Producing quality beef with grass and grain

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Producing Quality Beef With Grass and Grain

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Preface

There is an increasing interest in Louisiana and in the Southeastern states in ways of producing more quality slaughter beef. The use of improved pastures makes it possible to produce more beef per acre with the steer fattening program than with a cow-calf plan. Previous work at this station has shown that the feeding of grain, either on grass or in drylot, is necessary to attain slaughter grades of U.S. Good or Choice.

Currently the demand in Louisiana markets is for carcasses weighing from 450 to 650 pounds, grading Good to Choice, with a minimum amount of external fat.

This bulletin compares three programs for producing high-quality beef utilizing high-quality forage, with limited amounts of grain. These programs are described as follows:

(1) Feed grain on grass for 300 to 350 days.
(2) Graze 215 to 225 days and feed grain on grass for 90 to 130 days.
(3) Graze 330 to 340 days and feed in drylot for 112 days.

These programs take advantage of our natural resources by utilizing a maximum amount of grass and a minimum amount of grain. These systems of finishing beef cattle might be described as “low-risk” systems, since they require a minimum amount of labor and purchased inputs.
Producers Quality Beef With Grass and Grain

John C. Carpenter, Jr.,¹ R. H. Klett,² Paul B. Brown³
and George L. Robertson⁴

Summary

Research at the Northeast Louisiana Experiment Station has shown that quality beef carcasses may be produced by feeding grain either as a pasture supplement or in drylot following a period of grazing. These carcasses averaged 510 to 601 pounds and had sufficient marbling to grade U.S. Standard to Choice with only a thin rind of external fat. The fat was white except for a very few cases each year, and these were not yellow enough to be objectionable to packers.

Three programs were used in producing these slaughter steers. Each program began in the fall with weanling beef calves weighing 422 to 463 pounds and grading Standard to Good. At the close of each program the steers weighed 864 to 1,073 pounds and graded U.S. Standard to Choice. Carcasses were observed in two of the three years.

In Program No. 1, concentrates were fed to steer calves grazing pastures for 300 to 350 days. Approximately one ton of feed was required per steer. Concentrates were fed to one group at a constant level of 8 pounds per head daily and to the other group at 1 pound per head daily for each 100 pounds of live weight. Thus the amount of concentrates fed to the latter group was increased with each 100 pounds increase in body weight. The steers fed at the 1 percent level carried a higher degree of finish as observed after approximately 220 days in each trial. Forty-five percent of the steers in this group graded Choice when slaughtered as compared with 20 percent in the group fed at a constant level during the trial. All carcasses exhibited superior marbling and rind fat that was fairly thin and white.

In Program No. 2 weanling calves were grazed approximately 220 days (from October to May) without concentrates. Beginning in May they were fed 1.5 pounds of concentrates per 100 pounds of body weight while grazing common Bermudagrass pastures for approximately 128 days. Approximately 1,500 pounds of concentrates were required per steer. The carcasses produced in this program were also acceptable. They exhibited white fat, had sufficient marbling to grade U.S. Standard to Good, and had exceptionally thin rind fat.

The weanling calves in Program No. 3 were grazed 330 to 340 days with no supplemental grain and were fed for a finishing period of 112 days in drylot. In these trials, an average of approximately 1,842 pounds

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of concentrates and 566 pounds of hay were fed per steer. Carcasses had thin, white rind fat and sufficient marbling to grade Good to Choice. Approximately one-third of the carcasses produced in this program graded U.S. Choice.

Program No. 1 produced a greater number of Choice carcasses, which exhibited superior marbling, than did the other two programs. Program No. 2 produced carcasses with thinner rind fat. All three programs produced Good to Choice carcasses each year that were highly acceptable to the packers.

Previous Work

Research at this station during 1961-1963 showed that, to obtain a slaughter grade of U.S. Good, it is necessary to feed grain to steers while grazing Coastal Bermudagrass pastures (1).5

Investigations at the North Carolina Agricultural Experiment Station (8) showed that one of the best ways to increase returns from a cattle fattening program is to include high-quality pasture in the program. Indications were that concentrates should be fed at the level of 0.8 to 1 percent of the animal's body weight. In that work salt was as effective as yellow grease in controlling feed intake.

