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*Wheat, Oats, or Rye with Ryegrass
and Yuchi Arrowleaf Clover as
Grazing for Stocker Calves*

Agricultural Experiment Station / Auburn University
E. V. Smith, Director

Auburn, Alabama



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Wheat, Oats, or Rye with Ryegrass and Yuchi Arrowleaf Clover as Grazing for Stocker Calves

R. R. HARRIS, C. S. HOVELAND, J. K. BOSECK, and W. B. WEBSTER¹

COOL-SEASON annual grazing crops offer potential for profitably growing calves to feeder size (1,3,6,7,8). In the past, the principal cool-season annual pastures in Alabama consisted of small grain or small grain with crimson clover and/or ryegrass. In recent years, Yuchi arrowleaf clover (*Trifolium vesiculosum* Savi) has shown promise in several Alabama tests (2,9). Yuchi arrowleaf is superior to crimson clover in that it remains productive and highly digestible 2 months later than crimson (9).

The question often arises as to which species of small grain to use in a cool-season annual grass-clover sward. Surprisingly, there are very few published reports comparing small grain species as grazing for beef calves. Brock (4) reported that animal performances on oats and wheat were very similar during 1965-66 in southern Mississippi. However, in 4 previous years, oats were damaged by cold during 2 of the years, and beef gains per acre were reduced from 500-600 pounds to 300 pounds. Test calves weighed about 450 pounds and pastures were stocked at approximately 1.9 animals per acre from mid-November until late in May.

Gangstad (5) reported average total grazing yields of 301 and 278 pounds of gain per acre for wheat and oats, respectively, in north-central Texas during a 3-year study with stocker beef calves. In addition, animal gain was greater during the winter months on wheat than on oats (135 vs. 119 pounds per acre). The same investigator also reported that beef gain was 190

¹ Associate Professor, Department of Animal and Dairy Sciences; Professor, Department of Agronomy and Soils; and Superintendent and Assistant Superintendent, Tennessee Valley Substation, respectively.

pounds per acre for rye and 166 pounds for oats during a single test year (5).

Georgia workers (10) obtained comparable animal performance from oats or rye grazed by beef steer calves weighing an average of 492 pounds and stocked at the rate of 1.15 animals per acre. These calves gained an average of 2.16 pounds daily during the 112-day grazing period on oats or rye, but they received 5 pounds of ground snapped corn per animal per day on grazing. McCormick *et al.* (10) suggested that oats were the forage of choice but that disease often resulted from continuous planting of oats. Further, they noted that rye could be rotated successfully with oats as pasture in programs for fattening yearling beef steers.

The objective of the experiments reported here was to compare wheat, oats, or rye in combination with Italian ryegrass as grazing swards for stocker beef calves. Yuchi arrowleaf clover was included in each mixture during the last 2 years. Tests were initiated at the Tennessee Valley Substation in the fall of 1967 and were conducted annually for 4 years.

EXPERIMENTAL PROCEDURE

The same general procedure was used in establishing pastures grazed during the 4 years. Only cool-season annual grazing crops were grown on the test area so that land could be plowed in June or July and fallowed during the summer. Fallowing helped ensure good stands for early grazing by conserving moisture and controlling weeds. The crops were planted during the last week of August or first week in September. Fertilizer was broadcast before planting, providing at least 40 pounds of N per acre and P and K to meet soil test recommendations. Two additional nitrogen applications of 40 to 50 pounds each were made in January and March.

Recommended varieties of each species of small grain were planted in 4-acre paddocks on Humphreys silt loam soil during each of the 4 test years. Rye and wheat were seeded at a rate of 1.5 bushels per acre and oats at 3 bushels per acre. Ryegrass was included at a rate of 15 pounds and Yuchi arrowleaf clover at 10 pounds per acre. The same species of small grain was planted on the same 4-acre paddocks for the first 3 years. In 1970-71 the crops were rotated so that wheat followed oats, oats followed rye, and rye was planted on the area previously planted to wheat. Fall armyworms were controlled by spraying with Sevin or methyl parathion.

