

An Evaluation of Two Methods Of Measuring External Fat on a Beef Carcass

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Introduction

Consumers today want a high quality meat product, and have a decided aversion to fat. To meet the consumer demand, the retailer must display beef cuts with a minimum amount of fat trim. This often results in considerable waste and reduces the amount of salable meat. Excessive fat on the beef carcass has become an important factor in determining the actual value of the carcass.

The increasing emphasis on carcass evaluation, consumer preference, and in general a more intense effort to determine the criteria which will define a good beef carcass, makes the measure of carcass fat an important factor.

This investigation was initiated to compare two external fat measurements of the beef carcass with the actual percent fat estimated by separating the 9-10-11th rib section.

Procedure

A total of 117 Angus steers and heifers from the Oklahoma State University performance testing program were used in this study. As calves, they ran to a creep feeder while nursing their dams. The calves were weaned at seven months of age and placed in a feed lot for 159 days. A ration consisting of the following was fed: 350 pounds ground whole corn; 200 pounds cottonseed hulls; 100 pounds chopped alfalfa hay; 100 pounds whole oats; 100 pounds wheat bran; 100 pounds cottonseed oil meal; and 50 pounds blackstrap molasses.

At the end of the 159 day feeding period, the cattle were slaughtered and the routine carcass data were obtained. The age of the cattle at the time of slaughter averaged 13 months. Tracings of the lean and fat areas at the 12th rib were taken on both sides of the carcass. A physical separation of the 9-10-11th rib sections into fat, lean, and bone was made. The amount of fat in the carcass was then estimated from these values.

The external fat covering over the loin muscle was determined by two measurements; *width of fat* and *fat area*. The *width of fat* was determined by the following procedure. (Figure 1.)

1. Measure the length of the loin (*longissimus dorsi*) muscle using the long axis as shown in Figure 1. (A-B)

2. Three measurements were designed to characterize the adjacent external fat. The first measurement was made perpendicular to the center line of the long axis of the loin muscle at a point one-half the length of the muscle (E). The second was parallel to the first at a point one-fourth the length of the loin muscle measured from the ventral edge of the muscle (C). The third was parallel to the first located at a point one-fourth the distance from the dorsal edge of the muscle (D).
3. Measure from the outside of the fat (C^1 , E^1 , D^1) where the surface of the fat is perpendicular to the three points on the loin muscle that were determined in step two. The average of the three measurements was recorded as the fat thickness.

The fat area was determined by the following method. (Figure 1.)

1. Measure from the lateral and dorsal edges of the long axis of the loin muscle at a point perpendicular to the center line (A to A^1) and (B to B^1).
2. Follow the outline of the fat with a compensating polar planimeter to obtain the area in square inches.

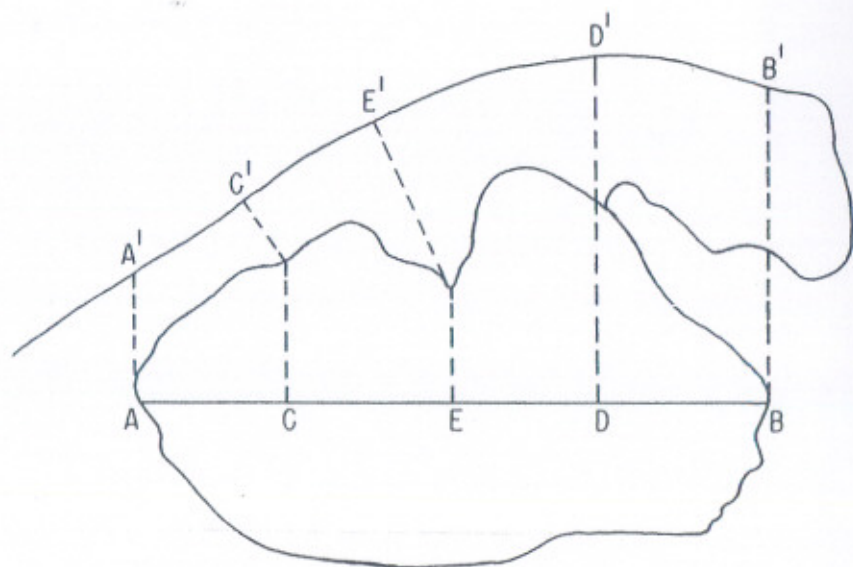


Figure 1.—A Tracing Showing the Points to Use in Making the Width of Fat and Fat Area Measurements.

The 9-10-11th rib section from both sides of each carcass was removed from the wholesale rib and separated into fat, lean, and bone. The percent fat, loin, and bone was then computed for each side. A mean value was obtained for each carcass after combining the percent fat, lean, and bone from the 9-10-11th rib sections from both sides.

Results and Discussion

Data pertaining to width of fat and fat area measurements collected in 1959 and 1960 are shown in Tables 1 and 2. It is interesting to note the similarity between the two groups relative to the amount of fat.

Table 1.—The Mean, Range, and Standard Deviation of Three Fat Measurements of the Beef Carcass¹

Fat Measurements	Mean	Range	Standard Deviation
Width of fat—inches	0.92	0.63 — 1.33	0.17
Fat area—square inches	4.33	3.16 — 6.00	0.64
9-10-11th rib % fat	43.13	36.08 — 51.66	3.65
Width of fat inches per 100 pounds of chilled carcass weight	0.17	0.09 — 0.25	0.04
Fat area square inches per 100 pounds of chilled carcass weight	0.81	0.57 — 1.09	0.12
9-10-11th rib % fat per 100 pounds chilled carcass weight	8.13	5.13 — 10.74	1.20

¹Data collected on 58 head in 1959.

