Grazing Beef Cattle On Winter-Growing Crops

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The future success of the beef cattle industry of Mississippi depends very largely upon the production of beef based largely on a pasture and forage production program. The low per acre yields of grain of this area eliminate almost entirely the possibility of selling grain through commercial beef cattle to an advantage, as is done in the Mid-West. With relatively cheap lands, long growing seasons, and mild winters that exist in the southeast the beef cattle industry, properly managed, should be able to compete very favorably with the beef cattle industry of other areas regardless of price trends.

It is realized by cattle producers that the cheapest and most satisfactory feed for beef cattle is that which is harvested by cattle and this feed usually consists of that produced on permanent and supplemental pastures. Permanent pastures that have been properly managed usually furnish an abundance of palatable nutritious feed for cattle during the spring months, but when the weather gets hot and rainfall is less plentiful the carrying capacity of most permanent pastures is lowered, consequently during the hot dry period of the summer and fall cattle fail to gain in weight or grow as they did in the spring. The winter period, however, is even more critical than the worst drouths of summer, because permanent pastures have ceased to supply any, or at best very little feed, and it becomes necessary that cattle be carried either on supplemental pasture or on harvested feed.

With the above situation existing in regard to beef cattle management and feed problems, it is clear that further research work should be done and a study be made of the practicability of providing supplemental grazing crops, the kinds and varieties of crops most suitable for summer and winter grazing, as well as the kinds and amounts of fertilizers that should be added to pastures for most profitable results.

A cooperative project has been initiated at State College on the Central Experiment Station farm involving about one hundred and ten acres of land, the object of which is to make a comprehensive study of some of the grazing problems in this section of the State. This study is being carried on by the Soils, Crops, and Animal Husbandry Departments in order that a more complete analysis may be made of the problems that could be otherwise handled.

The 110-acre tract, mostly land that is too rough for row crops, has been divided into six supplemental grazing plots each containing 9.44 acres, and ten permanent pasture plots which contain 5.03 acres each. Three of the supplemental plots and five of the permanent plots or one-half of the total number are on one side of a drain ditch, and the other three supplemental and five permanent pasture plots are on the opposite side of the drain ditch. On either side of the drain ditch the supplemental plots are comparable in soil types, slopes, and fertility, but these three plots are not comparable in soil type to those on the opposite side of the ditch.

The permanent pasture plots were surveyed in a similar manner. That is, the five plots on either side of the drain ditch were surveyed so that an equal amount of the various soils are represented in each plot, but those on the west side of the ditch do not compare to those on the east side. This system of plot arrangement allows for replication of each fertilizer treatment as well as crops studied.
and should give a more accurate analysis of the problems studied than if single-plot studies were made.

The original plan of this project involved a study of oats, oats and wild winter peas, and oats and crimson clover for winter grazing on the supplemental plots, and of Johnson grass, Sudan grass, and Johnson grass-sorghum hybrid for summer grazing. The ten permanent pasture plots were to be treated with varying amounts and kinds of mineral fertilizers, seeded to dallis grass and white clover, and used for spring and summer grazing.

The over-all plan was to begin with weanling calves in November and December on the winter growing supplemental crops, the calves to be taken off of these crops in March when white clover pastures were ready to graze. The permanent pasture plots were to be grazed until July when the summer supplemental crops would be available, and the supplemental plots would then be utilized as required for permanent pasture recovery and maximum gains by the grazing animals. With such a system of rotation cattle would not only be on grazing crops the year round, but they also would have access to the crops during the most palatable and nutritious stages of growth.

The first series of winter growing crops has been grazed, but on account of unavoidable circumstances the cattle were not turned on the plots until January 23, 1946. Since it was impossible to have the permanent pastures ready for grazing in March this year it was decided to carry the cattle on oats and the other winter crops this spring as long as the grazing in these plots produced satisfactory gains. Therefore, the grazing results obtained in connection with this project during the past winter and spring in some respects will not be comparable to future data and virtually amounts to selling the entire winter crops through cattle since they were left on the various crops until May 15. The permanent plots will not be grazed in 1946, but will be mowed regularly to control weeds.

Land Used and Previous Treatment

Of the total of 110 acres in the overall project, approximately 30 acres of the land involved in winter grazing, and that upon which the results reported in the table were obtained, had been in permanent pasture for a number of years. The remainder had been in cultivation in recent years and had been planted to general crops such as cotton, corn, sorghum, oats, etc. Approximately one-third of the total acreage is considered to be too rough and hilly for row crop farming. The remainder ranges from a gradual slope to level topography.

