Rotation experiments with cotton, corn cow reas and oats

William Rufus Dodson
Agricultural Experiment Station

of the

Louisiana State University

and A. & M. College,

Baton Rouge.

Rotation Experiments with

Cotton, Corn, Cow Peas

and Oats.

BY

W. R. Dodson, Director.

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Louisiana State University and
A. & M. College

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Rotation Experiments
WITH
Cotton, Corn, Cow Peas and Oats
BY
W. R. DODSON, Director.

It is generally conceded that the major portion of the cotton producing land is gradually growing less productive under the prevailing system of cropping. Most men agree that some regular system of rotation is to be commended in preference to continuous cropping in cotton or occasional shifting to corn and cow peas, or allowing the land to lie idle for a year or more at a time. Notwithstanding this general conviction, little progress has been made in the adoption of a definite system of rotation of crops. It is reasonable to suppose that the average man will follow that course which he feels will give him the greatest returns for the labor and capital involved, and if he does not follow a system of rotation, it is because he has not been fully convinced of its practicability and profitableness. Of course, the preservation of soil fertility is an important factor in considering this question. In some instances, no doubt, land owners do not have sufficient knowledge regarding the cultivation and the influence on soil of other crops than cotton to justify them in undertaking to carry out a definite rotation, and tenants, too often, have little or no regard for the future condition or producing power of the soil. It is also true that many of our people have considered our soils inexhaustible, and have taken no precautions to replace any of the plant food consumed by the cotton crop. Others have excused themselves in the belief that available labor was suited only for cotton production. In many instances the question of securing money on the crop in advance of its harvest has encouraged the production of cotton to the exclusion of other crops. Whatever may have been the consid-
eration, when the subject of rotation has been discussed, it has almost invariably ended in the decision that it was easier or more profitable to place one's dependence upon cotton. And so we have gone on from year to year, and probably should have continued as long as the soil would produce enough to make a living for those who cultivate it; but a new condition has arisen because of the invasion of the Mexican cotton boll weevil, and there is an active interest in crops other than cotton, that may be used as substitute crops, or for reducing the expenditure on the cotton crop, or that will aid in other ways in making cotton profitable under boll weevil conditions. For these reasons it has seemed timely to give a resume of some rotation experiments that have been carried on at Baton Rouge and at Calhoun for an extended period of time. Some of the results have been previously published, but data has now been extended over such a number of years that deductions will be more reliable, and it is confidently believed that some modification of the rotation given here will be applicable and desirable for many individuals in Louisiana.

PLAN OF ROTATION.

The rotation was originally planned by Dr. W. C. Stubbs, and the results have been so satisfactory that but little change has been made in the original plan.

The experiments have been conducted on six acres at Baton Rouge, and a fraction less than six acres at Calhoun, devoted exclusively to these investigations. One-third of the area is planted each year to cotton, one-third to corn, with cow peas in the corn, and one-third to rust-proof oats, also with cow peas sown after the oats are harvested. The area in cotton any one year is planted in corn and peas the following year; the area in corn and peas is planted to oats in October or early November; the area in oats and peas is planted in cotton the succeeding year. Thus, in three years each plot of land has produced one crop of cotton, one of corn, one of oats and two of cow peas.

One-half of each plot was well fertilized, as hereafter described, and the other half was dependent upon the rotation and the cow peas for the maintenance of fertility up to 1907, when acid phosphate, 150 pounds per acre, was added to the pea crops.
We will first give the method of fertilizing the plots and the tabulated yields at Calhoun, La.

**FERTILIZER FOR ROTATION CROPS.**

**AT CALHOUN, LA.**

The cotton was fertilized with 30 bushels per acre of compost made by the following formula:

- 2 tons of acid phosphate.
- 100 bushels of stable manure.
- 100 bushels of green cotton seed.

The corn was fertilized with 30 bushels per acre of compost made of

- 1 ton of acid phosphate.
- 100 bushels of stable manure.
- 100 bushels of green cotton seed.