Workers at the Florida Experiment Station (2) showed that either orally administered (10 milligrams daily) or implanted (24 mg. per steer) stilbestrol can be used in fattening of steers. Carcass grades were occasionally lowered by a 36-mg. implant per steer to grazing animals. No more than a 24-mg. implant of stilbestrol per steer was recommended for cattle fed on pasture.

Research workers at Clemson (5) reported a one-third higher carcass grade from drylot fed steers than from steers fed grain on pasture. Ratings of meat (steaks and roasts) by purchasers showed no significant difference in preference for either drylot or pasture fed cattle when the meat was rated on the basis of taste, tenderness, and aroma.

Virginia workers (6) found that feeding 22.3 bushels of coarsely ground corn per head to grazing steers from July 1 to October resulted in a live slaughter grade of Good. Steers grazing pasture alone graded Standard.

Research data (3 and 4) collected at the Tennessee Station indicated that high-quality winter and spring pastures can be used as an economical source of feed in a yearling slaughter steer program if followed by a short drylot feeding period (70 days). During this feeding period the slaughter grade of the cattle increased from Standard to Good, which resulted in an increased value per hundredweight of more than $5.50.

Georgia workers (7), while studying alternative cattle feeding systems, reported more profits from a combination of grazing winter annuals and drylot feeding or from grazing alone than from drylot feeding alone. Their most profitable system included winter grazing of annual pastures for 120 days followed by a 120-day drylot feeding period. The least profitable system was drylot feeding for 180 days.

5Italic numbers in parentheses refer to Literature Cited, Page 11.
General Procedure

Preparation of Pastures

Pastures used in these studies included fescuegrass, ryegrass, Coastal Bermudagrass, common Bermudagrass, Johnsongrass, and a forage sorghum (Lindsey 77F).

Fescuegrass pastures were on established plots with a good stand of grass. These pastures were topdressed each September with 67 pounds of nitrogen per acre. Another application of 33.5 pounds of nitrogen per acre was made in February or March of each year.

Ryegrass pastures were seeded on a prepared seedbed each September. Just prior to seeding, 67 pounds of nitrogen was disked in. Common ryegrass was seeded at the rate of 45 pounds per acre and cultipacked. A topdressing of 33.5 pounds of nitrogen per acre was applied each February or March.

Coastal Bermudagrass pastures were topdressed each April with 67 pounds of nitrogen per acre, and another 33.5 pounds of nitrogen was applied each acre in July or August.

Forage sorghum (Lindsey 77F) was seeded at the rate of 30 to 40 pounds per acre on a prepared seedbed during May each year, following fertilization with 67 pounds of nitrogen per acre.

Stocking rates varied from one to two animals per acre depending on the amount of grain being fed and the amount of forage available. All plots furnished abundant high-quality forage.

Handling of Cattle

Weanling beef steers for each of the three programs were purchased each year in October. These calves ranged in weight from 422 to 463 pounds, and in grade from Medium to Good. All calves were wormed soon after purchase and again in May of the following year. They were sprayed to control lice, and backrubbers were provided to control flies. Each steer received a 12-mg. implant of diethylstilbestrol in October and a 24-mg. implant in May. Salt and minerals were fed free choice.

After being randomly assigned to treatment groups, all cattle were on winter and spring grazing crops from October until May. Only the animals in Program No. 1 received supplemental concentrates during the period from October to May. (Lots 1 and 2 on Program No. 1 were grazed together and received 8 pounds of 12 percent protein fattener pellets per head per day, while Lot 3 received 1 pound of a mixture containing equal parts of 12 percent fattener pellets and hominy per 100 pounds of body weight per day.)