Fence, Water, Scales

Each plot is fenced with semi-permanent materials, Number 9, 49-inch and 54-inch net wire being used where a net wire fence is needed most, while 5-strand 4-point heavy barb wire is used for cross fences. Steel line posts are used throughout, while corner and pull posts are of unsplit cedar, at least 6 inches in diameter, firmly set in the ground. The brace posts are 4" x 4" x 12' pine and are pressure-treated with creosote. It is believed that this fence, tightly stretched and well braced, is necessary in order to keep experimental animals in the grazing paddocks and other stock out and will need very little attention for 10 years or more. Water is piped from the College water system to each plot and kept available in concrete troughs with float valves.

A scale will be installed near the center of the plots which will facilitate weighing and cause a minimum of disturbance to the experimental animals during the grazing periods.
Seeding, Land Preparation, and Fertilizer Treatments

The supplemental plots were thoroughly disked with a “bush and bog harrow” the first week in August, 1945. Since one-half of the land to be used in the supplemental plots had been in permanent pasture for a number of years, this part of the area was rather turfy and was disked again with a pulverizing disc before the fertilizers were applied.

Four tons of lime, 600 pounds 20 percent superphosphate, 300 pounds 50 percent muriate of potash, and 200 pounds of 16 percent nitrate of soda per acre were applied about the middle of August. The large amount of lime was applied because it was hauled by truck from a nearby lime plant and distributed on a contract basis, and with the spreading equipment used it was impossible to uniformly distribute less lime. It is believed, however, that on this particular land the cost of lime can be distributed over a 10-year period. Rather heavy amounts of phosphate and potash were applied to eliminate any differences that might occur on the different plots due to a deficiency of these minerals. The nitrate of soda was applied at seeding time to stimulate maximum growth of plants for winter feed.

The minerals were disked into the soil, and the plots were seeded around the first of September.

Plot number 70 was seeded to 100 pounds of oats per acre, plot number 20 with 100 pounds oats and 50 pounds of wild winter peas, and plot number 30 with 100 pounds oats and 20 pounds crimson clover seed per acre.

Fortunately, showers came in early September and the seed, except the wild winter peas, germinated immediately. The oats and crimson clover grew rapidly during September and October and by November 15 these crops had made sufficient growth to be grazed, but on account of the fencing problem the cattle were not turned on the plots until January 23, 1946.

A slight amount of winter killing was noted in the oats where the rankest growth was made, which probably would not have occurred if grazing had been started in November. This, however, was not serious and did not cause any appreciable decrease in the amount of grazing afforded when the cattle were turned on the plots in January. As is usually the case with wild winter peas the first year, a very small percent of germination was noted; it was thought that because of the poor stand of peas they added little, if anything, to the quality or quantity of grazing in this plot.

The 10 permanent pasture plots consist of 5.03 acres each. For the next few years these plots will be used in a study of amounts and kinds of mineral fertilizers needed and most profitable in a permanent pasture program. One of the yardsticks for measuring the efficiency of the various fertilizer treatments, as well as of all grazing crops, will be gains produced on beef cattle.

As part of the land included in these plots was in cotton and other field crops in 1945 it was impossible to get it prepared, fertilized, and seeded in the fall of 1945, and it was necessary that this part of the grazing program be delayed until the spring of 1946, because the land was too wet for preparation from December 1, 1945, to April 1, 1946. However, all plots were thoroughly disked during the first part of April, fertilizer treatments applied, and dallis grass seed planted during the month of April.

The fertilizer treatments applied per acre were as follows:

Plot 1, check, no fertilizer treatment.
Plot 2, 200 pounds 20 percent superphosphate plus 100 pounds ammonium nitrate (40 pounds P₂O₅ plus 32 pounds N).
Figure 1. Cattle grazing on oats and crimson clover. This plot produced more grazing than oats alone or oats plus wild winter peas. Photographs made April 18, 1946, after crops had been continuously grazed for 3 months.

Plot 3, 400 pounds 20 percent superphosphate plus 100 pounds ammonium nitrate (80 pounds P₂O₅ plus 32 pounds N).

Plot 4, 400 pounds 20 percent superphosphate, plus 1 ton lime, plus 100 pounds ammonium nitrate.

Plot 5, 400 pounds 20 percent superphosphate, plus 120 pounds 50 percent muriate of potash (60 pounds K₂O), plus 1 ton lime, plus 100 pounds ammonium nitrate.

