COASTAL BERMUDA GRASS
by
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Although Bermuda grass, *Cynodon dactylon*, is now distributed throughout the tropical and subtropical parts of the world, the best evidence points to Asia and particularly to India as the land of its origin. There, because it furnishes feed for the sacred cow, Bermuda grass long has been considered a special gift of God, and, like the cow, has been held sacred. In the United States, particularly in the Southeast, it has been a serious pest in cultivated fields for years. It is easy to understand, therefore, why farmers, dependent upon cotton and tobacco for a livelihood, developed a hatred for Bermuda grass. Only recently, with the growing interest in livestock production and soil conservation, have they begun to recognize the merits of this grass. Pasture specialists agree that Bermuda grass is the best upland pasture grass for the Southeast. As a plant to prevent soil erosion it is unsurpassed and is now being planted on land no longer suited for cultivation. Many farmers who have fought Bermuda grass for years are now planting it. That it will enjoy a greater use and a better reputation in the future seems certain.

ORIGIN OF COASTAL BERMUDA GRASS

Coastal Bermuda is a highly productive hybrid between Tift Bermuda (discovered by J. L. Stephens in an old cotton patch near Tifton, Georgia, in 1929) and an introduction from South Africa. It was developed as follows:

In 1937 two tall growing strains of Bermuda grass from South Africa, common Bermuda, and Tift Bermuda were interplanted so that many hybrids might be produced naturally. Sufficient seed was collected from these parents in 1937 to produce over 5,000 seedling plants in 1938.

During the summer of 1938 each of these seedling plants (kept separate by wide spacing and cultivation) was studied carefully in an effort to select the most promising individuals. These studies revealed

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1 Cooperative investigations at Tifton, Georgia, of the Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, the Georgia Coastal Plain Experiment Station, and the Georgia Experiment Station.
2 Senior Geneticist, U. S. Department of Agriculture, Tifton, Georgia. The writer gratefully acknowledges the assistance of J. L. Stephens, B. L. Southwell, T. S. Boggess, and C. W. McBeth of the Georgia Coastal Plain Experiment Station, Tifton, Georgia, and the farmers and men in research, extension, and soil conservation in the Southeast who have assisted in the evaluation of Coastal Bermuda grass.
that it would be impossible to select the best plant in this nursery without a more critical evaluation. Therefore, in the spring of 1939, 4-inch plugs of sod from 147 of the most promising individuals were placed in the center of cultivated plots measuring 4 x 24 feet. Three plots of each selection were planted. Several of the superior selections (Coastal Bermuda was one of them) spread as much as 18 feet in three months, and most of the plots were completely sodded by fall.

In subsequent years the rate of spread, disease resistance, sod density, cold tolerance, earliness of growth, seed and forage yielding ability, etc., of these strains were studied and recorded. Their reactions when grown in association with crimson clover and annual lespedeza were observed. Those strains rating highest in these tests were increased and their palatability, chemical composition, and fertilizer requirements were studied.

In all of these comparisons a selection carrying the number 35 ranked unusually high. When compared with a selfed progeny of its female parent there could be no doubt but that it was a hybrid. The resemblance that it bore to the South African introductions in certain characteristics left little doubt but that one of these introductions was its male parent. When it became evident that this hybrid would have
a place in Southeastern Agriculture, it was named Coastal Bermuda in recognition of the Experiment Station where it was developed.

**DESCRIPTION**

When compared with common Bermuda (see figures 1 and 2) the stems, stolons, and rhizomes of Coastal Bermuda are found to be larger and to have much longer internodes. Its leaves have a characteristic light green color, are much longer, and form a more acute angle with the stem than the leaves of common Bermuda. At Tifton, Georgia, common Bermuda produces seed heads containing viable seed from April until October. Coastal Bermuda produces very few seed heads and those that are produced rarely contain viable seed. It is one of the most nearly seedless strains that has been produced at the Coastal Plain Experiment Station and ranks well above Tift Bermuda in this respect.

