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Evaluation of swine carcasses

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PURPOSE

The purpose of swine carcass evaluation is to help the producer achieve volume production of quality pork carcasses. Quality carcasses have a high lean to fat ratio and are desirable for such items as marbling, color, texture and firmness.

INTRODUCTION

The end product of the swine industry must be one which is easily merchandised. However, swine producers must not sacrifice productive efficiency to attain this goal. Swine carcass evaluation supplements breeding management, herd health and nutrition practices by relating desirable carcass traits with economically important traits, such as sow productivity, feed efficiency and feedlot gain in the live animal.

Current swine carcass evaluation programs take into account such measurements as carcass weight, average backfat, loin eye area, per cent ham and loin and carcass length. Differences observed in untrimmed swine carcasses are shown in Figure 1. In future programs, more emphasis will be placed on items which relate to quality.

SWINE CARCASS EVALUATION
PROCEDURES

Shipping weights and tattooing - In current swine carcass evaluation programs, the animals are marketed at live weights

Figure 1. Half-carcass, untrimmed hams and loins from meat type (left) and fat type (right) hogs. (Photos courtesy Iowa State University)
of 200 to 240 pounds. The animals should be weighed just prior to shipping or slaughter. They must be tattooed on each ham and shoulder prior to slaughter. These numbers are used to identify the carcass after slaughter and assist with obtaining the carcass measurements.

Dressing procedures - The "packer's style carcass" is the accepted carcass form in present evaluation programs. With this method, the jowl remains on the carcass. The head is removed just behind the ear at the atlas joint, and the carcass is split down the backbone. The two halves of the carcass remain attached, by skin, at points along the mid-line. A properly tattooed packer style dress carcass is shown in Figure 2.

Carcass weights - A hot carcass weight is usually obtained immediately after slaughter. This weight should be used to obtain the various values to be reported as a percentage of carcass weight. In some instances carcasses cannot be weighed until they have been chilled 24 hours at about 34°F. This results in a drop in carcass weight. A factor of two per cent should be added to these weights to make them equivalent to hot carcass weight.

Some evaluation programs may specify the use of chilled carcass weights. These are less accurate because of the variation in amount of shrink during the 24 hour chill period. Chilled carcass weight can be calculated by deducting two per cent of the hot carcass weight.

Identification of ham, loins and loin cutting point - The hams and loins of the split carcass should be properly identified with the carcass tattoo number prior to cutting into wholesale cuts. This identification is usually accomplished by use of either an approved carcass marking pencil or tags. The tattoo number is written on the hams four to five inches up from the hock; and on the loins between the fifth and eighth ribs about two inches from the backbone. If tags are used, they should be attached as shown in Figure 3.

When large numbers of carcasses are to be evaluated identification is sometimes easier to maintain if numbers are assigned to the carcass in the order they are slaughtered. In this case, the matching tattoo and kill order numbers must be recorded accurately.
The area between the tenth and eleventh ribs should also be marked on the loin to be cut. A properly identified half-carcass with the resulting wholesale cuts is shown in Figure 3.

**Backfat** - Backfat measurements are made on the split, chilled carcass with a steel ruler calibrated in tenths of inches. These measurements are taken at three places on the split carcass: (1) opposite the first rib (2) opposite the last rib and (3) opposite the last lumbar vertebra. The locations for these three measurements are shown in Figure 4.

![Figure 4.](image)

The backfat value reported for the carcass is an average, adjusted to 220 pound weight basis, of the three measurements. For example, if the three backfat measurements were 1.8, 1.5 and 1.2, on the carcass from a 200 pound hog, the reported value would be 1.58 inches \((1.8 + 1.5 + 1.2 = 4.5; 4.5 \div 3 = 1.5; 1.5 + .004 \times 20 = 1.5 + .08 = 1.58)\).

Figure 5.

**Length** - Length of the swine carcass is obtained with a metal tape ruler calibrated in tenths of inches. The most accurate measurement is usually made from the side of the carcass having the greater amount of backbone after splitting. The measurement is taken between the front (forward) edge of the aitch bone and the forward edge of the first rib near the backbone. Note that the length measurement shown in Figure 5 is 29.0 inches. The adjusted carcass length would be 29.5 inches for this 200 pound hog \((29.0 + .025 \times 20 = 29.0 + .50 = 29.5)\).

**Cutting pork carcasses - separating the ham:** Use a saw at a right angle to the hind shank and cut three-fourths of the distance between the end of the surface of the aitch bone and the angle formed at the junction of the lumbar and sacral vertebrae.

**Separating the shoulder:** Use a saw at a right angle to the long axis of the side and perpendicular to the table to cut the vertebrae, breast bone, and 3rd rib.
Figure 6.

Separating the loin and belly: Turn the middle so the shoulder end is nearest, then saw perpendicular to the table, starting just beneath the chinebone and in a direction parallel with the spinous processes to separate the rib region. Complete the division with a knife and make the straight line cut end adjacent to the outer edge of the tender-loin so as to avoid exposing the hipbone. A properly separated half-carcass is shown in Figure 3.

Trimming the ham: Saw across the shank at the point of the hock to remove the foot. Lift the tail bones with a boning knife and mark the skin for a seven-inch collar. Remove the skin and fat starting at the margin of vertebrae and continue removal of the fat except for a quarter-inch layer on the ham. Properly trimmed and untrimmed hams are shown in Figure 6.