The oats were fertilized with 200 pounds of cotton seed meal and 100 pounds of acid phosphate per acre. The peas were fertilized with 50 pounds of acid phosphate and 50 pounds of kainit.

The field was originally covered with pine timber, but had been exhausted by long-continued cultivation in cotton.

The compost is made by putting down a layer of stable manure, about five bushels in a suitable pen or enclosure, then five bushels of green cotton seed thoroughly wet, then 100 pounds of acid phosphate, or 50 pounds, as the formula may call for, is spread in an even layer; another layer of stable manure is then put on and the process continued until the compost heap is completed. After fermentation has progressed two or three weeks the compost heap is cut in slices from top to bottom with a spade and the whole thoroughly mixed. In a few days after this mixing the compost is ready for use. The compost is applied in the drill on which the row is made just before planting.

In 1907 we modified the plan to the extent of adding acid phosphate to each crop of cow peas on the unfertilized area. The crop of peas in 1907 and 1908, and corn and cotton of 1908 have shown marked improvement as a result. We have also added vetch and clover to the seeding in oats, thus utilizing another legume to increase the nitrogen in the soil.
The following results have been secured during the past nineteen years:

**Table I.**

<table>
<thead>
<tr>
<th></th>
<th>Cotton</th>
<th></th>
<th>Corn</th>
<th></th>
<th>Oats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yield Seed Cotton</td>
<td></td>
<td>Yield Bushels</td>
<td></td>
<td>Yield Bushels</td>
</tr>
<tr>
<td></td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
</tr>
<tr>
<td>Plot A</td>
<td>1558</td>
<td>321</td>
<td>24.4</td>
<td>6.1</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>1569</td>
<td>336</td>
<td>25.0</td>
<td>20.6</td>
<td>55.2</td>
</tr>
<tr>
<td></td>
<td>1694</td>
<td>413</td>
<td>24.4</td>
<td>6.14</td>
<td>47.0</td>
</tr>
<tr>
<td></td>
<td>1358</td>
<td>500</td>
<td>29.5</td>
<td>6.2</td>
<td>55.0</td>
</tr>
<tr>
<td></td>
<td>1698</td>
<td>291</td>
<td>40.0</td>
<td>6.0</td>
<td>38.0</td>
</tr>
<tr>
<td></td>
<td>1513</td>
<td>854</td>
<td>33.1</td>
<td>8.6</td>
<td>22.5</td>
</tr>
<tr>
<td>Average</td>
<td>1555</td>
<td>459</td>
<td>30.4</td>
<td>9.75</td>
<td>49.3</td>
</tr>
<tr>
<td>Including 1889</td>
<td></td>
<td></td>
<td>29.3</td>
<td>9.00</td>
<td>43.1</td>
</tr>
<tr>
<td>Plot B</td>
<td>829</td>
<td>528</td>
<td>34.2</td>
<td>14.6</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td>1719</td>
<td>620</td>
<td>29.3</td>
<td>4.8</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td>2018</td>
<td>398</td>
<td>39.0</td>
<td>12.0</td>
<td>20.5</td>
</tr>
<tr>
<td></td>
<td>1385</td>
<td>851</td>
<td>15.9</td>
<td>4.0</td>
<td>36.0</td>
</tr>
<tr>
<td></td>
<td>1936</td>
<td>382</td>
<td>37.0</td>
<td>5.2</td>
<td>38.0</td>
</tr>
<tr>
<td>Average</td>
<td>1811.2</td>
<td>507</td>
<td>30.5</td>
<td>8.9</td>
<td>32.2</td>
</tr>
<tr>
<td>Including 1889</td>
<td>1647</td>
<td>510.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plot C</td>
<td>708.0</td>
<td>429</td>
<td>16.8</td>
<td>4.8</td>
<td>47.8</td>
</tr>
<tr>
<td></td>
<td>1446.4</td>
<td>560</td>
<td>26.0</td>
<td>5.0</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>1410.0</td>
<td>476</td>
<td>42.0</td>
<td>10.7</td>
<td>37.5</td>
</tr>
<tr>
<td></td>
<td>1137.0</td>
<td>263</td>
<td>45.0</td>
<td>21.0</td>
<td>70.0</td>
</tr>
<tr>
<td>Average</td>
<td>1175.3</td>
<td>432</td>
<td>33.5</td>
<td>9.6</td>
<td>44.1</td>
</tr>
<tr>
<td>Including 1889</td>
<td></td>
<td></td>
<td>30.8</td>
<td>10.2</td>
<td></td>
</tr>
</tbody>
</table>