It is more resistant than common Bermuda to the _Helminthosporium_ leaf spot that causes the leaves of Bermuda grass to turn dark and die. This means more and better quality feed.

Coastal Bermuda tolerates more frost, makes more growth in the fall and remains green much later than common Bermuda. Observations
at Tifton and reports from Arkansas, Oklahoma and Texas indicate that it is more drought resistant.

Coastal Bermuda is immune to the root-knot-nematode and as a result root-knot susceptible legumes like the annual lespedeza have grown better in association with it than with the nematode susceptible common Bermuda.\footnote{Burton, Glenn W., McBeth, C. W., and Stephens, J. L. The growth of Kobe lespedeza as influenced by the root-knot-nematode resistance of the Bermuda grass strain with which it is associated. Amer. Soc. Agron. 38:651-656. 1946.}

Repeated tests indicate that Coastal Bermuda will spread faster and maintain a weed-free sod longer than common Bermuda grass.

Although its stems and leaves are quite coarse, cattle have consistently grazed Coastal Bermuda in preference to the finer stemmed common types.

When clipped frequently to simulate close grazing Coastal Bermuda has produced over twice as much forage as common Bermuda. In such tests it has been outstanding in its ability to grow and produce more forage in the late summer and fall than other summer growing grasses with which it was compared.

COASTAL BERMUDA FOR PASTURE

Grazing experiments at the Georgia Coastal Plain Experiment Station indicate that Coastal Bermuda is the best grass now available for upland pasture purposes. Although the preliminary studies just described had suggested that this might be true, it was not until actual grazing tests had been conducted that it could be accepted with confidence.

In the spring of 1943 a 6-acre pasture was fertilized with 500 pounds of 4-8-4 fertilizer per acre and was planted to Coastal Bermuda by setting the sprigs 5 feet apart in 5-foot rows. Several cultivations between the rows during the summer reduced the weed competition and hastened the establishment of the pasture. The growth that accumulated during the summer of 1943 was removed by grazing in the fall.

The standard fertilization practice used in the evaluation of all new grasses at Tifton was applied to the Coastal Bermuda pasture. In 1944, 1945 and 1947 it received 200 pounds of nitrate of soda per acre. In 1946, 600 pounds of 6-12-6 fertilizer were applied. In order to obtain the best measure of the nutritive value of the grass it was grown alone without a legume during the first four years of the test.

In 1944 the 6-acre Coastal Bermuda pasture carried 8 steers from April 12 to November 8 and produced a total of 252 pounds of beef
per acre. With the same number of steers the production in 1945 was 338 pounds of beef gain per acre. Production continued at the same rate in 1946 until early August. Additional gains were not made in 1946 due to the fact that centipede grass had taken over so much of the pasture that the supply of Coastal Bermuda was no longer adequate for 8 steers. (Centipede grass is so aggressive that it crowds out other grasses and is so low in nutritive value that cattle make little, if any, gain on it.) The Coastal Bermuda pasture was turned late in the spring of 1947 in an effort to eliminate some of the centipede grass. As a result grazing was delayed until June 4. Eight steers were carried for the remaining 156 days of the grazing season and produced 202 pounds of beef per acre. With the exception of 1946, the steers on the Coastal Bermuda pasture made much better late summer and fall gains than were made on the other perennial grasses being tested. In these tests Coastal Bermuda has produced nearly twice as much beef as common Bermuda receiving the same fertilization treatment.

The discussion of the fertilizer requirements of Coastal Bermuda which appears in another section of this circular shows that the pro-
duction is proportional to the amount of plant food, particularly nitrogen, that is available for its growth. Thus the gains obtained from the grazing trial described above might have been doubled or tripled with heavy fertilization. With no fertilization the production most certainly would have been less than that reported.

