 3.88 | 1.28 | 3.30 | 11.46 | 5.00 | 4.88 | 1.25 |
| Metric Mean | 20.71 | 6.98 | 4.34 | 3.91 | 1.76 | .58 | 1.50 | 5.17 | 2.29 | 2.21 | .57 |
| Group II .51-.75" | | | | | | | | | | | |
| 11 | 39.40 | 20.35 | 8.20 | 7.70 | 3.35 | 1.10 | 3.00 | 10.80 | 4.10 | 5.60 | 0.95 |
| 12 | 40.40 | 16.75 | 7.50 | 6.90 | 3.15 | 1.20 | 2.40 | 10.75 | 4.80 | 4.70 | 1.00 |
| 13 | 39.80 | 19.90 | 7.55 | 7.10 | 3.20 | 1.05 | 2.60 | 12.80 | 5.00 | 6.60 | 1.20 |
| 14 | 44.90 | 16.55 | 9.20 | 8.00 | 3.40 | 1.35 | 3.00 | 14.30 | 6.75 | 5.80 | 1.50 |
| 15 | 36.55 | 24.50 | 8.75 | 7.95 | 3.70 | 1.25 | 3.00 | 12.05 | 4.85 | 5.80 | 1.50 |
| 16 | 46.50 | 18.20 | 10.30 | 9.40 | 4.30 | 1.48 | 3.40 | 10.70 | 4.64 | 4.48 | 1.31 |
| 17 | 34.80 | 17.00 | 7.30 | 7.50 | 3.20 | 1.30 | 2.90 | 09.50 | 3.30 | 3.30 | 2.70 |
| 18 | 37.65 | 17.65 | 8.60 | 9.60 | 4.65 | 1.45 | 3.35 | 10.50 | 3.90 | 5.30 | 1.20 |
| 19 | 42.30 | 18.40 | 8.65 | 6.90 | 3.00 | 1.00 | 2.70 | 12.30 | 4.70 | 6.65 | 0.90 |
| 20 | 42.25 | 14.80 | 9.30 | 8.50 | 3.75 | 1.20 | 3.40 | 10.30 | 4.20 | 4.70 | 1.20 |
| Eng. Mean | 40.46 | 18.41 | 8.54 | 7.96 | 3.57 | 1.24 | 2.98 | 11.40 | 4.68 | 5.29 | 1.35 |
| Metric Mean | 18.35 | 8.35 | 3.87 | 3.61 | 1.62 | 0.56 | 1.35 | 5.17 | 2.10 | 2.40 | 0.61 |
| Group III .76-1.00" | | | | | | | | | | | |
| 21 | 39.55 | 22.60 | 8.38 | 8.10 | 4.40 | 1.40 | 2.60 | 10.30 | 4.00 | 5.00 | 1.10 |
| 22 | 37.50 | 20.40 | 6.30 | 9.50 | 4.25 | 2.10 | 3.05 | 13.30 | 5.40 | 6.90 | 0.90 |
| 23 | 42.90 | 18.65 | 7.60 | 8.00 | 3.60 | 1.30 | 3.10 | 12.10 | 5.30 | 5.70 | 1.00 |
| 24 | 40.60 | 22.55 | 7.65 | 7.60 | 3.30 | 1.20 | 2.90 | 14.00 | 5.20 | 7.35 | 1.05 |
| 25 | 38.30 | 19.30 | 7.70 | 8.30 | 3.90 | 1.40 | 2.80 | 14.90 | 5.70 | 7.70 | 1.35 |
| 26 | 43.95 | 16.40 | 7.80 | 9.40 | 4.85 | 1.35 | 3.00 | 15.80 | 6.75 | 7.10 | 1.55 |
| 27 | 35.25 | 22.60 | 7.40 | 7.70 | 3.45 | 1.45 | 2.60 | 14.00 | 5.20 | 7.60 | 1.15 |
| 28 | 36.80 | 19.00 | 5.80 | 7.90 | 3.90 | 1.25 | 2.60 | 12.20 | 5.40 | 5.45 | 0.75 |
| 29 | 43.30 | 22.50 | 8.10 | 7.20 | 3.20 | 1.30 | 2.60 | 12.80 | 5.00 | 6.70 | 1.00 |
| 30 | 43.40 | 24.70 | 7.35 | 6.80 | 3.00 | 1.15 | 2.60 | 10.80 | 4.10 | 5.60 | 0.85 |
| Eng. Mean | 40.16 | 20.87 | 7.41 | 8.05 | 3.76 | 1.39 | 2.78 | 13.02 | 5.20 | 6.51 | 1.07 |
| Metric Mean | 18.21 | 9.46 | 3.36 | 3.65 | 1.70 | 0.63 | 1.26 | 5.90 | 2.36 | 2.95 | 0.48 |

APPENDIX III A (Continued)

| Steer No. | Wt. Lean Chuck | Wt. Fat Chuck | Wt. Bone Chuck | Wt. Shank | Wt. Lean Shank | Wt. Fat Shank | Wt. Bone Shank | Wt. Brisket | Wt. Lean Brisket | Wt. Fat Brisket | Wt. Bone Brisket |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | | | |
| 31 | 37.65 | 23.10 | 7.30 | 8.10 | 3.50 | 1.50 | 2.90 | 14.40 | 5.05 | 8.25 | 0.90 |
| 32 | 34.00 | 21.30 | 7.00 | 8.30 | 3.75 | 1.80 | 2.50 | 16.20 | 5.70 | 9.00 | 1.00 |
| 33 | 44.80 | 19.10 | 6.30 | 6.90 | 3.25 | 1.15 | 2.40 | 11.90 | 5.20 | 5.80 | 0.80 |
| 34 | 45.00 | 20.40 | 8.30 | 7.35 | 3.40 | 1.10 | 2.70 | 11.80 | 4.70 | 5.85 | 1.10 |
| 35 | 37.80 | 21.90 | 7.70 | 7.50 | 3.10 | 1.60 | 2.65 | 15.10 | 5.40 | 8.30 | 1.20 |
| 36 | 35.65 | 23.30 | 6.85 | 7.70 | 3.90 | 1.25 | 2.50 | 13.50 | 5.20 | 6.95 | 1.10 |
| 37 | 37.00 | 23.80 | 6.85 | 8.20 | 3.80 | 1.60 | 2.60 | 16.80 | 6.00 | 9.60 | 1.20 |
| 38 | 32.90 | 18.90 | 7.35 | 6.70 | 2.65 | 1.50 | 2.40 | 13.40 | 7.65 | 4.65 | 0.90 |
| 39 | 39.50 | 17.80 | 7.20 | 8.10 | 3.75 | 1.55 | 2.70 | 11.65 | 4.90 | 5.75 | 0.70 |
| 40 | 42.20 | 19.90 | 7.70 | 7.30 | 3.30 | 1.20 | 2.60 | 12.70 | 5.00 | 6.40 | 1.10 |
| Eng. Mean | 36.65 | 20.96 | 7.27 | 7.62 | 3.44 | 1.42 | 2.65 | 13.74 | 5.48 | 7.35 | 1.00 |
| Metric Mean | 17.53 | 9.50 | 3.29 | 2.46 | 1.56 | .64 | 1.18 | 6.23 | 2.48 | 3.20 | .45 |
| Group V .26-.50" | | | | | | | | | | | |
| 41 | 59.60 | 26.90 | 12.90 | 10.90 | 4.70 | 1.20 | 4.70 | 16.90 | 6.70 | 8.00 | 1.65 |
| 42 | 61.70 | 22.60 | 11.75 | 09.70 | 4.50 | 1.10 | 4.00 | 14.80 | 7.30 | 5.90 | 1.50 |
| 43 | 63.20 | 22.40 | 10.90 | 11.30 | 5.60 | 1.50 | 3.90 | 19.70 | 9.40 | 8.10 | 2.00 |
| 44 | 53.00 | 25.65 | 10.90 | 11.60 | 5.45 | 2.20 | 3.20 | 15.10 | 6.00 | 7.50 | 1.20 |
| 45 | 54.05 | 25.50 | 10.30 | 09.90 | 4.50 | 1.45 | 3.80 | 19.60 | 7.65 | 10.10 | 1.50 |
| 46 | 53.75 | 21.95 | 10.15 | 10.10 | 4.60 | 1.35 | 4.00 | 14.10 | 5.65 | 6.85 | 1.10 |
| 47 | 56.35 | 23.80 | 11.90 | 10.70 | 4.70 | 1.65 | 4.25 | 18.00 | 7.40 | 8.70 | 1.65 |
| 48 | 60.50 | 19.90 | 12.50 | 11.30 | 5.30 | 1.45 | 4.40 | 17.25 | 8.55 | 6.50 | 2.00 |
| 49 | 64.60 | 24.90 | 11.20 | 10.40 | 4.90 | 1.45 | 3.90 | 15.80 | 7.40 | 7.00 | 1.35 |
| 50 | 66.30 | 24.90 | 11.60 | 11.80 | 5.70 | 1.60 | 4.40 | 15.50 | 7.25 | 6.50 | 1.50 |
| Eng. Mean | 59.62 | 23.75 | 11.41 | 10.74 | 4.75 | 1.45 | 4.12 | 16.68 | 7.35 | 7.54 | 1.54 |
| Metric Mean | 27.04 | 10.82 | 5.17 | 4.87 | 2.26 | .67 | 1.87 | 7.56 | 3.33 | 3.42 | .70 |
| Group VI .51-.75" | | | | | | | | | | | |
| 51 | 61.75 | 24.15 | 12.30 | 09.90 | 4.55 | 1.35 | 3.85 | 13.80 | 5.80 | 6.60 | 1.30 |
| 52 | 58.70 | 21.70 | 11.50 | 10.20 | 4.90 | 1.30 | 3.65 | 19.70 | 7.75 | 8.60 | 1.90 |
| 53 | 55.50 | 24.90 | 10.40 | 10.70 | 4.90 | 1.30 | 4.30 | 17.70 | 7.80 | 8.20 | 1.60 |
| 54 | 56.30 | 26.70 | 11.40 | 10.80 | 4.80 | 1.90 | 4.10 | 18.20 | 7.10 | 9.00 | 1.50 |
| 55 | 56.00 | 22.40 | 12.50 | 11.65 | 5.25 | 2.05 | 4.40 | 18.70 | 8.00 | 8.65 | 1.80 |
| 56 | 52.20 | 29.40 | 10.90 | 10.60 | 4.60 | 2.00 | 3.90 | 16.15 | 6.30 | 8.70 | 1.00 |
| 57 | 62.70 | 21.60 | 13.00 | 12.00 | 5.40 | 1.80 | 4.60 | 15.40 | 7.25 | 6.40 | 1.45 |
| 58 | 54.20 | 28.80 | 10.40 | 10.50 | 4.65 | 2.00 | 3.70 | 17.95 | 6.90 | 9.30 | 1.55 |
| 59 | 53.20 | 27.20 | 09.50 | 08.70 | 4.00 | 1.60 | 3.00 | 16.90 | 6.20 | 9.10 | 1.40 |
| 60 | 60.50 | 22.20 | 11.80 | 10.70 | 5.30 | 1.20 | 3.90 | 15.10 | 7.30 | 6.10 | 1.30 |
| Eng. Mean | 57.10 | 24.90 | 11.37 | 10.66 | 4.72 | 1.65 | 3.94 | 16.96 | 7.14 | 8.08 | 1.48 |
| Metric Mean | 25.90 | 11.29 | 5.16 | 4.81 | 2.18 | .75 | 1.79 | 7.69 | 3.24 | 3.66 | .67 |

APPENDIX III A (Continued)

| Steer No. | Wt. Lean Chuck | Wt. Fat Chuck | Wt. Bone Chuck | Wt. Shank | Wt. Lean Shank | Wt. Fat Shank | Wt. Bone Shank | Wt. Brisket | Wt. Lean Brisket | Wt. Fat Brisket | Wt. Bone Brisket |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | | | |
| 61 | 56.20 | 24.40 | 11.00 | 10.20 | 4.40 | 1.60 | 3.95 | 15.50 | 6.45 | 7.50 | 1.40 |
| 62 | 59.25 | 32.70 | 11.30 | 09.60 | 4.40 | 1.40 | 3.80 | 18.40 | 7.15 | 9.00 | 2.15 |
| 63 | 59.30 | 27.90 | 10.50 | 10.30 | 4.60 | 2.10 | 3.60 | 16.30 | 6.90 | 8.30 | 1.10 |
| 64 | 49.05 | 31.70 | 09.50 | 11.10 | 4.90 | 2.40 | 3.65 | 17.80 | 5.65 | 10.70 | 1.10 |
| 65 | 59.90 | 26.10 | 13.60 | 09.90 | 4.30 | 1.30 | 4.25 | 13.30 | 5.30 | 6.60 | 1.25 |
| 66 | 47.35 | 33.20 | 08.30 | 11.10 | 5.00 | 2.40 | 3.60 | 20.20 | 7.00 | 11.55 | 1.15 |
| 67 | 47.20 | 29.55 | 08.40 | 10.10 | 4.60 | 2.20 | 3.05 | 22.50 | 7.90 | 12.90 | 1.35 |
| 68 | 53.50 | 24.40 | 10.45 | 11.80 | 5.60 | 1.70 | 4.20 | 18.30 | 7.20 | 9.40 | 1.50 |
| 69 | 47.90 | 24.80 | 10.50 | 12.20 | 5.20 | 2.85 | 4.00 | 19.20 | 6.85 | 10.30 | 1.65 |
| 70 | 55.35 | 22.80 | 10.55 | 10.50 | 5.20 | 1.50 | 3.80 | 15.85 | 7.30 | 7.00 | 1.35 |
| Eng. Mean | 53.50 | 27.76 | 10.41 | 10.68 | 4.82 | 1.94 | 3.79 | 17.74 | 6.77 | 9.32 | 1.40 |
| Metric Mean | 24.26 | 12.59 | 4.72 | 4.84 | 2.18 | .88 | 1.72 | 8.04 | 3.07 | 4.23 | .63 |
| Group VIII 1.01-1.25" | | | | | | | | | | | |
| 71 | 50.70 | 27.60 | 07.80 | 10.50 | 4.90 | 2.30 | 3.05 | 15.80 | 6.40 | 07.90 | 1.00 |
| 72 | 52.70 | 31.50 | 09.50 | 09.30 | 3.90 | 2.00 | 3.25 | 13.30 | 5.15 | 06.90 | 1.00 |
| 73 | 52.00 | 28.85 | 10.10 | 10.90 | 4.50 | 2.30 | 3.80 | 21.50 | 7.20 | 12.35 | 1.50 |
| 74 | 55.50 | 26.50 | 12.20 | 09.60 | 4.30 | 1.35 | 3.90 | 13.30 | 5.80 | 06.50 | 1.00 |
| 75 | 54.95 | 24.90 | 10.70 | 11.10 | 5.10 | 2.10 | 3.85 | 16.90 | 7.70 | 08.00 | 1.05 |
| 76 | 52.30 | 29.20 | 10.60 | 09.70 | 4.10 | 1.80 | 3.60 | 16.70 | 6.00 | 09.20 | 1.20 |
| 77 | 60.40 | 30.60 | 11.55 | 10.00 | 4.20 | 1.60 | 4.10 | 15.60 | 6.50 | 07.30 | 1.70 |
| 78 | 53.20 | 30.85 | 09.05 | 10.75 | 4.50 | 2.55 | 3.50 | 15.70 | 6.25 | 08.30 | 0.90 |
| 79 | 50.50 | 26.50 | 11.20 | 10.40 | 4.40 | 2.00 | 4.00 | 18.80 | 6.55 | 10.80 | 1.35 |
| 80 | 52.60 | 28.30 | 10.05 | 09.80 | 4.50 | 3.45 | 1.85 | 19.80 | 7.60 | 10.40 | 1.50 |
| Eng. Mean | 53.48 | 28.40 | 10.28 | 10.20 | 4.44 | 2.14 | 3.49 | 16.74 | 6.52 | 8.76 | 1.22 |
| Metric Mean | 24.25 | 12.92 | 4.66 | 4.62 | 2.01 | .97 | 1.58 | 7.59 | 2.96 | 3.97 | .55 |