Beef steers averaging about 450 pounds initially were allotted at a stocking rate of approximately 2 animals per acre. These calves grazed the test pastures from October until June except when lack of forage or weather conditions required that they be removed. When off small grain pastures, cattle were fed corn silage and a corn-cottonseed meal supplement in a pole type barn or were fed grass hay and protein supplement while on tall fescue pasture. The fescue furnished little grazing during the mid-winter period when cattle were on it because it had been grazed heavily during the preceding fall months.

RESULTS

Animal performance data are reported separately by years because of differences in animal management during the winter when cattle were off small grain pastures. Additionally, Yuchi arrowleaf clover was included in the swards during the last 2 tests.

1967-68

Results from the 1967-68 grazing season are summarized in Table 1. Rate of gain for all swards ranged from 1.0 to 1.1 pounds and was the lowest obtained in several years on small grain pastures. However, total gain per acre ranged from 427 to 542 pounds, partially because of a long grazing season. The feed cost per cwt. of gain ranged from \$8.68 to \$11.02.

TABLE 1. PERFORMANCE OF STOCKER STEERS ON COOL-SEASON ANNUAL GRAZING AT TENNESSEE VALLEY SUBSTATION, BELLE MINA, ALABAMA, 1967-68

| Item | Abruzzi rye- ryegrass | Roanoke oats- ryegrass | Ga. 1123 wheat- ryegrass |
|--|-----------------------------|------------------------------|--------------------------------|
| Stocking rate per acre..... | 1.8 | 2.0 | 2.0 |
| Days on test pasture ¹ | 212 | 212 | 212 |
| Days off test pasture ² | 28 | 28 | 28 |
| Av. initial wt., lb..... | 435 | 393 | 419 |
| Av. wt. end grazing, lb..... | 672 | 664 | 691 |
| Gain/steer, lb. ³ | 237 | 271 | 272 |
| ADG, (Oct-June) lb..... | 0.99 | 1.13 | 1.13 |
| Gain per acre, lb. ³ | 427 | 541 | 542 |
| Hay/steer, lb..... | 282 | 282 | 282 |
| Feed cost/steer, dol. ⁴ | 47.06 | 47.06 | 47.06 |
| Feed cost/cwt. gain, dol..... | 11.02 | 8.70 | 8.68 |

¹ Pastures were stocked initially on October 10, 1967, and grazing ended June 6, 1968.

² Steers were fed Coastal bermudagrass hay on summer grass sod during time off the test pastures.

³ Includes gain resulting from hay fed while off grazing.

⁴ Based on \$40/acre charge for establishing and growing crop; hay charged @ \$25/ton.

Cattle were off the small grain pastures 16 days in January, 9 days in February, and 3 days in March. During times when they were removed from small grain grazing, hay was fed on summer grass sod in an adjacent area. Each grazing group was fed separately during the periods when cattle were off experimental pastures. Cattle were not weighed each time they were removed and returned to the small grain pastures; therefore, gain attributable to hay feeding could not be determined. Thus, the gain reported in Table 1 includes that made while cattle were off test pastures during the short periods mentioned above.

In 1967-68 oats and wheat produced greater gain per acre than did rye when each was planted in combination with ryegrass.

1968-69

Experimental pastures were stocked initially on October 10, 1968 and grazing on test areas ended May 13, 1969. Cattle were off the rye-ryegrass pasture from December 13 to February 25 during which time they were fed corn silage plus supplement at the barn. The oat-ryegrass pasture was not grazed from December 30 to March 20 during which time cattle grazed cool-season perennial pastures for 57 days and were fed silage and supplement at the barn for 23 days. The wheat-ryegrass sward was not grazed from December 30 to February 25. These steers were fed about 7 pounds of grass hay daily during that 57-day period while on limited tall fescue grazing.

Animal performance data for the 1968-69 grazing season are shown in Table 2. Differences in rate of gain for the entire season among cattle on the three small grains were due to the different rates of gain for the period when cattle were not on the experimental pastures. Calves from the rye-ryegrass combination gained an average of 1.42 pounds daily during the 74-day "off" period contrasted to 0.56 and -0.16 pounds for calves from the oat and wheat swards, respectively. Average daily gains of calves while actually grazing the different small grains were quite similar (1.62, 1.67, and 1.78 pounds).

The wheat combination produced 564 pounds of animal gain per acre compared to 456 pounds for rye and 450 pounds for oats. The slightly higher rate of gain while grazing experimental pastures and the shorter period off test swards accounted for this difference.