Management greatly influences the results obtained from any pasture. The young growth following close grazing is usually the most nutritious. Such grazing increases the nutritive qualities of the feed but reduces the total quantity produced to the extent sometimes that the animals are unable to get their total feed requirements during the grazing period. Coastal Bermuda will usually give the best results if it is grazed so that it will not get over 6 to 8 inches tall. On rich land or with heavy fertilization greater production may be expected by allowing it to grow 12 inches or more in height and grazing it rotationally. Removing a cutting of hay from a part of the pasture during the summer may often be possible and highly desirable. In addition to producing a quantity of good hay, this practice will help to control weeds and will scatter the droppings—two highly desirable management practices.

**COASTAL BERMUDA FOR HAY**

Coastal Bermuda is an excellent hay plant. Once established it can be expected to give several cuttings of hay each season for many years. (See table 1.) Perhaps the feature that makes it best suited for hay production in the humid Southeast is the ease with which it may be cured. Hay cured in the swath or the windrow is usually dry enough to bale 24 to 48 hours after it has been cut. Modern long range weather forecasting should make it possible to save a high percentage of this hay from rain damage.

The time or frequency of cutting is very important in determining the quality of hay produced by any hay crop. This is well illustrated in the chemical analyses of the four cuttings of Bermuda hay taken from plots that received 400 pounds per acre of nitrogen from nitrate of soda on March 31, 1947. Hay cut June 9, July 23, August 26, and October 14 contained 14.8%, 10.2%, 14.1%, and 13.1% of protein respectively. The protein content of the second cutting would no doubt have been higher had it been made a week or two earlier. These results suggest that Coastal Bermuda should be cut every 4 to 5 weeks during the summer for the best quality hay. In late summer and fall when the growth rate is slower two months may elapse between cuttings. While delaying the cutting date a week or more will reduce the percentage of protein, it will not result in losses of the magnitude often experienced with other hay crops. This latitude in cutting date
should help the farmer to match the hay cutting dates with good hay curing weather.

The data in table 2 show that the protein content of Bermuda grass hay is influenced greatly by nitrogen fertilization. Unfertilized hay carrying approximately 7.0% protein compared favorably in chemical composition with timothy hay. Hay from heavily fertilized plots contained over 13.0% protein and approached the chemical composition of good legume hay. Such hay should be particularly good for growing animals and milk cows.

Coastal Bermuda hay cut at the proper stage has been readily eaten by cattle and mules. Careful feeding trials must be conducted before the true value of this hay can be ascertained, but the excellent gains that cattle have made on pure Coastal Bermuda pasture indicate that the hay made from it should also be good feed.
Most cattlemen in the southeastern United States agree that producing winter feed is their number one problem. The winter feeds that they desire must be palatable and nutritious, must be dependable and must be cheaper than the feeds now being used. There is reason to believe that Coastal Bermuda hay will meet these requirements and thus make a sizable contribution to the solution of the winter feed problem in this area.
SOURCE OF PLANTING MATERIAL

Coastal Bermuda sprigs can usually be obtained from one of the following sources: The Georgia Crop Improvement Association is certifying Coastal Bermuda sprigs and is thus making available a supply of pure planting stock of this hybrid. An up to date list of certified growers can be supplied by the County Agents or the Georgia Crop Improvement Association at Athens, Georgia. Many County Agents have established County nurseries from which farmers in their counties have been able to get a start of Coastal Bermuda. Some of the Soil Conservation Service nurseries are also supplying limited quantities of planting material. Requests for this material should be made through the local Soil Conservation Service representative.
The Georgia Coastal Plain Experiment Station is maintaining a pure source of Coastal Bermuda for establishing certified nurseries and County nurseries. This demand has become so great that the Station is no longer able to supply individual farmers with planting stock.