APPENDIX III A (Continued)

| Steer No. | Wt. Plate | Wt. Lean Plate | Wt. Fat Plate | Wt. Bone Plate | Wt. Flank | Wt. Lean Flank | Wt. Fat Flank | Wt. Bone Flank | Wt. Kidney Knob |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 21.00 | 10.75 | 7.00 | 2.40 | 16.70 | 8.55 | 08.10 | .10 | 7.70 |
| 2 | 22.20 | 09.00 | 11.00 | 2.20 | 21.00 | 7.70 | 13.20 | .10 | 9.60 |
| 3 | 20.60 | 09.80 | 8.80 | 1.75 | 19.05 | 8.50 | 10.50 | .05 | 10.80 |
| 4 | 18.60 | 08.60 | 7.30 | 2.35 | 18.50 | 8.30 | 10.10 | .10 | 7.60 |
| 5 | 20.30 | 09.20 | 9.00 | 1.95 | 23.40 | 9.40 | 13.70 | .10 | 7.90 |
| 6 | 18.00 | 09.40 | 6.40 | 2.10 | 16.40 | 8.10 | 08.15 | .05 | 6.80 |
| 7 | 18.75 | 08.90 | 7.60 | 1.60 | 17.50 | 6.50 | 10.80 | .10 | 7.90 |
| 8 | 21.90 | 11.10 | 7.80 | 2.60 | 16.50 | 7.40 | 09.00 | .10 | 8.50 |
| 9 | 18.10 | 09.80 | 5.15 | 2.50 | 14.75 | 8.10 | 06.50 | .20 | 5.10 |
| 10 | 21.10 | 10.55 | 7.65 | 2.40 | 16.90 | 7.70 | 09.05 | .05 | 6.40 |
| Eng. Mean | 20.06 | 9.71 | 7.77 | 2.18 | 18.07 | 8.02 | 09.91 | .10 | 7.63 |
| Metric Mean | 9.10 | 4.40 | 3.52 | .99 | 8.20 | 3.64 | 04.49 | .04 | 3.55 |
| Group II .51-.75" | | | | | | | | | |
| 11 | 24.20 | 09.45 | 12.05 | 2.40 | 22.80 | 7.60 | 15.00 | .10 | 11.90 |
| 12 | 22.60 | 10.60 | 09.60 | 1.90 | 23.30 | 9.20 | 13.00 | .05 | 06.40 |
| 13 | 23.00 | 08.50 | 12.20 | 1.80 | 25.30 | 8.30 | 16.70 | .10 | 13.90 |
| 14 | 20.60 | 08.40 | 09.70 | 2.10 | 22.40 | 8.25 | 13.15 | .10 | 10.10 |
| 15 | 21.30 | 09.00 | 09.70 | 2.10 | 22.40 | 8.80 | 13.30 | .20 | 11.00 |
| 16 | 24.00 | 11.30 | 09.85 | 2.05 | 18.20 | 7.60 | 10.40 | .10 | 12.70 |
| 17 | 21.40 | 11.00 | 07.80 | 1.90 | 22.50 | 7.90 | 14.15 | .12 | 13.30 |
| 18 | 23.80 | 09.60 | 11.40 | 2.80 | 22.00 | 7.90 | 13.80 | .10 | 14.30 |
| 19 | 21.50 | 10.30 | 09.20 | 1.70 | 22.30 | 9.25 | 13.20 | .05 | 15.20 |
| 20 | 19.40 | 09.10 | 08.20 | 2.00 | 16.50 | 7.50 | 08.90 | .10 | 08.40 |
| Eng. Mean | 22.18 | 9.72 | 09.97 | 2.08 | 21.77 | 8.30 | 13.16 | .10 | 11.72 |
| Metric Mean | 10.06 | 4.41 | 04.52 | .94 | 9.87 | 3.76 | 5.97 | .04 | 5.32 |
| Group III .76-1.00" | | | | | | | | | |
| 21 | 23.80 | 08.10 | 12.60 | 1.30 | 27.60 | 8.70 | 18.45 | .10 | 09.30 |
| 22 | 22.00 | 08.50 | 11.05 | 1.55 | 24.10 | 7.72 | 15.60 | .10 | 12.40 |
| 23 | 23.90 | 10.00 | 11.40 | 2.00 | 22.90 | 9.10 | 12.60 | .10 | 12.10 |
| 24 | 23.80 | 09.20 | 12.40 | 1.75 | 22.00 | 7.40 | 14.40 | .05 | 10.60 |
| 25 | 22.00 | 09.60 | 10.10 | 1.90 | 25.20 | 8.60 | 16.50 | .02 | 11.50 |
| 26 | 23.50 | 10.60 | 10.00 | 2.10 | 21.60 | 7.05 | 14.20 | .05 | 10.00 |
| 27 | 24.50 | 07.90 | 14.60 | 1.80 | 21.60 | 5.80 | 15.70 | .05 | 17.50 |
| 28 | 23.70 | 09.90 | 11.40 | 1.60 | 22.75 | 7.05 | 15.30 | .05 | 14.90 |
| 29 | 23.20 | 10.20 | 10.90 | 1.80 | 21.30 | 7.90 | 13.30 | .10 | 13.20 |
| 30 | 24.00 | 08.80 | 12.65 | 1.85 | 27.35 | 8.50 | 18.50 | .10 | 11.50 |
| Eng. Mean | 23.44 | 9.28 | 11.71 | 1.79 | 23.64 | 7.78 | 15.48 | .07 | 12.30 |
| Metric Mean | 10.63 | 04.21 | 5.31 | .80 | 10.72 | 3.53 | 7.01 | .03 | 5.58 |

APPENDIX III A (Continued)

| Steer No. | Wt. Plate | Wt. Lean Plate | Wt. Fat Plate | Wt. Bone Plate | Wt. Flank | Wt. Lean Flank | Wt. Fat Flank | Wt. Bone Flank | Wt. Kidney Fleb |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 23.90 | 7.70 | 14.10 | 1.75 | 25.30 | 7.40 | 17.50 | .03 | 15.00 |
| 32 | 22.60 | 8.70 | 11.50 | 1.70 | 21.00 | 6.70 | 13.60 | .05 | 11.75 |
| 33 | 23.20 | 10.60 | 10.50 | 1.70 | 22.30 | 8.10 | 13.90 | .10 | 13.20 |
| 34 | 23.00 | 9.90 | 11.30 | 2.20 | 24.60 | 8.85 | 15.05 | .10 | 15.50 |
| 35 | 20.30 | 7.40 | 10.65 | 1.90 | 21.40 | 6.90 | 14.30 | .10 | 12.10 |
| 36 | 21.40 | 7.60 | 11.80 | 1.50 | 22.00 | 6.00 | 16.60 | .10 | 11.00 |
| 37 | 23.20 | 6.85 | 14.55 | 1.70 | 24.00 | 7.05 | 16.25 | .15 | 14.70 |
| 38 | 19.00 | 6.65 | 10.60 | 1.45 | 16.25 | 5.00 | 11.30 | .05 | 09.50 |
| 39 | 21.45 | 9.80 | 09.70 | 1.60 | 22.70 | 7.80 | 14.40 | .50 | 14.30 |
| 40 | 19.70 | 8.60 | 09.00 | 1.85 | 22.40 | 7.60 | 14.60 | .05 | 11.60 |
| Eng. Mean | 21.80 | 8.38 | 11.37 | 1.74 | 22.60 | 7.14 | 15.07 | .12 | 12.80 |
| Metric Mean | 9.91 | 3.80 | 5.16 | .79 | 10.25 | 3.24 | 6.83 | .05 | 5.80 |
| Group V .76-.50" | | | | | | | | | |
| 41 | 35.70 | 13.10 | 17.70 | 3.70 | 33.60 | 11.65 | 21.75 | .10 | 16.70 |
| 42 | 38.70 | 15.40 | 13.70 | 3.15 | 28.90 | 12.10 | 14.50 | .10 | 17.20 |
| 43 | 33.50 | 16.70 | 12.50 | 4.00 | 26.80 | 12.40 | 13.50 | .20 | 08.90 |
| 44 | 33.40 | 13.10 | 16.95 | 3.10 | 27.40 | 08.80 | 18.10 | .10 | 14.90 |
| 45 | 33.30 | 13.00 | 17.10 | 2.75 | 26.60 | 08.90 | 17.50 | .10 | 11.10 |
| 46 | 31.40 | 12.90 | 15.10 | 3.00 | 26.20 | 09.30 | 16.65 | .20 | 16.40 |
| 47 | 31.40 | 14.00 | 14.15 | 2.90 | 23.70 | 08.80 | 14.70 | .10 | 13.90 |
| 48 | 26.80 | 13.75 | 09.40 | 3.40 | 25.20 | 11.30 | 13.60 | .15 | 19.80 |
| 49 | 32.80 | 14.75 | 14.50 | 3.10 | 27.50 | 11.60 | 15.60 | .10 | 12.50 |
| 50 | 30.80 | 14.65 | 12.60 | 3.30 | 26.20 | 12.25 | 13.70 | .10 | 13.60 |
| Eng. Mean | 32.18 | 14.16 | 14.37 | 3.24 | 27.16 | 10.71 | 16.16 | .12 | 14.52 |
| Metric Mean | 14.59 | 6.42 | 6.52 | 1.47 | 12.32 | 4.86 | 7.33 | .05 | 6.58 |
| Group VI .51-.75" | | | | | | | | | |
| 51 | 29.30 | 11.60 | 14.40 | 2.90 | 29.00 | 10.90 | 17.80 | .10 | 13.20 |
| 52 | 30.80 | 13.60 | 13.30 | 2.90 | 29.40 | 12.00 | 17.10 | .10 | 21.20 |
| 53 | 33.60 | 15.35 | 15.10 | 2.70 | 25.70 | 09.80 | 15.60 | .08 | 19.20 |
| 54 | 31.20 | 12.00 | 15.30 | 3.10 | 31.40 | 10.40 | 20.40 | .10 | 16.20 |
| 55 | 30.30 | 12.80 | 13.80 | 3.50 | 30.20 | 11.80 | 18.00 | .10 | 12.25 |
| 56 | 29.90 | 10.70 | 16.00 | 2.90 | 33.80 | 09.90 | 23.55 | .15 | 15.75 |
| 57 | 30.80 | 13.80 | 13.35 | 3.45 | 28.80 | 11.25 | 17.15 | .10 | 21.60 |
| 58 | 30.20 | 12.60 | 14.65 | 2.60 | 30.20 | 10.00 | 19.80 | .10 | 16.60 |
| 59 | 35.50 | 12.20 | 20.20 | 2.60 | 33.10 | 09.70 | 22.80 | .10 | 14.00 |
| 60 | 27.70 | 13.20 | 11.80 | 2.90 | 26.90 | 10.00 | 16.60 | .05 | 11.70 |
| Eng. Mean | 30.87 | 12.76 | 14.73 | 2.90 | 29.65 | 10.58 | 18.78 | .10 | 16.47 |
| Metric Mean | 14.00 | 5.80 | 6.68 | 1.34 | 13.54 | 4.80 | 8.56 | .04 | 7.33 |