TABLE 2. PERFORMANCE OF STOCKER STEERS ON COOL-SEASON ANNUAL GRAZING AT TENNESSEE VALLEY SUBSTATION, BELLE MINA, ALABAMA, 1968-69

| Item | Abruzzi rye- ryegrass | Roanoke oats- ryegrass | Ga. 1123 wheat- ryegrass |
|---|-----------------------------|------------------------------|--------------------------------|
| Stocking rate per acre..... | 2.0 | 2.0 | 2.0 |
| Days on test pasture ¹ | 141 | 135 | 158 |
| Days off test pasture ² | 74 | 80 | 57 |
| Av. initial wt., lb..... | 460 | 459 | 460 |
| Av. wt. end grazing, lb..... | 793 | 729 | 734 |
| Gain/steer, lb. ² | 333 | 270 | 274 |
| ADG (Oct-May), lb..... | 1.55 | 1.26 | 1.27 |
| ADG on test pasture, lb..... | 1.62 | 1.67 | 1.78 |
| Gain per acre, test pasture, lb..... | 456 | 450 | 564 |
| Harvested feed/steer, lb. | | | |
| Corn silage..... | 2,932 | 883 | --- |
| CSM..... | 112 | 34 | --- |
| Hay..... | --- | 405 | 405 |
| Harvested feed, dol./steer ³ | 18.68 | 11.74 | 6.08 |
| Grazing cost, dol./steer ⁴ | 25.00 | 25.00 | 25.00 |
| Total feed, dol./steer..... | 43.68 | 36.74 | 31.08 |
| Feed, dol./cwt. gain..... | 13.12 | 13.61 | 11.34 |

¹ Grazing began on October 10, 1968, and ended on May 13, 1969 (215 days) for all cattle.

² Includes gain made while consuming harvested feed: 105 lb. per head for rye-ryegrass; 45 lb. for oats-ryegrass; and -8 lb. for wheat-ryegrass cattle.

³ Following prices used (dol./T): corn silage @ \$9.38; CSM @ \$88; grass hay @ \$30.

⁴ Charge of \$50 per acre made for production of cool-season annual grazing.

1969-70

Four-acre paddocks were planted to rye, oats, or wheat, in combination with Yuchi arrowleaf clover and Italian ryegrass. Extremely cold weather killed over 90% of the oats. All pastures were initially stocked at 2 steers per acre but the stocking rate on the oats combination was reduced during March, April, and May.

The grazing season began October 9, 1969, and ended June 2, 1970 (236 days); however, because of cold weather and limited forage cattle were off the test pastures for variable periods. All experimental pastures were grazed for 81 days, but then cattle were put on tall fescue swards where they were fed grass hay and protein supplement for 36 days. During the subsequent 27-day period, they grazed the fescue without supplemental feed. Wheat-ryegrass-Yuchi pastures were re-stocked on March 2 and were grazed continuously through June 1 (92 days). The rye-ryegrass-Yuchi combination was also re-stocked on March 2 and was grazed continuously through June 1 except for 14 days (May 8-22) when forage supply was limited. Calves assigned to

the oats-ryegrass-Yuchi sward grazed the tall fescue pasture 25 days longer than companion cattle. The late date (March 27) for starting grazing in the spring on the latter combination was because of winter-kill of the oats.

TABLE 3. PERFORMANCE OF STOCKER STEERS ON COOL-SEASON ANNUAL GRAZING AT TENNESSEE VALLEY SUBSTATION, BELLE MINA, ALABAMA, 1969-70