ESTABLISHING THE COASTAL BERMUDA NURSERY

Most farmers planning to establish any sizable acreage of Coastal Bermuda will do well to start a nursery in which to grow their own planting material. Since the sprigs can be grown at very little cost, such a nursery will usually result in a substantial saving in the cost of planting stock. Often the available planting material is so limited as to require a sizable increase in a nursery in order to permit extensive plantings. Those farmers who have established a small nursery on their own farms will also have the advantage of having fresh planting material available whenever they care to make increased plantings. Farmers who grow their own planting material and plant their pastures and hay meadows during periods too wet for most farming operations should, during the course of a year, establish a number of acres of Coastal Bermuda with no extra farm labor and very little cash outlay.

If the following suggestions are carefully followed, an excellent nursery should be so well established in one season that it will furnish planting material for many acres the next year.

1. Locate the nursery on a good, well-drained soil that is free of common Bermuda. Newly cleared land is best.

2. Prepare the soil as for cotton or peanuts.

3. Broadcast and disk in 600 to 800 pounds of complete fertilizer per acre; 4-8-6 is good.

4. Plant the sprigs as deep as possible being sure to leave the tip end of the sprig near the surface or protruding slightly above the ground. The sprigger shown in figures 5 and 6 may be used to achieve this end as follows: Drop the sprigs at the desired spacing in rows. Then place the end of the sprigger on the basal end of the sprig and push it straight down until approximately ½ inch of the tip is left protruding above the ground. Remove the sprigger and step on the sprig to firm the soil around it.

5. Water each hill as planted unless the soil is very moist.

6. Replant missing hills with stolons cut from living hills as soon as possible.

7. Cultivate frequently enough to keep the weeds down until the grass covers the ground completely. Mowing at 6-to 8-week
intervals will control weeds and will also supply some hay.

8. Fertilize with liberal quantities of nitrogenous fertilizers, such as nitrate of soda, to produce the maximum amount of planting stock.

**LARGE SCALE PLANTING METHODS**

Coastal Bermuda has been successfully planted in many different ways. On the muck soils of lower Florida it has been established by broadcasting and diskimg in above ground stems cut as for hay. Success with this method has required that the soil be moist and that the stems be broadcast and disked in before they have wilted appreciably. This method has generally failed on sandy soils due to a lack of sufficient moisture in the soil.

One Georgia farmer planted over 100 acres of Coastal Bermuda by hand with dibbles of the type used for planting pine trees.

Several farmers have planted Coastal Bermuda at the same time that the ground was turned by dropping sprigs in the bottom of the plow furrow. Very poor stands have generally resulted from this planting method due to the fact that the sprigs were buried too deep.

Most farmers have planted the grass by opening furrows in well prepared land, dropping sprigs in the furrows, covering the sprigs with a cultivator and finally packing the soil around the sprigs with the tractor wheels or a cultipacker. This method has been very successful where the soil has been moist and the grass has been dropped and covered as rapidly as possible after the furrows were opened. Any delay which has allowed the soil or the sprigs to dry out has usually resulted in poor stands. It has been possible using this method to plant the grass 30 inches apart in 5-foot rows at a rate of 1 acre per man day of labor.

The use of the planter shown in figures 7 and 8, constructed at little cost from scrap materials, has been the most effective and economical method of planting Coastal Bermuda devised to date. With this machine it has been possible for 3 men to plant Coastal Bermuda in 5-foot rows at the rate of 1 to 2 acres per hour. The furrow opener and covers are standard equipment for the cultivator attachment to which they are fastened. The packers on which the men ride as they drop the sprigs are essential to firm the soil around the sprigs. The planter is so adjusted that the small handful of sprigs dropped in the planting shute have some parts of the bunch of sprigs close to the surface of the soil and other parts in the bottom of the furrow at a depth of 4 to 6 inches. This approaches the ideal which would consist of having most of each sprig deeply planted with approximately ½ inch of the growing tip protruding from the surface of the ground.
Almost any method of planting Coastal Bermuda will succeed if the following principles are followed:

1. Plant as soon as possible after digging.
2. Never let the sprigs dry out or wilt badly.
3. Plant in moist soil, or water if the soil is dry.
4. Pack the soil firmly around the sprigs to keep them moist until they can establish a new root system.