APPENDIX III A (Continued)

| Steer No. | Wt. Plate | Wt. Lean Plate | Wt. Fat Plate | Wt. Bone Plate | Wt. Flank | Wt. Lean Flank | Wt. Fat Flank | Wt. Bone Flank | Wt. Kidney Knob |
|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | |
| 61 | 31.30 | 11.70 | 16.15 | 2.90 | 31.50 | 10.30 | 20.75 | .10 | 13.70 |
| 62 | 37.90 | 14.00 | 20.00 | 2.90 | 33.70 | 11.60 | 21.75 | .10 | 15.80 |
| 63 | 27.00 | 11.10 | 13.00 | 2.30 | 26.30 | 09.70 | 16.50 | .05 | 09.05 |
| 64 | 34.00 | 12.70 | 18.20 | 2.50 | 30.70 | 09.30 | 21.00 | .05 | 13.00 |
| 65 | 31.60 | 13.00 | 14.90 | 3.40 | 30.30 | 10.50 | 19.70 | .10 | 11.90 |
| 66 | 32.10 | 11.75 | 17.60 | 2.30 | 35.30 | 10.70 | 24.50 | .10 | 14.20 |
| 67 | 29.40 | 10.00 | 17.00 | 1.80 | 30.60 | 09.10 | 21.30 | .10 | 10.40 |
| 68 | 27.50 | 10.70 | 13.80 | 2.30 | 31.50 | 10.90 | 19.85 | .10 | 22.40 |
| 69 | 34.60 | 13.60 | 17.80 | 2.75 | 31.40 | 09.50 | 21.45 | .10 | 13.50 |
| 70 | 28.80 | 12.00 | 13.70 | 2.80 | 29.00 | 09.40 | 19.30 | .10 | 16.00 |
| Eng. Mean | 31.42 | 12.06 | 16.22 | 2.60 | 31.03 | 10.10 | 20.61 | .09 | 14.80 |
| Metric Mean | 14.25 | 5.47 | 7.36 | 1.18 | 14.07 | 4.58 | 9.35 | .04 | 6.71 |
| Group VIII 1.01-1.25" | | | | | | | | | |
| 71 | 27.70 | 10.60 | 14.40 | 2.10 | 31.75 | 10.25 | 21.00 | .10 | 14.80 |
| 72 | 35.80 | 14.65 | 18.10 | 2.55 | 32.80 | 10.45 | 22.00 | .10 | 14.80 |
| 73 | 32.40 | 10.50 | 18.80 | 2.50 | 39.90 | 11.30 | 27.80 | .15 | 18.30 |
| 74 | 31.80 | 11.35 | 17.10 | 2.90 | 29.00 | 0..15 | 19.35 | .10 | 13.90 |
| 75 | 33.90 | 14.10 | 16.30 | 2.70 | 32.90 | 11.30 | 21.00 | .15 | 13.80 |
| 76 | 35.10 | 11.80 | 20.30 | 2.50 | 28.20 | 08.30 | 19.80 | .05 | 16.00 |
| 77 | 32.40 | 14.90 | 13.80 | 2.90 | 29.90 | 10.90 | 18.60 | .20 | 17.60 |
| 78 | 29.90 | 11.30 | 15.35 | 2.40 | 27.00 | 09.30 | 17.30 | .05 | 13.30 |
| 79 | 31.80 | 11.20 | 17.10 | 2.75 | 32.65 | 09.40 | 23.00 | .10 | 17.00 |
| 80 | 31.40 | 11.60 | 16.40 | 2.50 | 30.80 | 09.40 | 21.20 | .10 | 15.00 |
| Eng. Mean | 32.22 | 12.20 | 16.78 | 2.58 | 31.49 | 09.98 | 21.10 | .11 | 15.45 |
| Metric Mean | 14.61 | 5.53 | 7.61 | 1.17 | 14.28 | 4.53 | 9.57 | .05 | 7.01 |

APPENDIX III A (Continued)

| Steer No. | Wt. Fat Kidney Knob | Wt. Bone Kidney Knob | Total Wt. Left Side | Total Lean | Total Fat | Total Bone |
|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | |
| 1 | 6.70 | 1.00 | 259.25 | 156.95 | 62.90 | 34.60 |
| 2 | 8.60 | 1.00 | 258.90 | 125.15 | 98.10 | 33.05 |
| 3 | 9.80 | 1.00 | 268.45 | 153.30 | 81.50 | 31.05 |
| 4 | 6.90 | 0.70 | 257.00 | 146.95 | 72.00 | 35.40 |
| 5 | 7.00 | 0.90 | 264.75 | 149.00 | 82.55 | 31.57 |
| 6 | 5.90 | 0.90 | 264.80 | 159.35 | 66.20 | 36.40 |
| 7 | 7.00 | 0.90 | 248.55 | 135.40 | 79.55 | 28.87 |
| 8 | 7.50 | 1.00 | 268.90 | 159.00 | 69.55 | 37.70 |
| 9 | 4.00 | 1.00 | 255.75 | 153.73 | 54.93 | 42.05 |
| 10 | 5.40 | 1.00 | 258.50 | 151.05 | 67.50 | 35.30 |
| Eng. Mean | 6.88 | 0.94 | 263.48 | 148.98 | 73.48 | 34.66 |
| Metric Mean | 3.12 | 0.43 | 118.13 | 67.56 | 33.32 | 15.69 |
| Group II .51-.75" | | | | | | |
| 11 | 11.20 | 0.70 | 267.60 | 131.30 | 102.95 | 30.05 |
| 12 | 05.60 | 0.80 | 261.95 | 142.50 | 087.25 | 27.65 |
| 13 | 13.20 | 0.70 | 272.90 | 135.00 | 104.70 | 28.60 |
| 14 | 09.30 | 0.80 | 270.70 | 144.85 | 089.75 | 32.25 |
| 15 | 10.00 | 1.00 | 264.30 | 132.35 | 097.55 | 32.85 |
| 16 | 11.70 | 1.00 | 269.55 | 145.79 | 085.66 | 34.56 |
| 17 | 12.30 | 1.00 | 255.20 | 126.15 | 091.37 | 31.00 |
| 18 | 13.30 | 1.00 | 269.05 | 130.85 | 100.50 | 33.80 |
| 19 | 14.20 | 1.00 | 271.90 | 140.05 | 099.20 | 30.45 |
| 20 | 07.50 | 0.90 | 251.95 | 140.40 | 074.65 | 32.75 |
| Eng. Mean | 10.83 | 0.89 | 265.51 | 136.92 | 93.36 | 31.40 |
| Metric Mean | 4.91 | 0.40 | 120.41 | 62.10 | 42.34 | 14.24 |
| Group III .76-1.00" | | | | | | |
| 21 | 08.50 | .80 | 277.70 | 135.17 | 107.91 | 28.60 |
| 22 | 11.80 | .60 | 270.50 | 132.22 | 104.67 | 26.88 |
| 23 | 11.15 | .95 | 266.80 | 141.76 | 089.90 | 29.53 |
| 24 | 09.90 | .80 | 275.00 | 134.35 | 107.75 | 29.05 |
| 25 | 10.70 | .80 | 272.85 | 135.70 | 104.30 | 28.82 |
| 26 | 09.20 | .80 | 268.50 | 143.60 | 089.30 | 30.20 |
| 27 | 16.60 | .90 | 271.20 | 119.75 | 121.80 | 27.90 |
| 28 | 14.10 | .80 | 267.85 | 131.20 | 106.25 | 24.70 |
| 29 | 12.30 | .90 | 273.85 | 138.30 | 105.15 | 28.05 |
| 30 | 10.70 | .80 | 277.75 | 134.80 | 111.70 | 26.90 |
| Eng. Mean | 11.50 | .82 | 272.20 | 134.68 | 104.67 | 28.06 |
| Metric Mean | 5.22 | .37 | 123.45 | 61.08 | 47.56 | 12.72 |

APPENDIX III A (Continued)

| Steer No. | Wt. Fat Kidney Knob | Wt. Bone Kidney Knob | Total Wt. Left Side | Total Lean | Total Fat | Total Bone |
|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | |
| 31 | 14.20 | .80 | 280.65 | 124.10 | 123.45 | 28.33 |
| 32 | 11.10 | .65 | 267.15 | 124.10 | 111.45 | 25.50 |
| 33 | 12.40 | .80 | 271.55 | 147.45 | 096.66 | 25.40 |
| 34 | 14.90 | .90 | 279.80 | 142.55 | 103.85 | 29.80 |
| 35 | 10.30 | .80 | 266.60 | 123.30 | 111.95 | 28.70 |
| 36 | 10.10 | .90 | 265.00 | 123.10 | 113.80 | 25.70 |
| 37 | 14.00 | .70 | 278.90 | 125.00 | 125.05 | 26.60 |
| 38 | 09.00 | .50 | 243.55 | 115.05 | 100.85 | 26.25 |
| 39 | 13.35 | .95 | 265.05 | 136.45 | 097.30 | 28.35 |
| 40 | 10.70 | .90 | 261.35 | 135.85 | 095.65 | 27.60 |
| Eng. Mean | 12.00 | .77 | 267.76 | 130.70 | 107.00 | 27.22 |
| Metric Mean | 5.44 | .36 | 121.52 | 58.82 | 48.98 | 12.34 |
| Group V .26-.50" | | | | | | |
| 41 | 15.40 | 1.30 | 372.95 | 189.80 | 131.15 | 47.50 |
| 42 | 16.25 | 0.95 | 358.85 | 197.50 | 115.90 | 42.30 |
| 43 | 08.00 | 0.90 | 363.25 | 211.05 | 105.50 | 43.20 |
| 44 | 13.90 | 1.00 | 350.30 | 179.70 | 125.60 | 41.70 |
| 45 | 10.30 | 0.80 | 306.85 | 178.90 | 124.95 | 40.00 |
| 46 | 15.50 | 0.90 | 350.90 | 187.55 | 119.50 | 40.70 |
| 47 | 12.90 | 1.00 | 346.50 | 187.90 | 112.90 | 42.80 |
| 48 | 08.80 | 1.00 | 345.75 | 203.95 | 092.25 | 47.15 |
| 49 | 11.60 | 0.90 | 355.60 | 198.30 | 113.85 | 41.05 |
| 50 | 12.60 | 1.20 | 353.10 | 202.55 | 105.30 | 42.70 |
| Eng. Mean | 12.52 | 1.00 | 334.04 | 192.72 | 114.69 | 42.91 |
| Metric Mean | 5.68 | 0.45 | 160.70 | 87.85 | 52.01 | 19.46 |
| Group VI .51-.75" | | | | | | |
| 51 | 18.10 | 1.10 | 363.80 | 191.80 | 121.90 | 44.30 |
| 52 | 20.10 | 1.10 | 360.20 | 189.55 | 125.25 | 41.30 |
| 53 | 18.10 | 1.00 | 350.30 | 187.35 | 123.45 | 40.08 |
| 54 | 15.40 | 0.80 | 365.70 | 181.20 | 137.65 | 42.40 |
| 55 | 11.20 | 1.25 | 359.20 | 190.04 | 121.40 | 46.60 |
| 56 | 14.75 | 0.90 | 360.60 | 171.10 | 148.50 | 38.85 |
| 57 | 20.60 | 1.20 | 372.45 | 196.80 | 131.55 | 47.70 |
| 58 | 15.70 | 0.80 | 365.65 | 176.70 | 146.25 | 39.15 |
| 59 | 13.20 | 0.80 | 351.65 | 171.15 | 142.40 | 34.35 |
| 60 | 13.80 | 0.70 | 345.10 | 173.00 | 137.60 | 41.05 |
| Eng. Mean | 15.80 | 0.95 | 355.76 | 180.80 | 135.78 | 41.75 |
| Metric Mean | 6.69 | 0.44 | 163.16 | 83.41 | 59.63 | 18.86 |

APPENDIX III A (Continued)

| Steer No. | Wt. Fat Kidney Knob | Wt. Lone Kidney Knob | Total Wt. Left Side | Total Lean | Total Fat | Total Bone |
|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | |
| 61 | 12.60 | 1.10 | 355.20 | 178.75 | 130.15 | 40.90 |
| 62 | 14.80 | 1.00 | 382.10 | 187.30 | 150.35 | 40.70 |
| 63 | 08.25 | 0.80 | 342.90 | 182.75 | 126.75 | 36.67 |
| 64 | 11.80 | 1.20 | 350.25 | 182.90 | 144.00 | 34.90 |
| 65 | 11.10 | 0.60 | 365.00 | 190.55 | 126.60 | 46.65 |
| 66 | 13.20 | 0.90 | 355.10 | 181.05 | 137.30 | 32.75 |
| 67 | 17.70 | 0.70 | 358.90 | 158.35 | 161.60 | 38.60 |
| 68 | 21.50 | 0.90 | 349.70 | 169.55 | 133.55 | 40.00 |
| 69 | 12.50 | 1.00 | 365.10 | 172.05 | 146.85 | 41.80 |
| 70 | 15.20 | 0.80 | 344.00 | 176.25 | 127.20 | 38.20 |
| Eng. Mean | 13.66 | 0.92 | 357.22 | 174.70 | 141.14 | 38.32 |
| Metric Mean | 6.28 | 0.42 | 162.00 | 78.91 | 64.01 | 17.38 |
| Group VIII 1.01-1.25" | | | | | | |
| 71 | 14.00 | 0.80 | 340.55 | 165.25 | 139.00 | 31.85 |
| 72 | 13.80 | 1.00 | 362.90 | 171.15 | 153.95 | 34.50 |
| 73 | 17.70 | 0.60 | 374.40 | 168.75 | 163.80 | 37.45 |
| 74 | 13.10 | 0.80 | 351.10 | 178.80 | 133.25 | 42.45 |
| 75 | 12.90 | 0.70 | 360.20 | 181.90 | 134.95 | 39.20 |
| 76 | 15.20 | 0.60 | 358.60 | 165.95 | 150.60 | 38.05 |
| 77 | 16.70 | 1.00 | 379.65 | 195.35 | 137.20 | 43.05 |
| 78 | 12.50 | 0.80 | 351.50 | 170.15 | 142.95 | 34.20 |
| 79 | 16.10 | 0.90 | 360.25 | 168.45 | 148.85 | 39.60 |
| 80 | 14.10 | 0.90 | 355.15 | 171.60 | 144.10 | 35.95 |
| Eng. Mean | 14.61 | 0.83 | 360.13 | 173.74 | 144.94 | 37.63 |
| Metric Mean | 6.62 | 0.38 | 163.32 | 78.79 | 65.73 | 17.06 |