In May of each year the cattle were allotted (on the basis of previous treatment and rate of gain) to treatment groups receiving varying amounts of concentrates and/or improved summer pasture as follows: Program No. 1

Lot 1 (5 steers) continued to receive 8 pounds of 12 percent fattener pellets.
Lot 2 (6 steers) received 8 pounds of 12 percent fattener pellets plus 3.5 pounds of hominy.
Lot 3 (10 steers) received 1 pound of a mixture of equal parts of 12 percent protein fattener pellets and hominy per 100 pounds of body weight per day.

**Program No. 2**

Lot 1 (8 steers) received 1.5 pounds of 12 percent fattener pellets per 100 pounds of body weight per day.
Lot 2 (8 steers) received 1.5 pounds of a mixture of equal parts of 12 percent pellets and hominy per 100 pounds of body weight.

**Program No. 3**

All cattle were on temporary grazing (Lindsey 77F forage sorghum) from May until mid-September. Beginning in September all cattle were fed for 112 days in drylot as one group; they received 2 pounds of a mixture of equal parts of 12 percent pellets and hominy per 100 pounds of body weight per day.

**Program No. 1 — Limited Feeding on Pastures**

**Procedure**

This program was designed to compare two groups of calves fed limited amounts of grain over a period of some 312 days. Two groups (Lots 1 and 2) were fed together during the first 222 days of the trial (Phase I) and received a constant amount of concentrates (8 pounds per head per day) which consisted of 12 percent protein fattener pellets containing 52 percent grain. Lot 3 was fed separately and received 1 pound of concentrates per 100 pounds of body weight. The concentrate supplement for Lot 3 during this period consisted of equal parts of 12 percent fattener pellets and hominy.

The calves in Lots 1 and 2 grazed Coastal Bermudagrass from October to December. Fescue or ryegrass pastures were grazed from then until May, and Coastal Bermudagrass provided the grazing for the final 90 days of the trial. The pasture used for Lot 3 was a 10-acre plot which contained fescue, ryegrass, Johnsongrass, and common Bermudagrass.

During the last 90 days (Phase II) of this study Lot 1 continued to receive 8 pounds of fattener pellets per head per day, while Lot 2 received an additional 3.5 pounds of hominy. Lot 3 continued to receive the hominy pellet mixture at the rate of 1 pound per 100 pounds of body weight.

**Results and Discussion**

Results of feeding and grazing in Phase I are presented in Table I. There were no significant differences in total gain per steer or average daily gain when Lots 1, 2, and 3 were compared. However, there was a trend for Lots 1 and 2 to have a lower rate of gain even though they consumed more feed than the steers fed 1 percent of their body weight. There was a tendency for the steers in Lot 3 to fatten earlier and carry a higher degree of finish in May than steers in the other lots.

During Phase II, the steers fed approximately 8 pounds of con-
centrates per day had the lowest rate of gain; however, they consumed less feed than those in Lot 3 (Table 2). Steers in Lot 2 consumed 11.2 pounds of feed per day and made the highest daily rate of gain (1.74 pounds) but were the least efficient when considering pounds of grain per pound of gain.

Pooled data for both phases of the study are presented in Table 3. Steers in Lot 3 exhibited a higher rate of gain on less feed than the other lots. Steers in Lot 3 consumed 2,143 pounds of concentrates during the 312-day feeding period and made a total gain of 548 pounds. Steers in Lots 1 and 2 consumed 2,215 and 2,552 pounds of concentrates and made total gains of 507 and 529 pounds, respectively. Steers fed 1 percent of their body weight required only 3.90 pounds of concentrates per pound of gain, whereas those in Lots 1 and 2 consumed 4.36 and 4.81 pounds of concentrates per pound of gain, respectively.

Steers fed 1 percent of their body weight were heavier at slaughter than those in Lots 1 and 2. Cattle in Lot 3 were slaughtered at what is considered the ideal slaughter weight necessary to produce a desirable carcass grading Good to Choice and having a minimum amount of waste fat.