DIGGING THE SPRIGS

Digging Bermuda sprigs with hand tools such as rakes, forks and shovels is a laborious and expensive operation. Standard farm equipment of the type generally used for destroying Bermuda grass will greatly
facilitate this step in the planting procedure. The spring tooth Bermuda grass harrow is one of the most effective tools for digging Bermuda grass sprigs. Hay rakes and peanut weeder will greatly reduce the labor required to rake together the sprigs loosened by the Bermuda harrow. Perhaps the most effective tool for this purpose, however, is the side delivery rake which will shake the excess soil from the sprigs and rake them together in one operation. Equipment of this type makes the harvesting of planting stock a simple and inexpensive operation.

**SOIL AND FERTILIZER REQUIREMENTS**

Coastal Bermuda will grow on any moderately well drained soil in which common Bermuda will survive. Although it will tolerate flooding for rather long periods, it makes little, if any, growth on water logged soil. When adequately fertilized it has made excellent growth on deep sands and badly eroded clays where little vegetation grew before.
Coastal Bermuda is affected little, if any, by soil reaction and at Tifton, Georgia, it has made good growth on both acid and "over-limed" alkaline soils. On this "over-limed" soil having a pH well above 8, the common cultivated crops have not made satisfactory growth.

Like common Bermuda it may survive on soils low in fertility but will produce little feed. Just as the pure bred Jersey cow must be well fed in order to demonstrate her real superiority over the scrub, so must Coastal Bermuda grass be well fed if it is to show its full superiority over common Bermuda. If the required plant food is not in the soil it must be supplied in the form of fertilizer.

The data in tables 1 and 2 show the close relationship between the amount of nitrogen fertilizer used and the quantity of hay harvested. The decreasing yields of hay obtained from the unfertilized check plots (See table 1) prove very conclusively that Coastal Bermuda like every other crop grown in this area will decline in yield over a period of years if it is not fertilized. Although some phosphate and potash are required the great need seems to be for nitrogen. Legumes and commercial fertilizers are the two principal sources of this nitrogen.

Preliminary studies suggest that most commercial sources of nitrogen will be about equally effective per unit of nitrogen applied. The first year's results of a test comparing nitrate of soda, ammonium nitrate, urammon and cyanamid indicate, however, that cyanamid may not be as effective as the other materials in increasing hay yields.5

**LEGUMES WITH COASTAL BERMUDA**

Annual lespedeza, crimson clover, Louisiana White Dutch clover, Ladino clover and sweet clover have been successfully grown with Coastal Bermuda. It is believed that any pasture legume will grow well in association with Coastal Bermuda provided the soil requirements for the legume in question are met and provided the mixture is managed properly. Adequate applications of lime, phosphorus, potash, and perhaps some secondary and minor elements such as magnesium and boron must be made. When applying these materials it must be remembered that the highly productive Coastal Bermuda will have removed more of these elements from the soil than other less productive grasses. Low growing legumes like white Dutch clover and annual lespedeza can best be maintained in Coastal Bermuda with close grazing. More erect legumes like sweet clover and alfalfa must be grazed less intensively to keep them in a vigorous growing condition.

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Some legumes like white Dutch clover, sweet clover, and alfalfa supply considerable nitrogen for the grass growing in association with them. Observations at Tifton indicate that the annual lespedezas and crimson clover do not furnish much nitrogen for the grasses growing with them. While these legumes greatly improve the forage because of their presence in it, they do not cause much increased growth in the grass with which they are associated.