Trimming the loin: Remove the back-fat except for a quarter-inch layer on the loin. Expose lean on the blade end of the loin. Figure 7 shows a properly trimmed ham and loin.

Ham and loin weight and per cent - Weights of the trimmed hams and loins are taken at time of cutting. Note that one loin is hidden in Figure 8. Per cent ham and loin is a value used in most swine carcass evaluation programs as an indicator of meatiness.
Figure 9.

This measurement may be expressed in two ways: (1) as per cent of the chilled-carcass weight or (2) as per cent of the live-animal weight. Per cent ham and loin of the hog carcass weight is more frequently used and is the preferred measurement. This measurement will vary from 28 per cent in extremely fat-type animals to 47 per cent in the very outstanding meat-type animals. The most accurate measurement is made when weights are obtained on both trimmed hams and loins.

Loin eye area - Another measure of carcass meatiness is the loin eye area between the 10th and 11th ribs. The loin should be cut perpendicular to the backbone. The "grid" is a recently developed device which decreases the amount of work involved in obtaining loin eye area. It has a certain number of "squares" or "dots" per square inch. The grid is placed over the exposed loin eye and those "squares" or "dots" lying inside the outline of the loin eye are counted. This method has proven to be just as accurate and much faster than the tracing planimeter reading method.

In cases where a tracing is made of the muscle, take care not to distort the area. The tracing is then identified with the carcass tattoo number. Figure 9 shows the proper methods for identifying a loin eye and for tracing with a planimeter. Loin eye measure would be reported on a 220-pound basis using the conversion factor given below.

Specifications for the meat-type hog - The present specifications for a meat-type hog are: (1) reach market weight (220 pounds) in 180 days or less (2) have an average back-fat of 1.50 or less inches (3) have a loin-eye area of 4.50 or more square inches (4) have a carcass length of 29.5 or more inches. All certification standards are based on a 220-pound market weight basis. All measurements for each pig at his slaughter weight will be converted to a 220 pound standard by use of this conversion factor:

The 220 pound standards are:

<table>
<thead>
<tr>
<th>Days</th>
<th>180 max.</th>
<th>2.00 lbs/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>29.5 in. min.</td>
<td>0.025 in/lb.</td>
</tr>
<tr>
<td>Backfat</td>
<td>1.50 in. max.</td>
<td>0.004 in/lb.</td>
</tr>
<tr>
<td>Loin eye area</td>
<td>4.50 sq.in. min.</td>
<td>0.015 sq.in./lb.</td>
</tr>
</tbody>
</table>

The animal must also have been an efficient utilizer of available feed. The resulting carcass should be acceptable in quality items such as texture, marbling, color and firmness.
Differences Observed - Large differences exist in carcass measurements of 200 pound market animals. Some of these differences are shown in Figure 1 and Table 1:

Table 1. Differences in fat and lean type carcasses

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Meat Type</th>
<th>Fat Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ham and loin</td>
<td>lb.</td>
<td>60.4</td>
<td>49.0</td>
</tr>
<tr>
<td>Loin-eye area</td>
<td>sq.in.</td>
<td>6.28</td>
<td>3.34</td>
</tr>
<tr>
<td>Fat trim</td>
<td>lb.</td>
<td>13.0</td>
<td>22.0</td>
</tr>
</tbody>
</table>

*a/ Values are for carcasses shown in Figure 1.

USDA grades for barrows and gilts - The present USDA Grades for market barrows and gilts are presented in Table 2. It should be noted that carcass weight, carcass length and average backfat are the three items used in establishing the grades.

Table 2. USDA grades for barrows and gilts

<table>
<thead>
<tr>
<th>Approx. Live Wt.</th>
<th>Hot Carcass</th>
<th>Average backfat thickness by grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wt. (lb.)</td>
<td>Length (in.) U.S. No. 1 (in.) U.S. No. 2 (in.) U.S. No. 3 (in.) U.S. No. 4 (in.)</td>
</tr>
<tr>
<td>170 or less</td>
<td>120 or less</td>
<td>1.0-1.3 1.3-1.6 1.6-1.9 1.9 or more</td>
</tr>
<tr>
<td>171-234</td>
<td>121 to 164</td>
<td>1.0-1.4 1.4-1.7 1.7-2.0 2.0 or more</td>
</tr>
<tr>
<td>235-299</td>
<td>165 to 204</td>
<td>2.1 or more</td>
</tr>
<tr>
<td>300 or more</td>
<td>205 or more</td>
<td>1.5-1.8 1.8-2.1 1.9-2.2 2.2 or more</td>
</tr>
</tbody>
</table>

Table 3. Expected yields of the four lean cuts based on chilled carcass weight by grade

<table>
<thead>
<tr>
<th>Grade</th>
<th>Yield^{a/}</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. No. 1</td>
<td>53% and over</td>
</tr>
<tr>
<td>U.S. No. 2</td>
<td>50 to 52.9%</td>
</tr>
<tr>
<td>U.S. No. 3</td>
<td>47 to 49.9%</td>
</tr>
<tr>
<td>U.S. No. 4</td>
<td>Less than 47%</td>
</tr>
</tbody>
</table>

*a/ Includes hams, loins, shoulders as % of chilled carcass

Table 3 gives the average expected yield of lean cuts for animals from the top four USDA swine carcass grades.