APPENDIX III B [illegible] 6-7-8th, 9-10-11th, AND 12th RIB SECTIONS

| Steer No. | 9-10-11th Lean | 9-10-11th Fat | 9-10-11th Bone | 6-7-8th Lean | 6-7-8th Fat | 6-7-8th Bone | 12th Rib Lean | 12th Rib Fat | 12th Rib Bone |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 4.10 | 2.20 | 1.30 | 7.40 | 2.85 | 2.10 | 1.15 | 0.75 | .35 |
| 2 | 3.70 | 3.20 | 1.25 | 4.95 | 3.40 | 1.65 | 1.35 | 1.30 | .45 |
| 3 | 5.55 | 3.15 | 1.30 | 6.10 | 3.50 | 1.55 | 2.20 | 1.50 | .40 |
| 4 | 4.75 | 2.70 | 1.40 | 6.20 | 2.50 | 1.75 | 1.25 | 0.95 | .40 |
| 5 | 4.90 | 2.95 | 1.40 | 6.75 | 3.55 | 1.80 | 1.60 | 1.15 | .35 |
| 6 | 5.20 | 2.50 | 1.70 | 6.50 | 2.40 | 1.80 | 1.90 | 1.10 | .50 |
| 7 | 4.50 | 3.35 | 1.20 | 5.50 | 2.90 | 1.70 | 1.60 | 1.35 | .40 |
| 8 | 4.70 | 2.90 | 1.50 | 6.30 | 2.50 | 1.60 | 1.60 | 1.10 | .50 |
| 9 | 4.76 | 1.88 | 1.52 | 5.15 | 1.72 | 1.97 | 1.22 | 0.55 | .40 |
| 10 | 4.80 | 2.50 | 1.40 | 7.80 | 2.80 | 2.00 | 1.90 | 1.10 | .55 |
| Eng. Mean | 4.70 | 2.76 | 1.40 | 6.28 | 2.81 | 1.81 | 1.58 | 1.08 | .43 |
| Metric Mean | 2.13 | 1.25 | .63 | 2.84 | 1.27 | .82 | .72 | .49 | .20 |
| Group II .51-.75" | | | | | | | | | |
| 11 | 4.40 | 4.50 | 1.10 | 5.40 | 4.15 | 1.55 | 1.50 | 1.60 | .30 |
| 12 | 4.60 | 3.80 | 1.25 | 6.90 | 3.70 | 1.60 | 1.65 | 1.55 | .35 |
| 13 | 4.30 | 4.60 | 1.30 | 6.00 | 4.20 | 1.60 | 1.80 | 2.20 | .35 |
| 14 | 4.90 | 3.60 | 1.50 | 6.25 | 3.60 | 1.90 | 2.10 | 1.80 | .40 |
| 15 | 4.50 | 3.80 | 1.60 | 5.80 | 3.90 | 1.80 | 1.30 | 1.30 | .40 |
| 16 | 4.50 | 3.50 | 1.60 | 5.70 | 3.40 | 1.80 | 1.50 | 1.20 | .50 |
| 17 | 4.00 | 3.45 | 1.10 | 5.25 | 3.80 | 1.55 | 1.20 | 1.40 | .38 |
| 18 | 4.25 | 3.70 | 1.40 | 5.10 | 3.10 | 1.70 | 1.50 | 1.55 | .50 |
| 19 | 5.00 | 4.00 | 1.50 | 7.05 | 3.60 | 2.00 | 2.50 | 2.15 | .50 |
| 20 | 4.20 | 2.57 | 1.16 | 5.22 | 2.23 | 1.32 | 1.96 | 0.98 | .42 |
| Eng. Mean | 4.46 | 3.75 | 1.35 | 5.87 | 3.57 | 1.68 | 1.70 | 1.57 | .41 |
| Metric Mean | 2.02 | 1.70 | .61 | 2.66 | 1.62 | .76 | .77 | .71 | .18 |
| Group III .76-1.00 | | | | | | | | | |
| 21 | 4.40 | 4.05 | 1.20 | 5.10 | 4.50 | 1.40 | 1.80 | 1.90 | .40 |
| 22 | 4.35 | 4.17 | 1.58 | 5.75 | 3.90 | 1.50 | 1.80 | 1.95 | .35 |
| 23 | 5.26 | 3.90 | 1.33 | 6.10 | 3.20 | 1.70 | 2.30 | 1.90 | .40 |
| 24 | 4.10 | 4.15 | 1.20 | 6.10 | 4.60 | 1.55 | 2.05 | 2.80 | .40 |
| 25 | 4.20 | 4.10 | 1.20 | 5.75 | 4.10 | 1.60 | 2.50 | 2.60 | .40 |
| 26 | 4.60 | 3.15 | 1.30 | 5.30 | 3.00 | 1.70 | 1.80 | 1.60 | .30 |
| 27 | 3.50 | 5.70 | 1.20 | 5.60 | 5.70 | 1.70 | 1.45 | 2.15 | .40 |
| 28 | 3.35 | 3.40 | 1.20 | 7.95 | 5.55 | 1.65 | 2.30 | 3.10 | .40 |
| 29 | 4.50 | 3.90 | 1.25 | 5.90 | 4.00 | 1.50 | 2.00 | 2.05 | .40 |
| 30 | 4.40 | 4.20 | 1.35 | 5.80 | 4.10 | 1.50 | 1.80 | 2.10 | .40 |
| Eng. Mean | 4.27 | 4.07 | 1.28 | 5.94 | 4.26 | 1.58 | 1.95 | 2.22 | .38 |
| Metric Mean | 1.94 | 1.84 | .58 | 2.69 | 1.93 | .72 | .90 | 1.01 | .17 |

APPENDIX III B (Continued)

| Steer No. | 9-10-11th Lean | 9-10-11th Fat | 9-10-11th Bone | 6-7-8th Lean | 6-7-8th Fat | 6-7-8th Bone | 12th Rib Lean | 12th Rib Fat | 12th Rib Bone |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 4.20 | 5.55 | 1.15 | 5.10 | 4.80 | 1.45 | 1.60 | 2.50 | .40 |
| 32 | 4.60 | 4.70 | 1.10 | 5.85 | 4.50 | 1.30 | 1.20 | 1.65 | .30 |
| 33 | 5.40 | 3.80 | 1.20 | 6.70 | 3.90 | 1.40 | 2.15 | 1.91 | .35 |
| 34 | 4.75 | 4.00 | 1.25 | 6.70 | 3.90 | 1.60 | 2.05 | 2.25 | .40 |
| 35 | 3.70 | 5.30 | 1.20 | 6.00 | 5.20 | 1.70 | 1.30 | 1.90 | .40 |
| 36 | 4.10 | 4.85 | 1.00 | 5.40 | 5.30 | 1.30 | 1.70 | 2.50 | .35 |
| 37 | 3.15 | 4.90 | 1.00 | 5.15 | 5.70 | 1.50 | 1.20 | 2.20 | .45 |
| 38 | 3.80 | 4.90 | 1.10 | 5.10 | 4.00 | 1.45 | 1.30 | 2.00 | .35 |
| 39 | 4.20 | 3.70 | 1.30 | 6.40 | 3.40 | 1.70 | 2.10 | 2.25 | .40 |
| 40 | 3.95 | 3.70 | 1.10 | 5.10 | 3.35 | 1.35 | 1.60 | 1.65 | .40 |
| Eng. Mean | 4.22 | 4.54 | 1.14 | 5.75 | 4.40 | 1.48 | 1.62 | 2.06 | .36 |
| Metric Mean | 1.91 | 2.06 | .52 | 2.61 | 2.00 | .67 | .73 | .94 | .17 |
| Group V .26-.50" | | | | | | | | | |
| 41 | 6.20 | 5.20 | 1.80 | 7.30 | 5.20 | 2.30 | 2.50 | 1.70 | .60 |
| 42 | 5.80 | 3.65 | 1.50 | 7.80 | 4.30 | 2.00 | 2.75 | 1.90 | .50 |
| 43 | 6.70 | 3.90 | 1.90 | 7.70 | 3.60 | 2.10 | 2.70 | 1.80 | .55 |
| 44 | 5.60 | 4.30 | 1.70 | 7.00 | 5.10 | 2.20 | 2.30 | 1.70 | .50 |
| 45 | 5.20 | 4.70 | 1.50 | 8.10 | 5.30 | 2.10 | 2.60 | 1.70 | .55 |
| 46 | 5.90 | 4.00 | 1.75 | 8.70 | 4.55 | 2.00 | 2.40 | 1.80 | .50 |
| 47 | 5.55 | 3.60 | 1.50 | 8.10 | 4.00 | 2.05 | 2.60 | 1.70 | .55 |
| 48 | 6.10 | 3.10 | 1.60 | 8.00 | 3.30 | 2.20 | 2.55 | 1.45 | .55 |
| 49 | 5.30 | 4.30 | 1.60 | 8.10 | 4.50 | 2.20 | 1.80 | 1.40 | .50 |
| 50 | 6.50 | 4.00 | 1.55 | 7.20 | 3.55 | 2.00 | 2.40 | 1.70 | .50 |
| Eng. Mean | 5.88 | 4.38 | 1.64 | 7.90 | 4.24 | 2.12 | 2.45 | 1.63 | .53 |
| Metric Mean | 2.67 | 1.85 | .74 | 3.58 | 1.97 | .96 | 1.09 | .76 | .24 |
| Group VI .51-.75" | | | | | | | | | |
| 51 | 6.35 | 5.00 | 1.75 | 8.85 | 4.80 | 2.30 | 2.45 | 2.45 | .50 |
| 52 | 5.95 | 4.50 | 1.60 | 7.90 | 4.45 | 2.05 | 2.65 | 2.20 | .55 |
| 53 | 6.80 | 3.80 | 1.80 | 9.10 | 4.30 | 2.30 | 3.20 | 2.40 | .60 |
| 54 | 5.00 | 4.70 | 1.60 | 6.90 | 4.55 | 2.00 | 2.50 | 2.40 | .50 |
| 55 | 6.00 | 4.80 | 1.85 | 8.40 | 4.20 | 2.15 | 2.30 | 2.10 | .60 |
| 56 | 5.10 | 5.60 | 1.40 | 6.30 | 5.10 | 1.70 | 1.70 | 2.20 | .40 |
| 57 | 5.60 | 4.40 | 1.65 | 7.90 | 4.45 | 2.20 | 1.60 | 1.20 | .50 |
| 58 | 5.70 | 5.10 | 1.50 | 7.10 | 5.30 | 1.95 | 2.30 | 2.10 | .55 |
| 59 | 5.80 | 5.45 | 1.50 | 7.60 | 5.70 | 1.90 | 2.15 | 2.20 | .40 |
| 60 | 5.50 | 3.90 | 1.55 | 7.60 | 4.30 | 1.90 | 2.35 | 1.90 | .50 |
| Eng. Mean | 5.78 | 4.72 | 1.62 | 7.93 | 4.72 | 2.04 | 2.32 | 2.19 | .51 |
| Metric Mean | 2.62 | 2.14 | .73 | 3.41 | 2.14 | .92 | 1.05 | .98 | .23 |

APPENDIX III B (Continued)

| Steer No. | 9-10-11th Lean | 9-10-11th Fat | 9-10-11th Bone | 6-7-8th Lean | 6-7-8th Fat | 6-7-8th Bone | 12th Rib Lean | 12th Rib Fat | 12th Rib Bone |
|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | |
| 61 | 5.90 | 5.65 | 1.60 | 7.20 | 5.10 | 1.90 | 2.55 | 2.50 | .60 |
| 62 | 5.90 | 5.50 | 1.70 | 8.15 | 6.25 | 2.20 | 1.55 | 1.65 | .50 |
| 63 | 5.70 | 5.30 | 1.42 | 6.90 | 4.65 | 1.70 | 2.35 | 2.15 | .40 |
| 64 | 4.90 | 5.70 | 1.30 | 6.60 | 5.80 | 1.70 | 1.70 | 2.30 | .45 |
| 65 | 6.75 | 5.55 | 1.60 | 7.80 | 5.35 | 2.25 | 2.70 | 2.35 | .60 |
| 66 | 4.40 | 5.55 | 1.40 | 7.75 | 7.05 | 2.10 | 2.30 | 3.65 | .40 |
| 67 | 5.30 | 6.20 | 1.30 | 6.40 | 5.30 | 1.60 | 2.60 | 3.60 | .40 |
| 68 | 5.40 | 5.40 | 1.35 | 5.80 | 4.10 | 1.90 | 1.90 | 2.10 | .50 |
| 69 | 5.50 | 6.60 | 1.80 | 7.75 | 5.55 | 2.20 | 1.75 | 2.30 | .60 |
| 70 | 5.00 | 4.80 | 1.40 | 6.70 | 4.50 | 1.90 | 2.20 | 2.30 | .45 |
| Eng. Mean | 5.46 | 5.62 | 1.51 | 7.10 | 5.40 | 1.94 | 2.12 | 2.51 | .47 |
| Metric Mean | 2.48 | 2.55 | .68 | 3.22 | 2.48 | .88 | .96 | 1.14 | .22 |
| Group VIII 1.01-1.25" | | | | | | | | | |
| 71 | 5.20 | 5.60 | 1.40 | 6.50 | 4.80 | 1.70 | 1.55 | 2.50 | .50 |
| 72 | 5.60 | 6.50 | 1.40 | 6.20 | 4.65 | 2.10 | 2.50 | 3.30 | .45 |
| 73 | 5.10 | 6.70 | 1.60 | 5.95 | 5.35 | 1.60 | 1.40 | 1.05 | .40 |
| 74 | 5.90 | 5.70 | 1.60 | 6.60 | 5.35 | 2.10 | 2.20 | 2.35 | .60 |
| 75 | 6.00 | 6.80 | 1.60 | 6.10 | 4.80 | 1.60 | 2.35 | 2.90 | .60 |
| 76 | 5.30 | 5.50 | 1.60 | 6.80 | 5.10 | 1.90 | 1.60 | 2.30 | .45 |
| 77 | 6.60 | 5.60 | 1.60 | 8.00 | 4.70 | 2.15 | 2.25 | 2.40 | 1.00 |
| 78 | 5.35 | 6.35 | 1.25 | 7.60 | 6.80 | 1.75 | 2.10 | 2.50 | .40 |
| 79 | 4.60 | 5.20 | 1.40 | 6.10 | 4.60 | 1.90 | 2.30 | 2.35 | .50 |
| 80 | 5.10 | 6.10 | 1.50 | 7.60 | 6.20 | 2.10 | 2.60 | 2.60 | .45 |
| Eng. Mean | 5.42 | 6.07 | 1.51 | 7.04 | 5.72 | 1.91 | 2.07 | 2.51 | .54 |
| Metric Mean | 2.46 | 2.76 | .70 | 3.19 | 2.59 | .87 | .93 | 1.12 | .25 |