Lots 1 and 2 were stocked at a higher rate per acre and were

---

**TABLE 1.**—Two-Year Average Results of Feeding and Grazing Fescue-Ryegrass Pastures (October-May; 222 Days)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Pasture plus 8 lb. concentrates</th>
<th>Pasture plus 1 percent concentrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot No.</td>
<td>1, 2*</td>
<td>3</td>
</tr>
<tr>
<td>Avg. number of animals/yr.</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Steers per acre</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Final weight, lb.</td>
<td>829</td>
<td>850</td>
</tr>
<tr>
<td>Initial weight, lb.</td>
<td>459</td>
<td>450</td>
</tr>
<tr>
<td>Gain per steer, lb.</td>
<td>370</td>
<td>400</td>
</tr>
<tr>
<td>Daily gain per steer, lb.</td>
<td>1.67</td>
<td>1.80</td>
</tr>
<tr>
<td>Concentrate intake/hd/day, lb.</td>
<td>6.94</td>
<td>5.99</td>
</tr>
<tr>
<td>Concentrate intake/lb. gain, lb.</td>
<td>4.16</td>
<td>3.33</td>
</tr>
</tbody>
</table>

*Lots 1 and 2 fed together.

**TABLE 2.**—Two-Year Average Results of Summer Feeding and Grazing (May-September; 90 Days)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Pasture plus 8 lb. concentrates</th>
<th>Pasture plus 11.5 lb. concentrates</th>
<th>Pasture plus 1 percent concentrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot No.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Avg. number of animals/yr.</td>
<td>5</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Steers per acre</td>
<td>2.0</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Final weight, lb.</td>
<td>966</td>
<td>988</td>
<td>998</td>
</tr>
<tr>
<td>Initial weight, lb.</td>
<td>826</td>
<td>831</td>
<td>850</td>
</tr>
<tr>
<td>Gain per steer, lb.</td>
<td>140</td>
<td>157</td>
<td>148</td>
</tr>
<tr>
<td>Daily gain per steer, lb.</td>
<td>1.56</td>
<td>1.74</td>
<td>1.64</td>
</tr>
<tr>
<td>Conc. intake/hd/day, lb.</td>
<td>7.50</td>
<td>11.20</td>
<td>9.00</td>
</tr>
<tr>
<td>Conc. intake/lb. gain, lb.</td>
<td>4.81</td>
<td>6.44</td>
<td>5.49</td>
</tr>
</tbody>
</table>
TABLE 3.—Two-Year Average Results of Feeding and Grazing Fescue-Ryegrass and Bermudagrass Pastures (October-September; 312 Days)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Pasture plus 8 lb. concentrates</th>
<th>Pasture plus 8-11.5 lb. concentrates*</th>
<th>Pasture plus 1 percent concentrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot No.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg. No. animals/yr.</td>
<td>5</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Steers per acre</td>
<td>1.5-2**</td>
<td>1.5-2</td>
<td>1.0</td>
</tr>
<tr>
<td>Final weight, lb.</td>
<td>966</td>
<td>988</td>
<td>998</td>
</tr>
<tr>
<td>Initial weight, lb.</td>
<td>459</td>
<td>459</td>
<td>450</td>
</tr>
<tr>
<td>Gain per steer, lb.</td>
<td>507</td>
<td>529</td>
<td>548</td>
</tr>
<tr>
<td>Daily gain per steer, lb.</td>
<td>1.63</td>
<td>1.70</td>
<td>1.76</td>
</tr>
<tr>
<td>Conc. int/hd/day, lb.</td>
<td>7.10</td>
<td>8.18</td>
<td>6.87</td>
</tr>
<tr>
<td>Conc. int/lb. gain, lb.</td>
<td>4.36</td>
<td>4.81</td>
<td>3.90</td>
</tr>
<tr>
<td>Carcass grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice</td>
<td>2</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Good</td>
<td>8</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Yield grade</td>
<td>2.20</td>
<td>2.60</td>
<td>2.80</td>
</tr>
<tr>
<td>Percent Choice</td>
<td>20%</td>
<td>33.3%</td>
<td>45%</td>
</tr>
</tbody>
</table>

*The steers in Lot 2 were fed at the 8-lb. level for 222 days and at the 11.5-lb. level per head daily for the last 90 days of the trial.