After the fertilizers were applied the land was disked and harrowed with a drag harrow. The dallis grass seed was planted at the rate of ten pounds per acre with a grain drill a few days later on a firm seed bed. The cultipacker was run over the land after the seed was planted. White Dutch clover seed will be planted with a cyclone seeder on all plots in August. Plots 6, 7, 8, 9, and 10 are replicates of the above plots, and they have been fertilized and seeded in a similar manner, plot 6 getting the same treatment as plot 5, plot 7 the same as plot 4, plot 8 same as plot 3, plot 9 same as plot 2, and plot 10 used as a check plot same as plot 1.

Cattle Used

The cattle used in these grazing experiments were calves dropped in March, April, and May 1945, averaging about 10 months in age at the time they were put on the plots. Sixteen steers and fourteen heifers were uniformly divided...
as follows: Plots 70 and 20, 5 heifers and 5 steers each; plot 30, 6 steers and 4 heifers. These calves were weaned about the middle of November and since the temporary grazing plots had not been fenced, were fed in dry lot all the sorghum silage they would eat plus a daily feed of 3 pounds of cottonseed meal pellets and 3 pounds of Johnson grass hay per calf.

The steer calves were branded for individual identification purposes while being fed in the barn. They were weighed individually on January 21, 22, and 23, and the heifers were divided into three uniform groups and a bulk weight taken January 23, just before they were driven to the plots along with the three groups of steers. The steers and heifers were driven to the cattle barn, which is about one-half mile from the grazing plots, and weighed at the end of each 28-day period. They remained on the grazing plots four 28-day periods or a total of 112 days, beginning January 23 and ending May 15.

All heifers used were high grade Angus and Herefords and the two breeds were about equally represented on each plot. One steer on each plot was a high grade Angus. The Hereford steers were high grades, and first cross and second cross calves out of native south Mississippi cows, with an equal number of each grade on each plot. The steers and heifers when put on the plots graded "good" stocker calves. They had been fed in dry lot since weaning for about 50 days on slightly above maintenance ration, and the dry lot gain made was largely growth rather than fat. The performance of these three lots of calves while on the 112-day grazing test is reported in table 1.

Discussion of Results

In general, the calves on this winter grazing experiment made satisfactory gains. Scouring was noted with each individual after they had been on the grazing plots from two to four days, but was more pronounced with some individuals than with others. This condition continued for 60 to 70 days, but was less severe near the end than at the beginning of the grazing period. During the last 30 to 40 days of the test the droppings were normal and the quarters and around the tail were clean and free from foulness.

The scouring, although considered to be objectionable with cattle on feed, did not seem to interfere seriously or cause the cattle to fail to gain on this grazing test. The gains made during the first half of the period, when the droppings were the thinnest, were only slightly lower than the gains made during the last half of the test when the scouring had practically ceased. With the exception of the scouring, all animals remained healthy and made satisfactory gains throughout the experiment.

It is noted in the table that there is a difference in total acreage and acreage planted in each plot. At the time the crops were planted the plots had not been accurately surveyed. Therefore, the permanent lines established by the surveyor did not correspond with the tentative plot outline. In one case, part of one plot was planted to crops which could not be harvested in time to plant the winter crops. These factors account for the difference in total plot acreage and acreage planted.

It might be mentioned, also, that since most of the land used in this grazing test was previously in permanent pasture, plants other than those seeded appeared in early spring. Hop clover, which had been the principal early spring grazing crop in the permanent pasture, appeared more generally over the area in all plots than did other volunteer plants; and as the oats and other plants were grazed closer to the ground, hop
Table 1. Summary of results of cattle grazing on winter crops, January 23, 1946 to May 15, 1946.