## APPENDIX III C MUSCLE AND BONE WEIGHTS

| Steer No. | Semitend-inosus | Quadriceps | Semimemb. + Adduct. | Semimem-branosus | Biceps Femoris | Rectus Femoris | Triceps Brachii | Supra-spinatus | Psoas Major |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 3.60 | 4.00 | 9.00 | | 4.30 | | | | 2.10 |
| 2 | 3.55 | 5.40 | 8.50 | 6.80 | 4.30 | | | | 2.15 |
| 3 | 3.75 | 5.10 | 8.45 | 6.40 | 4.70 | 2.60 | 4.75 | 2.15 | 2.30 |
| 4 | 3.75 | 4.40 | 8.30 | 6.50 | 4.95 | 2.80 | 4.80 | 1.95 | 2.25 |
| 5 | 3.60 | 5.70 | 7.70 | 5.80 | 4.95 | 2.30 | 4.30 | 2.15 | 2.60 |
| 6 | 3.45 | 4.20 | 9.20 | 7.00 | 4.50 | 2.85 | 5.10 | 2.25 | 2.40 |
| 7 | 3.40 | 4.30 | 8.25 | | 4.00 | 2.50 | | | 3.30 |
| 8 | 3.30 | 5.50 | 9.10 | | 6.20 | | | | 3.10 |
| 9 | 3.50 | 5.60 | 8.90 | | 5.65 | | | | 1.90 |
| 10 | 3.40 | 6.50 | 7.55 | 5.60 | 4.70 | 3.10 | 4.30 | 1.90 | 2.10 |
| Eng. Mean | 3.53 | 5.07 | 8.50 | 6.35 | 4.82 | 2.69 | 4.65 | 2.08 | 2.42 |
| Metric Mean | 1.60 | 2.30 | 3.85 | 2.88 | 2.18 | 1.22 | 2.11 | 0.94 | 1.10 |
| Group II .51-.75" | | | | | | | | | |
| 11 | 3.50 | 3.90 | 7.75 | 5.90 | 3.90 | 2.30 | 3.90 | 1.90 | 2.20 |
| 12 | 3.70 | 4.50 | 8.35 | 6.80 | 4.85 | 2.65 | 4.00 | 2.20 | 2.30 |
| 13 | 2.90 | 5.30 | 6.30 | 4.40 | 4.30 | 2.60 | 3.60 | 1.80 | 1.95 |
| 14 | 3.35 | 4.80 | 7.10 | 5.20 | 4.70 | 2.45 | 4.25 | 2.15 | 2.30 |
| 15 | 2.60 | 5.60 | 6.95 | 5.10 | 4.40 | 2.55 | 2.10 | 1.85 | 1.95 |
| 16 | 3.00 | 4.15 | 7.45 | 5.55 | 4.45 | 2.80 | 2.70 | 2.15 | 2.05 |
| 17 | 2.70 | 5.20 | 8.25 | 6.00 | 4.80 | 2.55 | 2.05 | 1.85 | 2.00 |
| 18 | 2.32 | 4.75 | 7.50 | 5.45 | 4.05 | 2.30 | 2.10 | 2.10 | 1.60 |
| 19 | 2.50 | 4.35 | 7.30 | 5.90 | 4.40 | 2.55 | 3.10 | 1.90 | 2.15 |
| 20 | 2.55 | 6.15 | 8.35 | 5.10 | 4.85 | 2.40 | 3.20 | 1.95 | 2.20 |
| Eng. Mean | 2.91 | 4.67 | 7.53 | 5.57 | 4.47 | 2.52 | 3.10 | 1.98 | 2.07 |
| Metric Mean | 1.32 | 2.21 | 3.41 | 2.53 | 2.03 | 1.14 | 1.40 | 0.90 | 0.94 |
| Group III .76-1.00" | | | | | | | | | |
| 21 | 3.27 | 5.20 | 6.80 | 4.60 | 4.56 | 2.65 | 2.85 | 1.90 | 2.00 |
| 22 | 2.95 | 5.15 | 8.15 | 6.05 | 4.60 | 2.20 | 3.00 | 1.95 | 2.20 |
| 23 | 3.30 | 5.00 | 8.30 | 6.20 | 3.90 | 2.75 | 2.40 | 2.10 | 1.95 |
| 24 | 3.10 | 5.70 | 6.45 | 4.80 | 4.20 | 2.40 | 3.80 | 1.77 | 2.10 |
| 25 | 3.20 | 4.90 | 7.50 | 5.70 | 3.80 | 2.70 | 3.80 | 1.80 | 1.90 |
| 26 | 3.20 | 5.90 | 7.00 | 5.15 | 4.40 | 2.95 | 4.25 | 2.00 | 1.90 |
| 27 | 2.70 | 4.30 | 6.50 | 4.80 | 4.10 | 2.20 | 3.15 | 1.85 | 1.80 |
| 28 | 3.00 | 5.20 | 7.40 | 5.50 | 3.95 | 2.50 | 3.50 | 2.00 | 2.20 |
| 29 | 2.95 | 4.10 | 7.40 | 5.45 | 4.15 | 2.30 | 4.30 | 1.80 | 2.10 |
| 30 | 3.35 | 4.10 | 7.60 | 5.70 | 4.25 | 2.50 | 4.00 | 2.00 | 2.05 |
| Eng. Mean | 3.10 | 4.95 | 7.31 | 5.40 | 4.19 | 2.52 | 3.50 | 1.92 | 2.02 |
| Metric Mean | 1.40 | 2.25 | 3.32 | 2.45 | 1.90 | 1.14 | 1.59 | 0.87 | 0.92 |

APPENDIX III C (Continued)

| Steer No. | Semitend-inosus | Quadriceps | Semimemb. + Adduct. | Semimem-branosus | Biceps Femoris | Rectus Femoris | Triceps Brachii | Supra-spinatus | Psoas Major |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 2.95 | 4.70 | 6.20 | 4.50 | 3.40 | 2.35 | 3.55 | 1.60 | 1.70 |
| 32 | 3.20 | 4.20 | 6.40 | 4.70 | 3.40 | 2.50 | 3.30 | 1.70 | 2.10 |
| 33 | 3.00 | 5.65 | 8.20 | 6.15 | 4.70 | 2.98 | 4.65 | 2.10 | 2.55 |
| 34 | 3.40 | 4.00 | 8.00 | 5.90 | 4.30 | 2.60 | 4.05 | 2.00 | 2.10 |
| 35 | 2.60 | 3.90 | 6.80 | 5.10 | 4.10 | 2.20 | 3.50 | 1.90 | 1.90 |
| 36 | 2.90 | 4.80 | 7.10 | 5.30 | 4.20 | 2.40 | 3.35 | 1.90 | 2.10 |
| 37 | 3.15 | 4.35 | 6.80 | 4.80 | 4.55 | 2.50 | 3.30 | 1.95 | 1.90 |
| 38 | 2.40 | 4.85 | 6.70 | 5.00 | 3.90 | 2.40 | 3.60 | 1.50 | 1.90 |
| 39 | 3.20 | 4.95 | 8.10 | 6.20 | 4.20 | 2.35 | 3.65 | 2.00 | 2.10 |
| 40 | 3.10 | 5.20 | 8.35 | 6.20 | 5.40 | 2.30 | 4.05 | 1.90 | 2.15 |
| Eng. Mean | 2.99 | 4.66 | 7.26 | 5.36 | 4.22 | 2.46 | 3.70 | 1.83 | 2.05 |
| Metric Mean | 1.36 | 2.11 | 3.29 | 2.44 | 1.91 | 1.12 | 1.68 | 0.84 | 0.93 |
| Group V .26 .50" | | | | | | | | | |
| 41 | 4.65 | 6.00 | 09.90 | 7.70 | 5.80 | 3.65 | 5.15 | 2.65 | 2.30 |
| 42 | 4.55 | 6.20 | 10.20 | 7.80 | 6.30 | 3.75 | 5.25 | 2.50 | 2.40 |
| 43 | 5.35 | 6.75 | 11.05 | 8.40 | 6.10 | 3.90 | 6.40 | 2.60 | 2.85 |
| 44 | 4.60 | 8.00 | 10.40 | 7.80 | 5.60 | 3.40 | 5.45 | 3.00 | 2.80 |
| 45 | 4.40 | 4.70 | 10.80 | 7.90 | 6.70 | 3.35 | 4.95 | 2.40 | 2.90 |
| 46 | 4.55 | 7.00 | 11.10 | 8.50 | 7.00 | 3.50 | 5.30 | 2.50 | 2.90 |
| 47 | 3.80 | 7.75 | 10.85 | 7.85 | 6.85 | 3.30 | 5.20 | 2.70 | 2.35 |
| 48 | 4.85 | 8.20 | 11.60 | 8.15 | 7.70 | 3.80 | 5.85 | 3.00 | 2.75 |
| 49 | 4.60 | 7.20 | 10.50 | 7.70 | 6.80 | 3.65 | 5.70 | 2.70 | 2.90 |
| 50 | 4.70 | 6.90 | 11.50 | 8.80 | 7.30 | 3.85 | 6.00 | 3.10 | 2.90 |
| Eng. Mean | 4.60 | 6.67 | 10.79 | 8.06 | 6.62 | 3.62 | 5.52 | 2.74 | 2.70 |
| Metric Mean | 2.09 | 3.12 | 4.89 | 3.66 | 3.00 | 1.64 | 2.50 | 1.24 | 1.22 |
| Group VI .51-.75" | | | | | | | | | |
| 51 | 4.25 | 5.35 | 10.70 | 8.40 | 5.85 | 3.70 | 5.30 | 2.70 | 2.85 |
| 52 | 4.50 | 6.80 | 09.55 | 6.30 | 5.40 | 3.65 | 5.60 | 2.40 | 2.70 |
| 53 | 3.80 | 6.10 | 10.20 | 7.65 | 6.10 | 3.15 | 5.10 | 2.60 | 2.90 |
| 54 | 4.05 | 5.80 | 0.90 | 7.70 | 5.60 | 3.80 | 5.60 | 2.80 | 2.80 |
| 55 | 3.75 | 7.90 | 10.40 | 7.45 | 7.35 | 3.95 | 5.00 | 2.50 | 2.85 |
| 56 | 4.00 | 5.10 | 10.60 | 7.60 | 5.85 | 3.50 | 5.10 | 2.50 | 2.50 |
| 57 | 4.10 | 7.80 | 11.10 | 8.30 | 7.10 | 4.00 | 5.80 | 2.60 | 2.85 |
| 58 | 3.85 | 5.25 | 08.90 | 6.60 | 6.30 | 3.30 | 5.00 | 2.30 | 2.75 |
| 59 | 3.70 | 5.90 | 08.60 | 6.35 | 5.80 | 3.45 | 5.20 | 2.40 | 2.85 |
| 60 | 4.00 | 8.00 | 10.85 | 7.80 | 6.90 | 3.85 | 5.40 | 2.60 | 3.00 |
| Eng. Mean | 3.98 | 6.47 | 10.13 | 7.39 | 6.34 | 3.71 | 5.41 | 2.59 | 2.78 |
| Metric Mean | 1.81 | 2.94 | 4.59 | 3.36 | 2.88 | 1.51 | 2.45 | 1.18 | 1.26 |

APPENDIX III C (Continued)

| Steer No. | Gastrocnemius | Quadriceps | Semimemb. + Adduct. | Semitendinosus | Biceps Femoris | Rectus Femoris | Triceps Brachii | Supraspinatus | Teres Major |
|---|---|---|---|---|---|---|---|---|---|
| Group VII 1.01-1.25" | | | | | | | | | |
| 61 | 3.85 | 5.70 | 10.10 | 7.70 | 5.70 | 3.30 | 4.75 | 2.60 | 2.55 |
| 62 | 4.20 | 6.40 | 09.00 | 6.60 | 5.35 | 3.50 | 6.00 | 2.50 | 2.45 |
| 63 | 4.40 | 5.60 | 08.40 | 6.00 | 5.70 | 3.30 | 5.60 | 2.70 | 3.00 |
| 64 | 3.40 | 6.10 | 08.80 | 5.70 | 4.90 | 3.60 | 4.45 | 2.35 | 2.45 |
| 65 | 5.00 | 6.00 | 10.55 | 7.55 | 6.40 | 3.40 | 6.40 | 2.75 | 2.90 |
| 66 | 3.55 | 5.40 | 07.20 | 5.30 | 4.25 | 3.10 | 4.35 | 2.30 | 2.00 |
| 67 | 3.60 | 6.00 | 07.90 | 5.20 | 5.20 | 2.70 | 4.25 | 2.10 | 2.30 |
| 68 | 3.20 | 7.00 | 07.75 | 5.50 | 5.90 | 3.25 | 4.80 | 2.35 | 2.60 |
| 69 | 3.70 | 6.70 | 09.30 | 6.80 | 5.75 | 3.25 | 4.65 | 2.80 | 2.55 |
| 70 | 3.60 | 7.50 | 10.40 | 7.55 | 6.50 | 3.30 | 5.20 | 2.50 | 2.30 |
| Eng. Mean | 3.85 | 6.35 | 9.44 | 6.39 | 5.66 | 3.30 | 5.08 | 2.44 | 2.39 |
| Metric Mean | 1.75 | 2.88 | 4.02 | 2.90 | 2.56 | 1.46 | 2.30 | 1.11 | 1.16 |
| Group VIII 1.01-1.25" | | | | | | | | | |
| 71 | 4.50 | 3.80 | 09.60 | 7.30 | 4.95 | 3.00 | 4.40 | 2.20 | 2.50 |
| 72 | 3.50 | 5.05 | 09.30 | 6.70 | 4.80 | 3.15 | 5.00 | 2.30 | 2.70 |
| 73 | 3.75 | 6.15 | 08.30 | 6.10 | 5.30 | 2.65 | 5.20 | 2.40 | 2.75 |
| 74 | 4.25 | 5.80 | 11.10 | 8.55 | 6.50 | 3.50 | 5.40 | 2.50 | 2.80 |
| 75 | 4.10 | 6.85 | 09.15 | 6.80 | 6.50 | 2.10 | 5.30 | 2.40 | 2.60 |
| 76 | 3.70 | 5.90 | 09.05 | 6.60 | 5.15 | 2.35 | 5.00 | 2.60 | 2.45 |
| 77 | 4.05 | 3.70 | 10.52 | 8.05 | 6.00 | 2.60 | 3.65 | 2.40 | 2.65 |
| 78 | 3.25 | 6.50 | 08.75 | 6.45 | 6.10 | 3.30 | 5.50 | 2.30 | 2.60 |
| 79 | 4.05 | 6.50 | 10.00 | 7.90 | 6.00 | 3.30 | 5.10 | 2.30 | 2.25 |
| 80 | 3.75 | 5.85 | 09.90 | 7.30 | 6.10 | 3.10 | 5.20 | 2.30 | 2.40 |
| Eng. Mean | 3.85 | 5.55 | 9.97 | 7.22 | 5.74 | 3.08 | 4.93 | 2.37 | 2.60 |
| Metric Mean | 1.76 | 2.52 | 9.34 | 3.27 | 2.60 | 1.37 | 2.26 | 1.07 | 1.18 |