Table 2.—The Mean, Range, and Standard Deviation of Fat Thickness, Fat Area, and Physical Separation in the Beef Carcass¹

Fat Measurements	Mean	Range	Standard Deviation
Width of fat—inches	0.90	0.60 — 1.33	0.17
Fat area—square inches	4.90	3.00 — 7.32	0.90
9-10-11th rib % fat	45.31	36.95 — 58.07	4.15
Width of fat inches per 100 pounds of chilled carcass weight	0.16	0.10 — 0.24	0.03
Fat area square inches per 100 pounds of chilled carcass weight	0.86	0.62 — 1.19	0.14
9-10-11th rib % fat per 100 pounds chilled carcass weight	8.02	6.32 — 10.52	0.97

¹Data collected on 59 head in 1960.

When cattle of this age, breed, and condition are slaughtered, one may expect to find at least 0.1 of an inch of outside fat cover for each 100 pounds of chilled carcass weight. The range in these cattle which were considered to be unitorm was 0.09 to 0.25 inches. With this much

variation in animals of similar breeding, it is logical to assume a much wider range would occur in commercial cattle going to market. Once this variation is recognized, steps such as a simple fat measurement will become a tool for detecting these differences.

The fat area indicated that more variation actually existed than was expressed by the linear measurement. When the fat area measurement is used to determine differences, one may expect approximately 0.8 square inches of fat cover for each 100 pounds of chilled carcass weight. The actual range in this group of cattle was 0.57 to 1.19 square inches for each 100 pounds.

The percent separable fat, estimated from the 9-10-11th rib section, was also found to show considerable variation among these carcasses. This variation ranged from 5.13 to 10.74 percent when expressed on a 100 pound basis. When the fat content of a beef carcass varies from five to 11 percent for each 100 pounds of carcass weight, as estimated by the 9-10-11th rib separation, it is easy to see why some carcasses are of more value to the retailer than others.

Correlations between width of fat and percent fat in the 9-10-11th rib section, along with the fat area and percent fat in the 9-10-11th rib section, are presented in Table 3.

Table 3.—Simple Correlations Between Two Fat Measurements and Actual Percent Separable Fat in the 9-10-11th Rib Section*

	Percent Fat In		Percent Fat In	
	9-10-11th Rib Section 1959	9-10-11th Rib Section 1960	9-10-11th Rib Section ² 1959	9-10-11th Rib Section ² 1960
Width of fat ¹	.48*	.66*		
Fat area ²	.32	.67*		
Width of fat ³			.69*	.62*
Fat area ³			.53*	.61*

*Significant at 0.01 level.

¹Measured in inches

²Area in square inches

³Per 100 lbs. of chilled carcass weight

In most instances, the width of fat had a higher relationship with the percent fat in the 9-10-11th rib section than did the fat area measurement. The data accumulated over a two year period was pooled and the simple correlations were: width of fat (inches) and percent fat in the 9-10-11th rib section .54; fat area (square inches) and percent fat in the 9-10-11th rib section .58; width of fat (inches per 100 pounds chilled carcass weight) and percent fat in the 9-10-11th rib section (per 100 pounds chilled carcass weight) .65; and fat area (square inches per 100 pounds chilled carcass weight) and percent fat in the 9-10-11th rib section per 100 pounds .53. Although most correlations were significant, there seems to be no trend suggesting that one fat measurement is more closely associated with the percent fat in the 9-10-11th rib section than another.

The fat area involved more time and effort to compute than did the width of fat. Thus, it appears that the width of fat would be more useful in practical application than determining the fat area.

Summary and Conclusions

An investigation involving 117 yearling cattle over a two year period was conducted to evaluate two external fat measurements taken at the 12th rib. Primary emphasis was placed on the relationship between a linear fat measurement, and area of fat to the percent separable fat in the 9-10-11th rib section. One may conclude the following relative to these fat measurements.

1. The fat area appears to be more variable within a group than does the width of fat.
2. The linear measurement of fat seems to be an indicator of total carcass fatness. The correlations were significant at the one percent level.
3. Variation in correlation values between each measure of external fat and the percent of fat in the 9-10-11th rib section was considerable between groups. The evidence that one fat measurement is more highly associated with the percent fat in the 9-10-11th rib cut than another is not conclusive.
4. The fat area measurement involves a great deal more time and effort to compute than does the linear measurement.
5. The linear fat measurement appears to be a more practical method for expressing carcass fatness. It takes less time to compute and study thus far indicates that it is just as applicable as the area measurement.

Performance Records on Relatives As Aids in Selecting Boars

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The boar contributes half the inheritance of all the pigs he sires. Furthermore, more intense selection is possible among boars than among gilts, because fewer boars are needed for replacement. For these reasons the selection of the boar is a critical and important decision. Performance test records are increasing in availability from swine evaluation stations and "on the farm" tests. Although some of these tests may give direct information on the boar himself, much of the information is on his relatives. Thus, it is important to consider the usefulness of such data on relatives in selecting the boar.