GROWING NITROGEN WITH LUPINES

Many of the pasture legumes cannot be successfully grown upon the light upland soils that grow excellent Bermuda grass. That legumes are not a dietary requirement of cattle grazing fertilized Coastal Bermuda has been demonstrated by the excellent gains made by cattle feeding upon pure stands of this grass. It has been shown also that lupines, which grow during the winter months, will grow on many soils where the pasture legumes will not succeed. These observations suggested the possibility of growing the nitrogen required for Coastal Bermuda with lupines in the winter when the grass is dormant. To test this theory bitter blue lupines were planted with a regular grain drill in Coastal Bermuda sod on October 1, 1946. Due to faulty inoculation and some disease many of the seedlings died giving a stand so poor that it seemed desirable to allow the plants to make their maximum growth before disk ing them into the soil. Plots on which these lupines were disked in on May 6, gave total hay yields for 1947 of $3\frac{3}{4}$ tons per acre as compared with 1½ tons from the check plots.

In the fall of 1947 bitter blue lupines were drilled into plowed, and undisturbed sod on plots that had, and had not, grown lupines previously. The stand and growth of lupines were equally good on both types of soil preparation indicating that there is no need to plow or disturb the sod before planting the lupines with a disk drill.

The root-rots and diseases that attack lupines were unusually severe in the fall of 1947 killing many seedling plants. The survival on the plots where lupines had been grown previously, however, was much better than on plots where lupines had never been grown before. This was probably due to the fact that lupines on the old plots were inoculated better (even though all seed was inoculated when planted) and were in a healthier condition than the poorly inoculated plants in the new plots.

The lupines disked in on March 8, 1948, contained approximately 80 pounds of nitrogen per acre. This quantity of nitrogen had increased to 115 pounds per acre by April 1, 1948, when the last plots were disked in.
These amounts of nitrogen should increase the 1948 production of Coastal Bermuda by several fold.

Although these results are not conclusive they do suggest that lupines may be used to good advantage in growing nitrogen for Coastal Bermuda. Turning the sod in preparation for drilling the lupines should not be necessary, particularly if the grass is grazed closely or the last cutting of hay is taken just before the lupines are planted. Fertilization with several hundred pounds per acre of a complete fertilizer (such as a 2-12-6) the first year that the lupines are seeded should facilitate their establishment. Applications of phosphate and potash as needed to provide good lupine growth should be the only fertilization required in subsequent years. While the nitrogen grown by lupines should greatly increase the yield of Coastal Bermuda, the data in table 2 clearly show that additional top dressings of commercial nitrogen will be required for the maximum production of high protein feed.

The use of the sweet lupine instead of the bitter blue variety has been suggested because of the spring grazing that it might supply. That this practice will work has been demonstrated at the Georgia Coastal Plain Experiment Station. Since, however, approximately 80 per cent of the nitrogen in the lupine plant is in the above ground parts, to remove them by grazing would greatly reduce the amount of nitrogen available to fertilize the Coastal Bermuda grass later in the season. Under some conditions the need for feed may be so great in the early spring as to warrant the grazing of the lupines at that time. Generally, however, it would seem to be more economical to provide other feed for early spring and utilize all of the lupine nitrogen as fertilizer for the grass.

CONTROL MEASURES

In the days of the mule and single stock it was difficult to eradicate Bermuda grass and almost impossible to successfully grow a crop in a field infested with it. Modern tractor equipment has changed this situation to the extent that some farmers are actually using Bermuda grass in rotation with cultivated crops. While this practice cannot be generally recommended at this time, it does indicate that Bermuda grass is not as difficult to handle in cultivated fields as it was 20 years ago.

The manure of animals eating common Bermuda, either in pastures or as hay, contains many viable seeds of Bermuda grass. This manure is usually spread on cultivated fields and has undoubtedly been an important source of new Bermuda grass plants in fields that have been freed of Bermuda stolons and rhizomes by careful cultural practices. Since Coastal Bermuda seeds little, if any, it should be easier to keep out of cultivated fields than common Bermuda. Once established in a
cultivated field, however, it may become as troublesome as common Bermuda and will require the same control measures.