APPENDIX III C (Continued)

| Steer No. | L. Dorsi | Radius + Ulna | Femur | Tibia + Fibula | Scapula | Humerus |
|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | |
| 1 | 09.50 | 2.09 | 3.10 | 2.75 | 1.80 | 2.55 |
| 2 | 08.25 | 2.60 | 3.65 | 2.70 | 1.65 | 2.40 |
| 3 | 11.40 | 1.70 | 3.00 | 2.20 | 1.55 | 2.35 |
| 4 | 10.05 | 2.25 | 3.75 | 2.70 | 1.80 | 2.80 |
| 5 | 10.95 | 1.90 | 3.37 | 2.50 | 1.65 | 2.60 |
| 6 | 11.55 | 2.20 | 3.75 | 2.70 | 2.45 | 2.65 |
| 7 | 10.28 | 2.00 | 3.25 | 2.40 | 1.62 | 2.10 |
| 8 | 09.55 | 2.80 | 3.55 | 3.00 | 2.00 | 2.50 |
| 9 | 09.06 | 2.70 | 4.70 | 3.50 | 2.18 | 2.85 |
| 10 | 10.00 | 2.20 | 3.50 | 2.60 | 1.85 | 2.85 |
| Eng. Mean | 10.06 | 2.24 | 3.56 | 2.70 | 1.86 | 2.56 |
| Metric Mean | 4.56 | 1.02 | 1.61 | 1.22 | .84 | 1.16 |
| Group II .51-.75" | | | | | | |
| 11 | 08.95 | 1.95 | 3.15 | 2.35 | 1.60 | 2.55 |
| 12 | 09.95 | 1.90 | 2.85 | 1.90 | 1.50 | 2.10 |
| 13 | 09.60 | 2.00 | 3.50 | 2.15 | 1.55 | 2.20 |
| 14 | 10.50 | 2.30 | 3.05 | 2.05 | 1.91 | 2.45 |
| 15 | 08.70 | 2.00 | 3.25 | 2.50 | 1.70 | 2.45 |
| 16 | 09.45 | 2.10 | 3.45 | 2.50 | 2.07 | 2.82 |
| 17 | 08.65 | 2.25 | 3.19 | 2.35 | 1.50 | 2.40 |
| 18 | 09.30 | 2.10 | 3.60 | 2.63 | 1.85 | 2.45 |
| 19 | 10.85 | 1.80 | 2.92 | 2.20 | 1.45 | 2.50 |
| 20 | 09.95 | 2.25 | 3.60 | 2.70 | 1.80 | 2.30 |
| Eng. Mean | 09.59 | 2.06 | 3.26 | 2.33 | 1.69 | 2.42 |
| Metric Mean | 04.35 | .93 | 1.48 | 1.06 | .77 | 1.10 |
| Group III .76-1.00" | | | | | | |
| 21 | 09.82 | 1.90 | 2.95 | 2.30 | 1.55 | 1.65 |
| 22 | 10.00 | 1.80 | 2.80 | 2.10 | 1.60 | 1.85 |
| 23 | 10.66 | 2.00 | 2.90 | 2.10 | 1,70 | 2.70 |
| 24 | 09.05 | 2.35 | 2.90 | 3.10 | 1.52 | 1.75 |
| 25 | 09.50 | 1.70 | 3.00 | 2.15 | 1.41 | 2.40 |
| 26 | 10.65 | 2.30 | 2.90 | 2.30 | 1.72 | 2.40 |
| 27 | 09.05 | 2.05 | 2.75 | 2.10 | 1.50 | 2.25 |
| 28 | 10.15 | 1.90 | 2.60 | 1.90 | 1.35 | 2.00 |
| 29 | 09.35 | 2.00 | 2.75 | 2.00 | 1.50 | 2.30 |
| 30 | 08.85 | 1.70 | 2.70 | 2.10 | 1.40 | 2.20 |
| Eng. Mean | 09.71 | 1.97 | 2.82 | 2.22 | 1.50 | 2.15 |
| Metric Mean | 04.40 | .89 | 1.28 | 1.01 | .68 | .98 |

APPENDIX III C (Continued)

| Steer No. | L. Dorsi | Radius + Ulna | Femur | Tibia + Fibula | Scapula | Humerus |
|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | |
| 31 | 8.40 | 2.20 | 3.05 | 2.30 | 1.52 | 2.35 |
| 32 | 8.70 | 2.25 | 3.20 | 2.70 | 1.40 | 2.10 |
| 33 | 10.75 | 1.95 | 2.45 | 1.95 | 1.42 | 2.00 |
| 34 | 9.65 | 2.20 | 3.00 | 2.20 | 1.65 | 2.35 |
| 35 | 8.60 | 2.05 | 2.85 | 2.05 | 1.65 | 2.25 |
| 36 | 8.85 | 1.90 | 2.70 | 2.00 | 1.35 | 2.15 |
| 37 | 8.85 | 2.00 | 2.65 | 2.10 | 1.35 | 2.15 |
| 38 | 7.80 | 1.90 | 2.85 | 2.05 | 1.40 | 2.10 |
| 39 | 9.85 | 2.00 | 3.00 | 2.10 | 1.55 | 2.40 |
| 40 | 9.10 | 2.10 | 2.80 | 1.85 | 1.40 | 2.30 |
| Eng. Mean | 9.08 | 2.06 | 2.86 | 2.13 | 1.47 | 2.22 |
| Metric Mean | 4.11 | .93 | 1.30 | .96 | .67 | 1.01 |
| Group V .26-.50" | | | | | | |
| 41 | 14.20 | 3.45 | 4.15 | 3.60 | 2.55 | 3.90 |
| 42 | 13.40 | 2.50 | 4.07 | 3.00 | 2.25 | 3.25 |
| 43 | 14.15 | 2.40 | 4.05 | 3.20 | 2.10 | 3.20 |
| 44 | 12.45 | 2.60 | 4.80 | 2.90 | 2.20 | 3.70 |
| 45 | 12.70 | 2.95 | 4.25 | 3.10 | 2.05 | 3.25 |
| 46 | 14.20 | 3.10 | 4.35 | 3.40 | 2.20 | 3.30 |
| 47 | 12.75 | 3.40 | 4.45 | 3.40 | 2.25 | 3.55 |
| 48 | 14.75 | 3.40 | 4.80 | 3.50 | 2.60 | 3.80 |
| 49 | 12.30 | 3.10 | 4.05 | 2.80 | 2.35 | 3.25 |
| 50 | 13.70 | 3.50 | 4.20 | 3.30 | 2.40 | 3.80 |
| Eng. Mean | 13.46 | 3.04 | 4.32 | 3.22 | 2.30 | 3.50 |
| Metric Mean | 6.10 | 1.38 | 1.96 | 1.46 | 1.04 | 1.59 |
| Group VI .51-.75" | | | | | | |
| 51 | 13.45 | 3.20 | 4.55 | 3.55 | 2.50 | 3.55 |
| 52 | 12.80 | 2.40 | 3.70 | 2.82 | 2.10 | 2.10 |
| 53 | 12.70 | 2.70 | 3.90 | 2.90 | 2.00 | 3.30 |
| 54 | 12.15 | 2.70 | 4.40 | 3.20 | 2.35 | 3.60 |
| 55 | 14.42 | 2.90 | 4.55 | 3.60 | 2.40 | 3.90 |
| 56 | 13.15 | 3.10 | 3.90 | 3.10 | 2.25 | 3.60 |
| 57 | 12.25 | 3.60 | 4.10 | 3.70 | 2.55 | 4.00 |
| 58 | 12.00 | 2.90 | 4.15 | 3.00 | 2.05 | 3.10 |
| 59 | 12.65 | 2.45 | 3.35 | 2.35 | 2.05 | 2.60 |
| 60 | 12.30 | 3.10 | 4.30 | 3.10 | 2.10 | 3.45 |
| Eng. Mean | 12.79 | 2.90 | 4.04 | 3.13 | 2.28 | 3.38 |
| Metric Mean | 5.80 | 1.32 | 1.85 | 1.42 | 1.04 | 1.50 |

APPENDIX III C (Continued)

| Steer No. | L. Dorsi | Radius + Ulna | Femur | Tibia + Fibula | Scapula | Humerus |
|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | |
| 61 | 12.80 | 2.55 | 3.90 | 3.05 | 2.30 | 2.25 |
| 62 | 12.75 | 3.25 | 3.65 | 2.60 | 2.00 | 2.30 |
| 63 | 13.15 | 2.80 | 3.10 | 3.00 | 2.00 | 3.10 |
| 64 | 10.35 | 2.70 | 3.80 | 2.80 | 1.80 | 3.10 |
| 65 | 13.45 | 2.80 | 4.30 | 3.00 | 2.80 | 3.60 |
| 66 | 11.20 | 2.70 | 3.40 | 2.50 | 1.70 | 2.75 |
| 67 | 12.29 | 2.35 | 3.00 | 2.30 | 1.90 | 2.50 |
| 68 | 11.10 | 3.30 | 3.40 | 3.40 | 2.15 | 3.35 |
| 69 | 12.20 | 3.10 | 4.15 | 3.50 | 2.10 | 3.10 |
| 70 | 11.95 | 2.90 | 4.00 | 2.80 | 2.05 | 3.15 |
| Eng. Mean | 12.12 | 2.81 | 3.67 | 2.90 | 2.00 | 2.92 |
| Metric Mean | 5.50 | 1.28 | 1.66 | 1.32 | .91 | 1.32 |
| Group VIII 1.01-1.25" | | | | | | |
| 71 | 11.42 | 2.00 | 4.00 | 2.75 | 1.73 | 2.70 |
| 72 | 12.15 | 2.55 | 3.45 | 2.40 | 2.80 | 2.80 |
| 73 | 11.25 | 3.00 | 3.80 | 2.85 | 1.90 | 3.00 |
| 74 | 12.85 | 3.20 | 4.45 | 3.35 | 2.35 | 2.40 |
| 75 | 12.40 | 2.90 | 4.00 | 3.05 | 2.05 | 3.20 |
| 76 | 11.45 | 2.40 | 3.90 | 3.00 | 1.95 | 3.10 |
| 77 | 10.05 | 3.50 | 4.40 | 3.10 | 2.30 | 3.60 |
| 78 | 12.30 | 2.20 | 3.65 | 2.75 | 1.85 | 2.90 |
| 79 | 11.70 | 3.20 | 4.35 | 3.10 | 2.15 | 3.45 |
| 80 | 12.15 | 2.75 | 3.70 | 2.75 | 1.95 | 2.10 |
| Eng. Mean | 11.77 | 2.77 | 3.97 | 2.91 | 2.11 | 2.92 |
| Metric Mean | 5.34 | 1.26 | 1.80 | 1.32 | .96 | 1.32 |