**Pastures were stocked at the rate of 1.5 steers per acre for the first 222 days and 2 steers per acre during the last 90 days.

considerably higher than Lot 3 in beef produced per acre. However, the intent was to stock the pastures based on the available forage in each lot, thus allowing a comparison of feed levels rather than stocking rate. It is recognized that there may have been variations in forage production and quality which could account for some of the differences in rate of gain and feed efficiency.

Steers fed at 1 percent of their body weight per day graded higher when slaughtered. The percentage of Choice carcasses produced in Lots 1, 2, and 3 was 20.0, 33.3, and 45.0 percent, respectively. This substantiates the earlier statement that cattle fed at 1 percent of their body weight tended to fatten earlier and carry a higher degree of finish throughout the feeding period. The same trend in fattening was exhibited with an increase in yield grade as the quality grade increased.

Carcasses produced in this program were highly acceptable. They were muscular and exhibited adequate marbling to grade Good to Choice. Backfat was thin, resulting in only a slight waste to the packer. The carcass fat was also highly acceptable in color, even though the steers had been fed on grass until slaughter.

Program No. 2—Deferred Feeding on Pastures

Procedure

Steers in Lots 1 and 2 were grazed together on winter and spring pasture (fescue or ryegrass alternately) without supplemental grain from October until May (217 days). In May of each year the cattle were randomly divided into two groups of eight animals each. The cattle
were placed on common Bermudagrass pastures and fed supplemental concentrates for 128 days. Lot 1 received a 12 percent protein fattener pellet at the rate of 1.5 pounds per 100 pounds of body weight; Lot 2 was fed a mixture of equal parts of 12 percent protein pellets and hominy at the same rate. Pastures were stocked at the rate of two steers per acre.

Results and Discussion

The steers gained 1.15 pounds per day during the initial 217-day grazing period. There were no significant differences in performance between the two groups during the 128 days they were fed concentrates on pasture (Table 4). The cattle gained an average of 1.82 pounds per head per day with an average conversion rate of 6.25 pounds of concentrates per pound of gain.

Two-year slaughter data showed no observable differences between treatments. Both treatments were effective in producing desirable slaughter animals weighing approximately 900 pounds. These steers were not as heavy and the carcasses did not exhibit as high quality as those in Program 1. There was adequate marbling for most of the carcasses to grade Good to Choice (13 Good and Choice and 3 Standards in each treatment).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Lot No.</th>
<th>1.5 lb. 12% protein pellets per 100 lb. body weight</th>
<th>1.5 lb. pellets and hominy per 100 lb. body weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steers per acre</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Final weight, lb.</td>
<td>2</td>
<td>919</td>
<td>906</td>
</tr>
<tr>
<td>Initial weight, lb.</td>
<td>2</td>
<td>685</td>
<td>674</td>
</tr>
<tr>
<td>Gain per steer, lb.</td>
<td>2</td>
<td>234</td>
<td>232</td>
</tr>
<tr>
<td>Daily gain per steer, lb.</td>
<td>2</td>
<td>1.83</td>
<td>1.81</td>
</tr>
<tr>
<td>Conc. int/hd/day, lb.</td>
<td>2</td>
<td>11.52</td>
<td>11.21</td>
</tr>
<tr>
<td>Conc. int/lb. gain, lb.</td>
<td>2</td>
<td>6.30</td>
<td>6.19</td>
</tr>
</tbody>
</table>

Program No. 3—Deferred Feeding in Drylot

Procedure

Thirty-four fall-purchased calves were grazed on winter and summer pastures with no supplemental grain for 330 to 340 days and finished in drylot during an additional 112 days. The winter pastures consisted of fescuegrass and ryegrass. The ryegrass in the winter program was overseeded on common Bermudagrass at the rate of 20 pounds per acre in October or November. Lindsey 77F (forage sorghum) was planted on a prepared seedbed in May to provide summer grazing.
Results and Discussion

Winter and spring grazing for an average of 221 days (October 16 to May 24) increased weight from 424 to 696 pounds, or an average daily gain of 1.23 pounds. Summer grazing on Lindsey 77F produced final weights of 804 pounds and average daily gains of 0.96 pound per steer.