| Item | Explorer rye- ryegrass- Yuchi arrowleaf | Coker 66-22 oats- ryegrass- Yuchi arrowleaf | Knox wheat- ryegrass- Yuchi arrowleaf |
|---|---|---|---|
| Stocking rate per acre ¹ | 2.00 | 1.76 | 2.00 |
| Days on test pasture..... | 159 | 148 | 173 |
| Days off test pasture..... | 77 | 88 | 63 |
| Initial wt., lb..... | 414 | 409 | 428 |
| Av. wt. end grazing, lb..... | 747 | 762 | 772 |
| Gain/steer, lb. ² | 333 | 353 | 344 |
| ADG (Oct-June), lb..... | 1.41 | 1.50 | 1.46 |
| ADG on test, pasture, lb..... | 1.81 | 2.26 | 1.94 |
| Gain per acre, test pasture, lb..... | 576 | 539 | 672 |
| Harvested feed/steer, lb. | | | |
| Grass hay..... | 253 | 253 | 253 |
| Protein supplement..... | 33 | 33 | 33 |
| Harvested feed, dol./steer ³ | 4.79 | 4.79 | 4.79 |
| Grazing cost, dol./steer ⁴ | 31.48 | 31.48 | 31.48 |
| Total feed, dol./steer..... | 36.27 | 36.27 | 36.27 |
| Feed, dol./cwt. gain..... | 10.89 | 10.27 | 10.54 |

¹ Test areas were stocked initially at rate of 2 steers per acre; however, cold weather resulted in a very poor stand of oats (10%) necessitating reduced stocking from late March to June.

² Includes gain made while consuming harvested feed.

³ Hay charged @ \$30/T; protein supplement @ \$60/T.

⁴ Primary pasture charged @ \$50/acre; \$0.24 per animal grazing day charged for the "extra" grazing but no charge made for pasture area where hay and supplement were fed.

Results shown in Table 3 indicate that the cattle were off grazing for 63 to 88 days during October-June. At this substation the 10-year average "off-period" has been about 60 days; however, the grazing season was about 30 days longer during 1969-70 than the 10-year average (236 vs. 207 days). Grazing began 12 days earlier and ended 17 days later than the 10-year mean dates. Yuchi arrowleaf clover growth was good in May and was probably responsible for the extra days of grazing at the end of the season. Clover growth in autumn was good, providing grazing in November and December as well as in the spring.

Steers gained at excellent rates while on grazing - 1.81 pounds on rye, 2.26 pounds on oats, and 1.94 pounds on wheat. Their body weight was barely maintained during the off-period and thus could have been a factor in the excellent rate of gain while

on grazing (compensatory gain). Total gain per acre attributed to grazing was 576, 589, and 672 pounds for rye, oats, and wheat combinations, respectively. These gains were produced at a feed cost of \$10 to \$11 per hundredweight. Oats did not withstand the severe cold temperatures which had little apparent effect upon rye, wheat, ryegrass, or Yuchi arrowleaf clover. There were several nights in January and February with low temperatures of 5°F and one period of 4 consecutive days with a maximum below 32°F.

1970-71

Pasture swards included Yuchi arrowleaf clover again in 1970-71 because of the results obtained in 1969-70. There were short periods of severe cold weather during the first 2 months of 1971 and almost all the oats were winter killed, leaving only ryegrass and Yuchi arrowleaf clover. Wheat and rye stands were unaffected by the cold.

TABLE 4. PERFORMANCE OF STOCKER STEERS ON COOL-SEASON ANNUAL GRAZING AT TENNESSEE VALLEY SUBSTATION, BELLE MINA, ALABAMA, 1970-71

| Item | Explorer rye- ryegrass- Yuchi arrowleaf | Carolee oats ¹ ryegrass- Yuchi arrowleaf | Ga. 1123 wheat- ryegrass- Yuchi arrowleaf |
|---|---|---|---|
| Stocking rate per acre ² | 1.94 | 1.82 | 1.75 |
| Days on test pasture..... | 135 | 114 | 135 |
| Days off test pasture ³ | 87 | 108 | 87 |
| Initial wt., lb..... | 503 | 503 | 500 |
| Av. wt. end grazing, lb..... | 778 | 772 | 778 |
| Gain/steer, lb. ⁴ | 275 | 269 | 278 |
| ADG (Oct-June), lb..... | 1.24 | 1.21 | 1.25 |
| ADG on test pasture, lb..... | 2.13 | 1.95 | 2.13 |
| Gain per acre, test pasture, lb..... | 538 | 412 | 502 |
| Harvested feed/steer, lb ⁵ | | | |
| Grass hay..... | 607 | 678 | 607 |
| Cottonseed meal..... | 93 | 99 | 93 |
| Harvested feed, dol./steer ⁶ | 20.86 | 23.26 | 20.86 |
| Grazing cost, dol./steer ⁷ | 25.77 | 27.47 | 28.57 |
| Total feed cost, dol./steer..... | 46.63 | 50.73 | 49.43 |
| Feed, dol./cwt. gain..... | 16.96 | 18.86 | 17.78 |

¹ Oats were winter-killed; therefore, the sward grazed from Apr. 5 to June 1 consisted of ryegrass and clover.