<table>
<thead>
<tr>
<th>Items</th>
<th>Plot 70</th>
<th>Plot 20</th>
<th>Plot 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of cattle</td>
<td>January 23, 1946, 10 months.</td>
<td>5 steers and 5 heifers in plots 70 and 20.</td>
<td>6 steers and 4 heifers in plot 30.</td>
</tr>
<tr>
<td>Sex of cattle</td>
<td>5 steers and 5 heifers in plots 70 and 20.</td>
<td>All heifers high grade Hereford and Angus.</td>
<td>Steers, high grade Angus, first cross, second cross and high grade Hereford.</td>
</tr>
<tr>
<td>Breeding of cattle</td>
<td>5 steers and 5 heifers in plots 70 and 20.</td>
<td>All heifers high grade Hereford and Angus.</td>
<td>Steers, high grade Angus, first cross, second cross and high grade Hereford.</td>
</tr>
<tr>
<td>Plot 70</td>
<td>9.44</td>
<td>9.44</td>
<td>9.44</td>
</tr>
<tr>
<td>Oats and wild winter peas</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Plot 20</td>
<td>8.4</td>
<td>8.6</td>
<td>6.9</td>
</tr>
<tr>
<td>Oats and crimson clover</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Rate of stocking per acre, pounds</td>
<td>583.0</td>
<td>574.0</td>
<td>694.0</td>
</tr>
<tr>
<td>Average weight, January 23, 1946, pounds</td>
<td>489.7</td>
<td>523.5</td>
<td>530.0</td>
</tr>
<tr>
<td>Average weight, February 20, 1946, pounds</td>
<td>554.4</td>
<td>572.5</td>
<td>576.0</td>
</tr>
<tr>
<td>Average weight, March 20, 1946, pounds</td>
<td>589.0</td>
<td>572.0</td>
<td>576.0</td>
</tr>
<tr>
<td>Average weight, April 17, 1946, pounds</td>
<td>658.0</td>
<td>634.5</td>
<td>652.5</td>
</tr>
<tr>
<td>Average weight, May 15, 1946, pounds</td>
<td>687.0</td>
<td>672.0</td>
<td>685.0</td>
</tr>
<tr>
<td>Total gain per head, pounds</td>
<td>197.3</td>
<td>177.7</td>
<td>205.7</td>
</tr>
<tr>
<td>Average daily gain (112-day period), pounds</td>
<td>1.76</td>
<td>1.58</td>
<td>1.83</td>
</tr>
<tr>
<td>Total gain per acre planted, pounds</td>
<td>234.0</td>
<td>206.0</td>
<td>298.0</td>
</tr>
</tbody>
</table>

Financial Statement

| Crops cost per acre                        | 8.68     | 3.00   | 6.60   |
| Fertilizer, dollars                       | 8.68     | 3.00   | 6.60   |
| Seedbed preparation and planting, dollars | 3.00     | 3.00   | 3.00   |
| Seed, dollars                             | 3.00     | 8.00   | 6.60   |
| Total, dollars                            | 14.68    | 19.68  | 18.28  |
| Value cattle, January 23 at $13.50, dollars | 66.11   | 66.73  | 64.70  |
| Value cattle, May 15 at $14.50 less 3% shrinkage | 96.71  | 94.54  | 96.42  |
| Increase in value per head, dollars       | 30.60    | 27.81  | 31.72  |
| Value per acre of crops planted, dollars  | 36.42    | 32.33  | 45.97  |
| Value per acre, above crop cost, dollars  | 21.74    | 12.65  | 27.69  |

clover became more noticeable. A small amount of bur and white clover was evident in each plot. Wild barley and cheat were also noticeable toward the end of the grazing period. It is not known how much these volunteer plants contributed to the total amount of grazing on each plot, but no doubt some benefit was obtained from their presence.

As previously mentioned in this article, a low percent germination was obtained with wild winter peas. The calves on the oats-wild-winter-peas plot made the lowest returns of any of the three groups. As there was an abundance of grazing on this plot at all times, the reason for the poor showing of the calves cannot be given.

It is noted from the table that the daily gains of the calves on the three plots were as follows: Plot 70, oats, 1.76 pounds; plot 20, oats and wild winter peas, 1.58 pounds; and plot 30, oats and crimson clover, 1.83 pounds. These data would indicate that calves will gain almost as fast on oats alone as on oats and crimson clover. The per acre yield of beef, however, is decidedly in favor of the combination of oats and crimson clover. It should be pointed out that the oats-crimson-clover plot was stocked at the rate of 694 pounds of cattle per acre, and during the last half of the period it is estimated that this plot would have carried approximately 200 pounds more per acre. The rate of stocking of the oats plot was 583 pounds per acre, and that of the oats and wild winter peas plot 574 pounds of cattle per acre. The number of pounds of cattle per acre
on the two latter plots was apparently about the right amount for maximum gains.

The question was often asked regarding the advisability of leaving the cattle on the plots continuously during the winter months and particularly during wet weather. Cattle in these tests were on the plots continuously from January 23 to May 15. No shelter was provided and no feed was given other than the green feed produced on the plots. Salt was supplied in block form. Rainfall was heavy during the first 5 months of the year, and February was one of the wettest of record. Evidence of bogging was noted during the extremely wet weather; but with the above rate of stocking it was determined that the amount of bogging did not interfere with plant growth and probably did not seriously injure the physical condition of the soil.