APPENDIX IV CHEMICAL AND [illegible] DATA

| Steer No. | % Protein | % Fat | % Moisture | K+ ppm fresh basis | K+ ppm prot. basis | Na+ ppm fresh basis | Na+ ppm prot. basis | Tenderness Taste Panel | Tenderness Shear |
|---|---|---|---|---|---|---|---|---|---|
| Group I .26-.50" | | | | | | | | | |
| 1 | 22.21 | 2.66 | 73.80 | 3292 | 148.2 | 573.4 | 25.8 | 6.67 | 09.67 |
| 2 | 23.91 | 4.71 | 73.17 | 3208 | 134.2 | 541.4 | 22.8 | 6.80 | 07.60 |
| 3 | 20.61 | 5.90 | 72.89 | 3500 | 169.8 | 489.4 | 23.7 | 6.37 | 10.82 |
| 4 | 21.15 | 4.45 | 73.65 | 3488 | 165.7 | 550.6 | 26.2 | 6.50 | 10.72 |
| 5 | 20.76 | 7.40 | 69.91 | 3426 | 165.5 | 513.2 | 24.7 | 6.25 | 10.65 |
| 6 | 21.07 | 2.64 | 73.23 | 3352 | 159.1 | 578.1 | 27.4 | 6.00 | 10.86 |
| 7 | 20.57 | 3.70 | 73.93 | 3400 | 165.3 | 512.3 | 26.4 | 7.12 | 09.65 |
| 8 | 21.33 | 2.66 | 73.63 | 3319 | 155.6 | 526.0 | 24.6 | 4.87 | 10.07 |
| 9 | 22.78 | 1.51 | 74.19 | 3473 | 152.4 | 493.6 | 21.7 | 6.00 | 11.05 |
| 10 | 21.23 | 4.31 | 73.95 | 3213 | 151.3 | 508.4 | 23.9 | 5.00 | 11.37 |
| Eng. Mean | 21.56 | 4.05 | 73.24 | 3368 | 156.71 | 531.94 | 24.72 | 6.18 | 10.25 |
| Metric Mean | 9.78 | 4.09 | 73.24 | 3368 | 156.71 | 531.94 | 24.72 | 6.18 | 4.65 |
| Group II .50-.75" | | | | | | | | | |
| 11 | 21.08 | 8.69 | 69.18 | 3242 | 153.8 | 508.2 | 24.1 | 7.62 | 08.76 |
| 12 | 21.00 | 7.96 | 70.66 | 3484 | 165.9 | 529.5 | 25.2 | 6.37 | 12.30 |
| 13 | 21.14 | 13.28 | 64.08 | 3208 | 151.8 | 597.8 | 28.3 | 7.62 | 10.07 |
| 14 | 21.17 | 8.69 | 69.69 | 3341 | 157.8 | 561.0 | 26.5 | 6.37 | 09.38 |
| 15 | 20.95 | 7.14 | 71.01 | 3306 | 157.8 | 532.0 | 25.4 | 7.12 | 10.47 |
| 16 | 21.50 | 6.50 | 71.72 | 3347 | 155.7 | 537.7 | 25.0 | 6.37 | 09.75 |
| 17 | 21.78 | 6.41 | 70.50 | 3336 | 153.2 | 582.2 | 26.7 | 6.25 | 10.48 |
| 18 | 20.92 | 5.12 | 72.10 | 3491 | 166.9 | 475.2 | 22.7 | 5.62 | 11.10 |
| 19 | 21.57 | 9.74 | 68.30 | 3190 | 147.9 | 519.4 | 24.1 | 6.62 | 09.77 |
| 20 | 20.96 | 4.94 | 71.47 | 3522 | 168.0 | 533.8 | 25.5 | 7.25 | 09.35 |
| Eng. Mean | 21.21 | 7.85 | 69.94 | 3347 | 157.9 | 537.7 | 25.4 | 6.72 | 10.14 |
| Metric Mean | 9.62 | 7.85 | 69.94 | 3347 | 157.9 | 537.7 | 25.4 | 6.72 | 4.60 |
| Group III .76-1.00" | | | | | | | | | |
| 21 | 20.28 | 07.63 | 70.32 | 3253 | 160.4 | 517.8 | 25.5 | 6.87 | 10.77 |
| 22 | 20.12 | 08.30 | 71.25 | 3197 | 158.9 | 578.4 | 28.8 | 7.12 | 08.20 |
| 23 | 21.69 | 06.86 | 69.66 | 3400 | 156.8 | 568.7 | 26.2 | 7.62 | 08.55 |
| 24 | 20.94 | 10.32 | 68.83 | 3253 | 155.3 | 518.2 | 24.7 | 6.50 | 09.87 |
| 25 | 20.72 | 11.50 | 67.08 | 3224 | 155.6 | 512.2 | 24.7 | 6.62 | 11.16 |
| 26 | 19.98 | 15.20 | 64.50 | 3001 | 150.2 | 547.0 | 27.4 | 5.62 | 10.58 |
| 27 | 19.86 | 13.06 | 66.69 | 3099 | 156.0 | 529.1 | 26.6 | 7.62 | 08.31 |
| 28 | 19.40 | 19.10 | 60.38 | 3065 | 158.0 | 608.6 | 31.4 | 6.00 | 07.50 |
| 29 | 22.24 | 08.80 | 68.76 | 3302 | 148.5 | 536.8 | 24.1 | 7.00 | 07.07 |
| 30 | 21.21 | 10.57 | 68.01 | 3181 | 150.0 | 548.9 | 25.6 | 7.37 | 08.16 |
| Eng. Mean | 20.64 | 11.34 | 67.55 | 3198 | 154.97 | 545.97 | 26.50 | 6.83 | 9.32 |
| Metric Mean | 9.36 | 11.34 | 67.55 | 3198 | 154.97 | 545.97 | 26.50 | 6.83 | 4.09 |

APPENDIX IV (Continued)

| Steer No. | % Protein | % Fat | % Moisture | K+ ppm fresh basis | K+ ppm prot. basis | Na+ ppm fresh basis | Na+ ppm prot. basis | Tenderness Taste Panel | Tenderness Shear |
|---|---|---|---|---|---|---|---|---|---|
| Group IV 1.01-1.25" | | | | | | | | | |
| 31 | 20.95 | 10.73 | 68.48 | 3348 | 159.8 | 515.0 | 24.6 | 6.87 | 10.21 |
| 32 | 20.28 | 11.18 | 67.22 | 3141 | 154.9 | 540.0 | 26.6 | 6.25 | 10.60 |
| 33 | 20.60 | 13.53 | 64.77 | 3191 | 154.9 | 470.4 | 22.8 | 7.25 | 10.33 |
| 34 | 20.98 | 10.59 | 68.11 | 3125 | 149.0 | 569.0 | 27.1 | 6.87 | 09.15 |
| 35 | 20.85 | 13.43 | 66.17 | 3079 | 147.7 | 643.4 | 30.8 | 6.75 | 10.35 |
| 36 | 20.74 | 09.01 | 69.30 | 3252 | 156.8 | 517.0 | 24.9 | 7.00 | 09.87 |
| 37 | 19.37 | 10.22 | 69.19 | 3190 | 164.7 | 568.3 | 29.3 | 7.00 | 09.33 |
| 38 | 22.93 | 04.92 | 70.91 | 3706 | 161.6 | 626.7 | 27.3 | 7.37 | 08.36 |
| 39 | 20.03 | 13.36 | 67.02 | 3426 | 171.0 | 557.0 | 27.8 | 7.00 | 08.38 |
| 40 | 20.58 | 05.86 | 71.41 | 3289 | 159.8 | 550.7 | 26.8 | 6.87 | 09.80 |
| Eng. Mean | 20.73 | 10.28 | 68.26 | 3274.7 | 158.02 | 555.75 | 26.8 | 6.92 | 9.64 |
| Metric Mean | 9.40 | 10.28 | 68.26 | 3274.7 | 158.02 | 555.75 | 26.8 | 6.92 | 4.37 |
| Group V .26-.50" | | | | | | | | | |
| 41 | 22.27 | 4.14 | 72.80 | 3357 | 150.7 | 473.3 | 21.2 | 5.12 | 10.60 |
| 42 | 21.01 | 8.90 | 69.30 | 3319 | 153.2 | 532.2 | 25.3 | 5.25 | 14.00 |
| 43 | 20.15 | 10.34 | 69.49 | 3498 | 173.6 | 555.7 | 27.6 | 6.25 | 11.06 |
| 44 | 22.02 | 8.26 | 68.33 | 3677 | 167.0 | 606.7 | 27.6 | 7.37 | 08.87 |
| 45 | 21.97 | 7.92 | 69.76 | 3512 | 159.8 | 650.3 | 29.6 | 6.00 | 08.68 |
| 46 | 20.41 | 9.38 | 70.44 | 3251 | 159.3 | 562.2 | 27.5 | 6.62 | 10.31 |
| 47 | 22.18 | 5.41 | 71.80 | 3288 | 148.2 | 607.4 | 27.4 | 5.87 | 11.05 |
| 48 | 21.65 | 4.87 | 73.33 | 3446 | 159.2 | 539.5 | 24.9 | 6.50 | 10.85 |
| 49 | 20.64 | 12.33 | 68.08 | 3173 | 153.7 | 514.8 | 24.9 | 6.37 | 11.00 |
| 50 | 21.57 | 4.46 | 71.33 | 3608 | 167.3 | 646.9 | 30.0 | 6.62 | 11.27 |
| Eng. Mean | 21.39 | 7.60 | 70.47 | 3403 | 159.2 | 568.9 | 26.6 | 6.20 | 10.99 |
| Metric Mean | 9.70 | 7.60 | 70.47 | 3403 | 159.2 | 568.9 | 26.6 | 6.20 | 4.92 |
| Group VI .51-.75" | | | | | | | | | |
| 51 | 19.22 | 4.59 | 75.86 | 2906 | 151.2 | 605.3 | 31.5 | 6.50 | 08.11 |
| 52 | 21.89 | 6.85 | 70.16 | 3489 | 159.4 | 565.6 | 25.8 | 6.25 | 09.97 |
| 53 | 20.60 | 9.66 | 67.91 | 3165 | 153.6 | 509.4 | 24.7 | 6.00 | 11.33 |
| 54 | 20.82 | 9.21 | 69.44 | 3189 | 153.2 | 593.9 | 28.5 | 6.37 | 13.56 |
| 55 | 22.29 | 5.14 | 70.53 | 3538 | 158.7 | 615.1 | 27.6 | 6.87 | 11.53 |
| 56 | 21.71 | 11.36 | 67.10 | 3255 | 149.9 | 618.5 | 28.5 | 6.75 | 09.05 |
| 57 | 21.90 | 4.89 | 72.08 | 3161 | 144.3 | 625.2 | 28.5 | 6.62 | 09.18 |
| 58 | 21.75 | 8.15 | 6[illegible].32 | 3263 | 150.0 | 659.1 | 30.3 | 6.50 | 10.82 |
| 59 | 19.86 | 12.55 | 68.92 | 3366 | 169.5 | 586.4 | 29.5 | 5.62 | 06.41 |
| 60 | 22.32 | 5.25 | 73.47 | 3512 | 157.3 | 650.1 | 29.1 | 6.87 | 11.11 |
| Eng. Mean | 21.24 | 7.76 | 70.46 | 3274 | 155.7 | 609.9 | 28.5 | 6.34 | 10.32 |
| Metric Mean | 9.63 | 7.76 | 70.18 | 3284 | 155.7 | 609.9 | 28.5 | 6.34 | 4.68 |

APPENDIX IV (Continued)

| Steer No. | % Protein | % Fat | % Moisture | Kt gm fresh basis | Kt gm prot. basis | Fat gm fresh basis | Fat gm prot. basis | Tenderness Taste Panel | Tenderness Shear |
|---|---|---|---|---|---|---|---|---|---|
| Group VII .76-1.00" | | | | | | | | | |
| 61 | 21.04 | 09.98 | 69.18 | 3855 | 154.7 | 570.4 | 27.1 | 6.87 | 11.13 |
| 62 | 21.65 | 09.91 | 69.39 | 3845 | 150.1 | 543.5 | 25.1 | 6.50 | 10.73 |
| 63 | 22.12 | 07.30 | 69.63 | 3318 | 150.0 | 553.7 | 25.0 | 6.62 | 09.87 |
| 64 | 20.09 | 09.31 | 68.74 | 3304 | 164.5 | 548.2 | 27.0 | 7.00 | 09.45 |
| 65 | 21.06 | 09.38 | 69.29 | 3537 | 167.9 | 498.5 | 23.7 | 4.37 | 11.01 |
| 66 | 19.98 | 18.65 | 61.65 | 2985 | 156.1 | 505.5 | 26.5 | 6.87 | 09.28 |
| 67 | 22.00 | 08.36 | 67.67 | 3342 | 151.9 | 604.0 | 26.6 | 6.62 | 10.95 |
| 68 | 21.82 | 12.87 | 65.19 | 3434 | 157.4 | 564.4 | 25.9 | 6.75 | 10.57 |
| 69 | 20.88 | 13.87 | 65.70 | 3146 | 150.3 | 497.8 | 24.5 | 6.62 | 10.80 |
| 70 | 22.19 | 10.37 | 66.79 | 3519 | 158.3 | 719.4 | 32.1 | 6.37 | 09.91 |
| Eng. Mean | 21.13 | 10.62 | 67.27 | 3390 | 156.55 | 592.7 | 26.6 | 6.46 | 10.29 |
| Metric Mean | 9.58 | 10.62 | 67.27 | 3390 | 156.55 | 592.7 | 26.6 | 6.46 | 4.67 |
| Group VIII 1.01-1.25" | | | | | | | | | |
| 71 | 20.96 | 08.43 | 70.30 | 3277 | 156.3 | 526.3 | 24.2 | 7.37 | 10.00 |
| 72 | 22.26 | 05.80 | 71.28 | 3217 | 144.1 | 441.0 | 19.8 | 7.37 | 10.20 |
| 73 | 21.70 | 08.64 | 68.94 | 3501 | 161.3 | 578.4 | 26.6 | 6.37 | 10.60 |
| 74 | 21.57 | 10.01 | 68.17 | 3519 | 163.1 | 712.6 | 33.0 | 7.50 | 09.13 |
| 75 | 21.08 | 09.66 | 67.64 | 3096 | 146.9 | 623.7 | 29.6 | 7.12 | 07.66 |
| 76 | 21.57 | 06.27 | 70.79 | 3514 | 164.3 | 573.6 | 26.6 | 8.12 | 09.47 |
| 77 | 22.05 | 06.80 | 71.19 | 3343 | 151.6 | 577.4 | 26.2 | 7.12 | 08.25 |
| 78 | 22.52 | 13.13 | 63.80 | 3381 | 150.1 | 546.7 | 24.3 | 6.37 | 12.05 |
| 79 | 22.23 | 07.85 | 69.13 | 3264 | 146.8 | 525.7 | 26.6 | 5.75 | 13.27 |
| 80 | 19.56 | 12.92 | 67.39 | 3210 | 164.1 | 618.7 | 31.6 | 7.25 | 10.37 |
| Eng. Mean | 21.83 | 8.97 | 68.84 | 3343 | 155.3 | 577.4 | 26.9 | 7.03 | 10.12 |
| Metric Mean | 9.77 | 8.97 | 68.84 | 3343 | 155.3 | 577.4 | 26.9 | 7.03 | 4.59 |