² Calculated from total grazing days per acre.

³ Cattle were off rye and wheat from Dec. 18 to Mar. 15 but were off oats until Apr. 5.

⁴ Includes gain made while consuming harvested feed.

⁵ Hay and supplement were fed on tall fescue pasture while cattle were off small grain pastures.

⁶ Hay charged @ \$30/T, CSM @ \$90/T, improved perennial pasture @ \$.24 per steer grazing day and browse @ \$.05 per day.

⁷ Pastures charged @ \$50/acre.

Steers gained about 2 pounds daily while on experimental pastures, Table 4. Cattle were off the pastures longer (87 to 108 days) than in any of the previous years. March temperatures were much colder than usual with occasional heavy rains. Total precipitation for the month of April was less than usual and average temperatures during May were near the lowest on record for that month.

When steers were removed from test swards, they were put on tall fescue pastures. Since the tall fescue had been grazed heavily during the fall, it did not provide much grazing during the winter; therefore, the steers were fed grass hay and cottonseed meal while on the fescue. The cattle barely maintained their body weight during the off-period. This level of performance probably affected rate of gain once the steers were returned to the experimental pastures.

Good gains were produced on all pastures but winter killing of oats caused the oat-ryegrass-Yuchi arrowleaf clover mixture to provide 21 days less grazing than the other swards. The fewer days of grazing for the oats combination also contributed to the lower gain per acre, Table 4. The slightly higher gain per acre for rye compared to that for wheat (538 vs. 502 pounds) was a result of a heavier stocking rate for the former. (1.94 vs. 1.75 steers/acre).

DISCUSSION

Steers grazing wheat pasture gained slightly faster and produced more gain per acre 3 of the 4 years than those on rye pastures, Table 5. Oats winter killed 2 years out of the 4, making this small grain less satisfactory as a grazing crop in northern Alabama. Inclusion of Yuchi arrowleaf clover lengthened the grazing season for all swards but seemed to be more advantageous with the rye than with the wheat. Early maturation of rye probably made it less competitive, thus allowing more clover growth in spring.

There were no major disease problems with oats, wheat, or rye during the 4 years included in this study even though they were planted on the same land area for 3 of the 4 years. Yuchi arrowleaf clover made rapid growth in autumn and provided considerable grazing in November and December. Winter survival of the clover was excellent and green forage persisted into June when steers were removed.

Seasonal (October to June) average daily gains were approximately 1.3 pounds on all swards for the 4-year period and included an average 67-day mid-winter period during which cattle merely maintained their body weight. Rate of gain of stocker calves grazing rye, oats, or wheat in combination with Italian ryegrass and Yuchi arrowleaf clover averaged 2.04 pounds daily over a 2-year period with no differences among the small grain species. Comparable daily gains for small grain ryegrass swards without clover in the two preceding years averaged 1.40 pounds. Seasonal gain, including that attributable to grazing and harvested feed provided during mid-winter when cattle were off test swards, averaged 292 pounds per steer and was similar for the different grazing crops.

A statistical study was made of the effect of change in body weight of test cattle during the winter period when they were removed from experimental pastures upon subsequent performance. The data indicated an effect of "off-period" gain on subsequent grazing gain ($P < .06$) during 1968-69. Cattle that gained faster during the winter period while off test grazing gained correspondingly slower during the spring. Each pound gained during the mid-winter period resulted in about 0.4 pound less gain during the subsequent grazing period. Consequently, post-winter gains for the last 3 years (1968-71) were adjusted by covariance analysis for gains made during the winter or "off period." The 3-year adjusted mean ADG for the post-winter period were 2.09, 2.33, and 2.12 pounds for rye, oat, and wheat combinations, respectively. Steers grazing the oat combination gained faster during the post-winter period than those grazing rye ($P < .05$) when post-winter gains were adjusted for winter gain as noted above.