The total gains made in each plot are reported in the table on the basis of the number of acres planted. The acreage planted was the only part of the plots that furnished grazing during the first half of the 112-day period. Hop clover, bur clover, wild barley, and cheat offered a small amount of grazing along with the planted crops during the last half of the grazing period. However, no allowance was made or credit given for the grazing of these crops as it was impossible to determine the amount of grazing

Figure 2. Cattle grazing on oats alone. These cattle made daily gains approximately as high as on the oats plus crimson clover plot, but the yield of beef per acre was not as high. Photographed April 18, 1946.
Figure 3. Cattle grazing on oats and wild winter peas. The peas germinated poorly and apparently did not materially affect the grazing. It is not known why this plot made the lowest gains. Photographed April 18, 1946.

obtained from them.

In the financial statement the crop costs shown are actual costs of fertilizer, seedbed preparation, planting, and seed. As was previously mentioned the fertilizer cost, including lime, phosphate, and potash, was distributed over a period of years. The nitrogen application was for one year only. The fertilizer costs shown in the table represent the annual charge for all fertilizers applied. Oats were seeded at the rate of 100 pounds, crimson clover 20 pounds, and wild winter peas 50 pounds per acre. In 1945 uncertified seed oats cost $1.00 per bushel, wild winter peas $10.00 per 100 pounds, and crimson clover seed $18.00 per 100 pounds.

The valuation of the cattle at the beginning of the grazing experiment was based on a price which similar cattle actually sold for in December. The value at the end of the trial was the actual selling price of the steers out of each group. The heifers, being equally as fat as the steers, would have sold for the same figure. One heifer out of plot 70 and one out of plot 30 were slaughtered for demonstration purposes. The other fourteen were retained in the herd for replacement purposes.

The 16 steers were slaughtered by a local packer who furnished the grade and bulk weight of the carcasses. Two steers graded “choice” and 14 graded “good” and the dressing percent or car-
cass yield of the 16 steers was 57.71 percent with 3 percent taken off of the gross weight for shrinkage. The two heifers slaughtered also graded "good." The color of fat of the carcasses of the 18 cattle slaughtered was only slightly colored and not enough to cause any penalty in price of wholesale and retail cuts.

**Summary**

Although several years of study might be required for final conclusions on many problems in connection with this grazing project, the following observations might be mentioned.

1. Ten-month-old thrifty beef type calves of both sexes will make gains on winter grazing crops for a 4-month period comparable to gains made by similar calves from birth to weaning. Steers and heifers in these tests made only 20 percent less gain per head per day than similar cattle usually make on full grain feed for 140-150-day period.

2. Maximum utilization of winter grazing crops produced on well fertilized land by weanling beef type calves might tend to extend the marketing period of calves over a longer period, thus leveling out the peak period of late summer and fall when most grass cattle are marketed. Calves handled on this kind of grazing program will not only be sold at heavier weights, but may also be sold during a period when prices of grass cattle are usually highest.

3. Scouring was very noticeable among all calves used in these experiments. However, this scouring condition did not seem to seriously affect the calves and did not prevent the making of normal gains. A daily feed of dry roughage might have been helpful in preventing or correcting the scours.

4. Labor cost involved in handling cattle on this grazing program after crops were planted was very little compared to some other systems of management.

5. Early planting, application of nitrate at planting time, and careful consideration given to rate of stocking or the number of pounds of cattle per unit or per acre, seem to be some factors that contribute to the success of a winter grazing program.

It is recommended that oats be planted in August or early September. As a safety measure crimson clover (soft seed) should be planted about the middle of October. Wild winter peas may be planted in August. It is usually good insurance to inoculate legume seed if planted on land where similar crops have not grown for several years.

Nitrogen applied in the spring, as recommended for grain production, is of little benefit in a winter grazing program. Nitrogen applied when or just before seed are planted stimulates growth immediately, and as a result the plants are much more vigorous and have a well established root system when freezing weather occurs. With nitrogen available, plants have a quicker come-back after growth has been checked by freezes or after being grazed off by cattle.

6. When all or a major part of the oat crop produced on average land is marketed through cattle in the form of grazing, a good return per acre might be expected and should compare favorably with the net value of the crop in the harvested form.