SUMMARY

Coastal Bermuda is a highly productive hybrid between Tift Bermuda and an introduction from South Africa. Years of testing were required to isolate it from the 5,000 different selections and hybrids with which it was first planted in 1938. The results of these tests, still underway, show that Coastal Bermuda grass is superior to common "cotton-patch" Bermuda in the following characteristics: disease resistance, frost tolerance, fall growth, rate of establishment, drought resistance, sod density, ability to maintain a weed free sod, nematode resistance, chemical composition, and yield of hay and pasturage. These features of Coastal Bermuda help to explain why it has produced nearly twice as much beef as common Bermuda grass in actual grazing trials conducted over a period of years at Tifton.

Legumes, particularly those susceptible to root-knot-nematode injury, have grown better with Coastal than with common Bermuda.

Coastal Bermuda is an excellent perennial hay crop giving each season 4 to 5 cuttings of hay that can be cured easier and quicker than any other hay crop adapted to the South. Annual hay yields ranging from 1 ton per acre with no fertilizer to nearly 7 tons per acre with applications of 800 pounds of 0-14-10 and 400 pounds of nitrogen per acre have been obtained. Highly fertilized hay has contained over 14 per cent protein. Coastal Bermuda hay has been readily eaten by cattle and mules.

Reports from Experiment Stations and farmers indicate that Coastal Bermuda is superior to common Bermuda throughout most of the Bermuda Grass Belt.

Coastal Bermuda produces very few seed heads and those that are produced rarely contain viable seed. This characteristic facilitates its management and control (livestock spread common Bermuda seed through their droppings) but makes vegetative propagation necessary. While this feature has slowed the rate of distribution it has not seriously handicapped the utilization of Coastal Bermuda on the farm. Farmers growing their own planting stock are finding that it costs less to establish Coastal Bermuda than to plant other pasture grasses from seed.
TABLE 1. ANNUAL PRODUCTION OF COASTAL BERMUDA HAY ON A TIFTON SANDY LOAM SOIL.

<table>
<thead>
<tr>
<th>Year</th>
<th>Unfertilized yield in pounds per acre</th>
<th>Pounds of N applied per acre</th>
<th>Hay yield pounds per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1942</td>
<td>3,540</td>
<td>96</td>
<td>12,250</td>
</tr>
<tr>
<td>1943</td>
<td>2,240</td>
<td>115</td>
<td>7,080</td>
</tr>
<tr>
<td>1944</td>
<td>1,640</td>
<td>152</td>
<td>11,870</td>
</tr>
<tr>
<td>1945</td>
<td>1,690</td>
<td>115</td>
<td>11,000</td>
</tr>
<tr>
<td>1946</td>
<td>1,540</td>
<td>115</td>
<td>9,580</td>
</tr>
<tr>
<td>1947</td>
<td>1,047</td>
<td>160</td>
<td>10,960</td>
</tr>
</tbody>
</table>

*Received 250 pounds per acre of 0-16-8 annually.
### TABLE 2. EFFECT OF NITRATE OF SODA ON THE YIELD AND CHEMICAL COMPOSITION OF BERMUDA HAY IN 1947.

<table>
<thead>
<tr>
<th>Pounds of N per acre in 1947</th>
<th>Total 1947 hay yield tons per acre</th>
<th>Average Per Cent Composition (Dry Basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Protein</td>
</tr>
<tr>
<td>0</td>
<td>1.5</td>
<td>7.4</td>
</tr>
<tr>
<td>50</td>
<td>2.4</td>
<td>7.9</td>
</tr>
<tr>
<td>100</td>
<td>3.1</td>
<td>8.5</td>
</tr>
<tr>
<td>200</td>
<td>4.9</td>
<td>10.2</td>
</tr>
<tr>
<td>400</td>
<td>6.9</td>
<td>13.1</td>
</tr>
</tbody>
</table>

All plots received 800 pounds per acre of 0-14-10 March 31, 1947.

Chemical analyses by Law and Co., Atlanta, Georgia.