TABLE 5. SUMMARY OF ANIMAL GAIN ON COOL-SEASON ANNUAL GRAZING AT TENNESSEE VALLEY SUBSTATION, BELLE MINA, ALABAMA 1967-71

| Year | Rye-ryegrass | | Oats-ryegrass | | Wheat-ryegrass | |
|----------------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|
| | Grazing ADG | Grazing gain/acre | Grazing ADG | Grazing gain/acre | Grazing ADG | Grazing gain/acre |
| | <i>Lb.</i> | <i>Lb.</i> | <i>Lb.</i> | <i>Lb.</i> | <i>Lb.</i> | <i>Lb.</i> |
| 1967-68..... | 0.99 | 427 | 1.13 | 541 | 1.13 | 542 |
| 1968-69..... | 1.62 | 456 | 1.67 | 450 | 1.78 | 564 |
| 1969-70 ¹ | 1.81 | 576 | 2.26 | 589 | 1.94 | 672 |
| 1970-71 ¹ | 2.13 | 538 | 1.95 | 412 | 2.13 | 502 |
| Average..... | 1.64 | 499 | 1.75 | 498 | 1.75 | 570 |

¹Yuchi arrowleaf clover was included in all mixtures for the last 2 years of this study.

SUMMARY

1. Stocker beef calves, weighing about 450 pounds initially, gained an average of 1.64 to 1.75 pounds daily while grazing rye, oats, or wheat in combination with ryegrass. Yuchi arrowleaf clover was included in all mixtures during the last 2 years of the 4-year study.

2. Gain per acre from grazing during the 4-year period averaged 499, 498, and 570 pounds for rye, oat, and wheat combinations, respectively.

3. Feed and pasture cost per cwt. of gain varied from \$8.68 to \$18.86 and averaged \$12.65 during this study.

4. Average stocking rates were 1.94, 1.90, and 1.94 steers per acre for rye, oat, and wheat combinations, respectively.

5. The slightly lower carrying capacity of pastures containing oats resulted from winter killing of oats during 2 of the 4 test years.

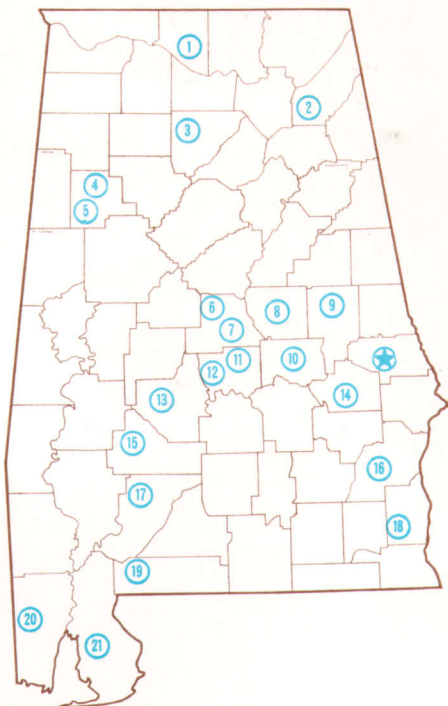
6. Cold weather also caused cattle to be removed from oat grazing longer during mid-winter than for the other two small grain combinations (76 days for oats, 66 days for rye, and 59 days for wheat).

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AGRICULTURAL EXPERIMENT STATION SYSTEM OF ALABAMA'S LAND-GRANT UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, live-stock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Thorsby Foundation Seed Stocks Farm, Thorsby.
7. Chilton Area Horticulture Substation, Clanton.
8. Forestry Unit, Coosa County.
9. Piedmont Substation, Camp Hill.
10. Plant Breeding Unit, Tallassee.
11. Forestry Unit, Autauga County.
12. Prattville Experiment Field, Prattville.
13. Black Belt Substation, Marion Junction.
14. Tuskegee Experiment Field, Tuskegee.
15. Lower Coastal Plain Substation, Camden.
16. Forestry Unit, Barbour County.
17. Monroeville Experiment Field, Monroeville.
18. Wiregrass Substation, Headland.
19. Brewton Experiment Field, Brewton.
20. Ornamental Horticulture Field Station, Spring Hill.
21. Gulf Coast Substation, Fairhope.