List of Variables on Data Cards

1. Av. 12th rib fat thickness
2. Carcass weight
3. Round Score
4. Carcass conformation
5. Hind Quarter conformation
6. Fore Quarter conformation
7. Maturity score
8. Marbling score
9. Carcass grade
10. 5th Thoracic - 4 in.
11. 5th Thoracic - 8 in.
12. 5th Thoracic - 12 in.
13. 5th Thoracic - av.
14. 8th Thoracic - 4 in.
15. 8th Thoracic - 8 in.
16. 8th Thoracic - 12 in.
17. 8th Thoracic - av.
18. 11th Thoracic - 4 in.
19. 11th Thoracic - 8 in.
20. 11th Thoracic - 12 in.
21. 11th Thoracic - av.
22. 1st Lumbar - 4 in.
23. 1st Lumbar - 8 in.
24. 1st Lumbar - 12 in.
25. 1st Lumbar - av.
26. 4th Lumbar - 4 in.
27. 4th Lumbar - 8 in.
28. 4th Lumbar - 12 in.
29. 4th Lumbar - av.
30. 6th Lumbar - 4 in.
31. 6th Lumbar - 8 in.
32. 6th Lumbar - 12 in.
33. 6th Lumbar - av.
34. 3rd Sacral - 4 in.
35. 3rd Sacral - 8 in.
36. 3rd Sacral - 12in.
37. 3rd Sacral - av.
38. 5th Sacral - 4 in.
39. 5th Sacral - 8 in.
40. 5th Sacral - 12 in.
41. 5th Sacral - av.
42. Av. at 4 in.
43. Av. at 8 in.
44. Av. at 12 in.
45. Depth of 10th rib.
46. Depth of 12th rib.
47. Depth of Brisket.
48. Length of round.
49. Circumference of round.
50. Taste panel-flavor
51. Wt. of un-trimmed lean cuts.
52. Wt. of belly cuts * KK,
53. Wt. of trimmed lean cuts.
54. Wt. of external fat trim.
55. Wt. of K.K. - R.S.
56. Wt. of boned, trimmed RLRC.
57. Cutting loss - R.S.
58. R.S. weight.
59. Wt. un-trimmed round- R.S.
60. Wt. trimmed round - R.S.
61. Wt. fat trim round - R.S.
62. Wt. un-trimmed loin - R.S.
63. Wt. trimmed loin - R.S.
64. Wt. fat trim loin - R.S.
65. Wt. un-trimmed rib - R.S.
66. Wt. trimmed rib - R.S.
67. Wt. fat trim rib - R.S.
68. Wt. Un-trimmed chuck - R.S.
69. Wt. trimmed chuck - R.S.
70. Wt. fat trim chuck - R.S.
71. Wt. shank - R.S.
72. Wt. brisket - R.S.
73. Salable yield - R.S.
74. Total internal fat trim- R.S.
75. Wt. bone - R.S.
76. Wt. plate - R.S.
77. Wt. flank - R.S.
78. Yield round - R.S.
79. Fat trim round - R.S.
80. Bone round - R.S.
81. Yield loin * R.S.
82. Fat trim loin - R.S.
83. Bone loin - R.S.
84. Yield Rib - R.S.
85. Fat trim rib - R.S.
86. Bone rib - R.S.
87. Yield chuck - R.S.
88. Fat trim chuck - R.S.
89. Bone chuck - R.S.
90. Yield shank - R.S.
91. Fat trim shank - R.S.
92. Bone shank - R.S.
93. Yield brisket - R.S.
94. Fat trim brisket - R.S.
95. Bone brisket - R.S.
96. % protein in L.D.
97. Yield Plate - R.S.
98. Fat trim plate - R.S.
99. Bone plate - R.S.
100. Yield flank - R.S.

101. Fat trim flank - R.S.
102. Bone flank - R.S.
103. Wt. Rump-less round - L.S.
104. Wt. Lean rump-less round - L.S.
105. Wt. fat rump-less round - L.S.
106. Wt. bone rump-less round - L.S.
107. Wt. Rump - L.S.
108. Wt. lean rump - L.S.
109. Wt. fat rump - L.S.
110. Wt. bone rump - L.S.
111. Wt. intact round - L.S.
112. Wt. lean intact round - L.S.
113. Wt. fat intact round - L.S.
114. Wt. bone intact round - L.S.
115. Wt. loin - L.S.
116. Wt. lean loin - L.S.
117. Wt. fat loin - L.S.
118. Wt. bone loin - L.S.
119. Wt. rib - L.S.
120. Wt. lean rib - L.S.
121. Wt. fat rib - L.S.
122. Wt. bone rib - L.S.
123. Wt. chuck - L.S.
124. Wt. lean chuck - L.S.
125. Wt. fat chuck - L.S.
126. Wt. bone chuck - L.S.
127. Wt. shank - L.S.
128. Wt. lean shank - L.S.
129. Wt. fat shank - L.S.
130. Wt. bone shank - L.S.
131. Wt. brisket - L.S.
132. Wt. lean brisket - L.S.
133. Wt. fat brisket - L.S.
134. Wt. bone brisket - L.S.
135. Wt. plate - L. S.
136. Wt. lean plate - L.S.
137. Wt. fat plate - L.S.
138. Wt. bone plate - L.S.
139. Wt. flank - L.S.
140. Wt. lean flank - L.S.
141. Wt. fat flank - L.S.
142. Wt. bone flank - L.S.
143. Wt. K.K. - L.S.
144. Wt. fat K.K. - L.S.
145. Wt. Kidney - L.S.
146. Wt. left side.
147. Wt. total lean - L.S.
148. Wt. total fat - L.S.
149. Wt. tetal bone - L.S.
150. Cutting loss - L.S.
151. Wt. 9-10-11 rib.
152. Wt. lean 9-10-11 rib.
153. Wt. fat 9-10-11 rib.
154. Wt. bone 9-10-11 rib.
155. Wt. 6-7-8 rib.
156. Wt. lean 6-7-8 rib.
157. Wt. fat 6-7-8 rib.
158. Wt. bone 6-7-8 rib.
159. Wt. 12th rib.
160. Wt. lean 12th rib.
161. Wt. fat 12th rib.
162. Wt. bone 12th rib.
163. Fat measurement A.
164. Fat measurement B.
165. Fat measurement C.
166. Fat measurement D.
167. Fat measurement E.
168. Fat measurement F.
169. Fat measurement G.
170. Av. measurements D,E,F,G.
171. Av. all fat measurements.
172. Loin eye area.
173. Taste panel- Juiceness.
174. Wt. semitendinosis
175. Wt. Quadriceps
176. Wt. semimembran. + adduct.
177. Wt. semimembranosus
178. Wt. biceps femoris
179. Wt. rectus femoris
180. Wt. triceps brachii
181. Wt. supraspinatus
182. Wt. psoas major
183. Wt. longissimus dorsi
184. Wt. L.D. 9-10-11 rib.
185. Wt. L.D. 6-7-8 rib.
186. Wt. L.D. 12th rib.
187. Wt. L.D. loin.
188. Wt. radius and ulna.
189. Wt. femur.
190. Wt. tibia and fibula.
191. Wt. scapula.
192. Wt. humerus.
193. Est. % Retail yield (Briedenstein)
194. U.S.D.A. Est. % RLRC.
195. Est. RLRC (Brungardt & Bray)
196. Est. Lb. lean (Cole)
197. Est. Lean (H & H).
198. Est. Fat (H & H).
199. Est. Bone (H & H).
200. Taste panel - tenderness.
201. Warner-Bratzler shear tenderness.
202. % Ether extract.
203. % Moisture of L.D.
204. Steer number.

## Transformed Variables

205. % K.K. of total carcass.
206. % Untrimmed lean cuts - R.S.
207. % Belly cuts - R.S.
208. % Trimmed lean cuts - R.S.
209. % Ext. fat trim - R.S.
210. % Untrmmd.round of R.S.
211. % Trimmed round of R.S.
212. % Total rnd. fat trim- R.S.
213. % Untrimmed loin- R.S.
214. % Trimmed loin- R.S.
215. % Fat trim from loin- R.S.
216. % Untrimmed rib- R.S.
217. % Trimmed rib - R.S.
218. % Rib fat trim - R.S.
219. % Untrimmed chuck - R.S.
220. % Trimmed chuck - R.S.
221. % Chuck fat trim - R.S.
222. % Shank - R.S.
223. % Brisket - R.S.
224. % Plate - R.S.
225. % Flank - R.S.
226. % RLRC - R.S.
227. % Retail Yield - R.S.
228. % Internal Fat trim - R.S.
229. % Bone - R.S.
230. % Yield of round - of R.S.
231. % Int. fat trim round - of R.S.
232. % Bone of round - of R.S.
233. % Yield of loin - of R.S.
234. % Int. fat trim of loin - R.S.
235. % Bone of loin - of R.S.
236. % Yield of rib - of R.S.
237. % Int. fat trim rib - of R.S.
238. % Bone of rib - of R.S.
239. % Yield of chuck - of R.S.
240. % Int. fat trim chuck - R.S.
241. % Bone of chuck - of R.S.
242. % Yield of shank - of R.S.
243. % fat trim of shank- of R.S.
244. % Bone of shank - of R.S.
245. % Yield of brisket - of R.S.
246. % Fat trim brisket - of R.S.
247. % Bone of brisket - of R.S.
248. % Yield of plate - of R.S.
249. % Fat trim plate - of R.S.
250. % Bone of plate - of R.S.
251. % Yield of flank - of R.S.
252. % Fat trim of flank - of R.S.
253. % Bone of flank - of R.S.

Variables below are expressed as a percent of the cuts themselves:

254. % Yield of round -R.S.
255. % Fat of round - R.S.
256. % Bone of round - R.S.
257. % Yield of loin - R.S.
258. % Fat of loin - R.S.
259. % Bone of loin - R.S.
260. % Yield of rib - R.S.
261. % Fat of rib - R.S.
262. % Bone of rib - R.S.
263. % Yield of chuck - R.S.
264. % Fat of chuck - R.S.
265. % Bone of chuck - R.S.
266. % Yield of shank - R.S.
267. % Fat of shank - R.S.
268. % Bone of shank - R.S.
269. % Yield of brisket - R.S.
270. % Fat of brisket - R.S.
271. % Bone of brisket - R.S.
272. % Yield of plate - R.S.
273. % Fat of plate - R.S.
274. % Bone of plate - R.S.
275. % Yield of flank - R.S.
276. % Fat of flank - R.S.
277. % Bone of flank - R.S.

Following variables are expressed as a percent of the left side:

278. % Rumpless round of L.S.
279. % Rump of L.S.
280. % Intact round of L.S.
281. % Loin of L.S.
282. % Rib of L.S.
283. % Chuck of L.S.
284. % Shank of L.S.
285. % Brisket of L.S.
286. % Plate of L.S.
287. % Flank of L.S.
288. % K.K. of L.S.
289. % K.K. of R.S.
290. % Lean of rumpless round of L.S.
291. % Fat of rumpless round of L.S.
292. % Bone of rumpless round of L.S.
293. % Lean of rump of L.S.
294. % Fat of rump of L.S.
295. % Bone of rump of L.S.
296. % Lean of intact round of L.S.
297. % Fat of intact round of L.S.
298. % Bone of intact round of L.S.

299. % Lean of loin of L.S.
300. % Fat of loin of L.S.
301. % Bone of loin of L.S.
302. % Lean of rib of L.S.
303. % Fat of rib of L.S.
304. % Bone of rib of L.S.
305. % Lean of chuck of L.S.
306. % Fat of chuck of L.S.
307. % Bone of chuck of L.S.
308. % Lean of shank of L.S.
309. % Fat of shank of L.S.
310. % Bone of shank of L.S.
311. % Lean of brisket of L.S.
312. % Fat of brisket of L.S.
313. % Bone of brisket of L.S.
314. % Lean of plate of L.S.
315. % Fat of plate of L.S.
316. % Bone of plate of L.S.
317. % Lean of flank of L.S.
318. % Fat of flank of L.S.
319. % Bone of flank of L.S.
320. % Fat of K.K. of L.S.
321. % Kidney of L.S.
322. % Total lean of L.S.
323. % Total fat of L.S.
324. % Total bone of L.S.
325. % Cutting loss of L.S.

Following variables are expressed as a percent of themselves:

326. % Lean of round - L.S.
327. % Fat of rumpless round - L.S.
328. % Bone of rumpless round - L.S.
329. % Lean of rump - L.S.
330. % Fat of rump - L.S.
331. % Bone of rump - L.S.
332. % Lean of intact round - L.S.
333. % Fat of intact round - L.S.
334. % Bone of intact round - L.S.
335. % Lean of loin - L.S.
336. % Fat of loin - L.S.
337. % Bone of loin - L.S.
338. % Lean of rib - L.S.
339. % Fat of rib - L.S.
340. % Bone of rib - L.S.
341. % Lean of chuck - L.S.
342. % Fat of chuck - L.S.
343. % Bone of chuck - L.S.
344. % Lean of shank - L.S.
345. % Fat of shank - L.S.
346. % Bone of shank - L.S.
347. % Lean of brisket - L.S.
348. % Fat of brisket - L.S.
349. % Bone of brisket - L.S.
350. % Lean of plate - L.S.
351. % Fat of plate - L.S.
352. % Bone of plate - L.S.
353. % Lean of flank - L.S.
354. % Fat of flank - L.S.
355. % Bone of flank - L.S.
356. % Lean in 9-10-11 rib- L.S.
357. % Fat in 9-10-11 rib - L.S.
358. % Bone in 9-10-11 rib - L.S.
359. % Lean in 6-7-8 rib - L.S.
360. % Fat in 6-7-8 rib - L.S.
361. % Bone in 6-7-8 rib - L.S.
362. % Lean in 12th rib - L.S.
363. % Fat in 12th rib - L.S.
364. % Bone in 12th rib - L.S.
365. % 9-10-11 rib of intact rib- L.S.
366. % 6-7-8 rib of intact rib - L.S.
367. % 12th rib of intact rib - L.S.
368. Volume of round.

Following variables were added to card # 0 after original punching:

369. Lb. total fat trim of R.S.
370. % total fat trim of R.S.
371. Est K.K. Wt. (only L.S. ).
372. PPM $K^+$ (fresh basis)
373. PPM $K^+$ (protein basis)
374. PPM $Na^+$ (fresh basis)
375. PPM $Na^+$ (protein basis)