During the 112-day drylot finishing period, which extended from September 15 through January 3, the steers gained 249 pounds for an average daily gain of 2.2 pounds. The roughage intake was 5.28 pounds per head per day, or 2.36 pounds per pound of gain. The concentrate intake was 16.56 pounds per head per day, or 7.39 pounds per pound of gain.

The steers dressed 59.25 percent at slaughter. Carcass grades for the 34 animals were 10 Choice and 24 Good. The average yield grade was 2.58, indicating better than 50 percent lean cuts.

Data from this study suggests the importance of feeding grain in addition to pasture. These cattle were grazed almost as long as those in the previous programs but were not ready for slaughter until after a short drylot feeding period.

General Discussion

Previous work at the Northeast Louisiana Experiment Station and the Macon Ridge Branch Station has indicated that weanling calves may be held economically for on-the-farm feeding until ready for slaughter. This approach to feeding beef cattle is becoming more apparent with the tremendous increases in land prices and cost of maintaining a cow during the year. Therefore, the previously described programs involving a combination of pasture and grain feeding were investigated as methods that may be feasible to the producer for feeding cattle to an acceptable slaughter weight and grade.

Program 1 appears to have several advantages over the other two. On the basis of weight at slaughter, average daily gain, number of carcasses grading Choice, feed efficiency, and time required to finish the steers, the first program is superior. Cattle in Program 1 were slaughtered at approximately 950 to 1,000 pounds, which gives a desirable carcass weight of 550 to 650 pounds. Cattle in Program 2 were considerably lighter (906 to 919 pounds) at slaughter, while those in the last program weighed approximately 1,050 pounds at slaughter. Cattle in Program 1 were slaughtered at 312 days while those in Programs 2 and 3 were slaughtered after grazing and/or feeding periods of 345 and 447 days, respectively. The cattle in Program 3 could probably have been fed for a shorter period since they were heavier at slaughter than normally desired by most packers. This would have reduced the concentrates consumed by these cattle and probably increased the return since cattle become less efficient at heavier weights.

The average daily gains for combined treatments within the various programs were 1.70, 1.40, and 1.39 pounds for Programs 1, 2, and 3, respectively. These figures include both the grazing and/or drylot periods for the various programs. It was evident that steers fed concentrates at
the beginning of the experiment were more efficient in their utilization than when fed in the latter stages. This was probably due to the fact that younger cattle are more efficient users of grain and heavier cattle decrease in their feed efficiency as they increase in weight.

It was of interest to note differences in concentrates consumed by cattle in the various programs. The most concentrates were consumed in Program 1 and the least in Program 2. However, the important consideration is not the total pounds of concentrates fed, but the quantity of total digestible nutrients (TDN) consumed. Unfortunately this could not be determined, since the quantity of forage consumed by the animals was not known. However, available data showing the amount of TDN required per pound of gain by beef steers would indicate that when less concentrates were fed in a treatment, more efficient utilization of forage was obtained.

Consumer preference for Good to Choice beef almost requires that cattle be fed some grain during grazing periods in order to produce carcasses containing sufficient marbling and quality to meet these grade standards. All three programs were effective in producing a majority of Good to Choice carcasses. Almost all carcasses were acceptable to the packer from the standpoint of fat color and degree of finish. Even though the cattle in Programs 1 and 2 grazed grass until slaughter, the fat was white and was not objectionable to the packer. An acceptable fat thickness over the ribeye was noted in all three programs.

---

**Literature Cited**

PROGRAM NO. 1 —
Superior marbling and a fairly thin rind fat.

PROGRAM NO. 2 —
Sufficient marbling to grade Good and a thin rind fat.

PROGRAM NO. 3 —
Sufficient marbling to grade Good and a rind fat not as thin as in Program No. 2.