Plot A was first in oats, B in cotton and C in corn. It will be noted that all crops were light, and that the second year they were very good. The first average given does not include 1889, the year the experiment was inaugurated, nor 1896, the year of great drought. The second average includes 1889.
Reducing these results to averages, we have the following:

**Table II.**

<table>
<thead>
<tr>
<th></th>
<th>COTTON</th>
<th></th>
<th>CORN</th>
<th></th>
<th>OATS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yield Seed Cotton—Yrly av. for 6 years</td>
<td>Yield Bush. yearly Av. for 4 Yrs.</td>
<td>Yield Bush. yearly Av. for 5 Yrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
</tr>
<tr>
<td>Plot A</td>
<td>1555.0</td>
<td>459</td>
<td>30.4</td>
<td>9.73</td>
<td>49.3</td>
<td>22.1</td>
</tr>
<tr>
<td></td>
<td>Yearly Average for 5 Years</td>
<td>Yearly Av. for 6 Yrs.</td>
<td>Yearly Av. for 4 Yrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
</tr>
<tr>
<td>Plot B</td>
<td>1811.2</td>
<td>507</td>
<td>30.5</td>
<td>8.9</td>
<td>32.2</td>
<td>12.4</td>
</tr>
<tr>
<td></td>
<td>Yearly Average for 4 Years</td>
<td>Yearly Av. for 5 Yrs.</td>
<td>Yearly Av. for 6 Yrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
</tr>
<tr>
<td>Plot C</td>
<td>1175.3</td>
<td>432</td>
<td>33.5</td>
<td>9.6</td>
<td>44.1</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>Average three plots</td>
<td></td>
<td>1513.8</td>
<td>466</td>
<td>31.4</td>
<td>9.41</td>
</tr>
</tbody>
</table>

We have omitted the results of 1896, the year of severe drought in North Louisiana, which will be referred to later.

From a direct money standpoint, these results show that cotton has yielded the largest money returns, both in well fertilized and in unfertilized land at Calhoun. Oats and cow peas closely approximate the value of the cotton crop on the unfertilized land, when a reasonable value is put on the hay or the peas produced.

The average of fifteen crops of fertilized cotton is 1513 pounds seed cotton, or a good bale per acre. The average of the
unfertilized is 466 pounds of seed cotton, or less than one-third bale per acre. Examining the soils today we find a marked contrast in the physical condition of the land receiving the compost and that which has had no compost. The fertilized plots are mellow and spongy to the tread of the foot, while the unfertilized soil is hard and lifeless.

Let us look at the cost of supplying this fertilizer. We have estimated the cost of the fertilizer for cotton at $5.50 per acre, corn $6.00 per acre, oats, $2.95 per acre. This does not count the labor of making the compost or of applying it to the land.

The fertilizer applied gave an average gain of 1047.8 pounds seed cotton, 21.99 bushels of corn and 25.4 bushels of oats. This means that one acre of land produces more cotton under this method of fertilization than would be produced by three acres in cotton without fertilization. It means that one acre of pine hill land, cultivated for seventy or eighty years here is producing more than the average of two acres throughout the South. However, at the beginning the results would seem discouraging.

The first year Plot A was in oats. The fertilizer gave an increased yield of only 4.8 bushels, at a cost of $2.95. The average of six crops of oats on this plot in nineteen years shows an increase of 25.5 bushels in favor of the fertilized acre, at the same cost. The first time it was in corn there was a net loss of $2.30. By the time it reached oats again it gave a net profit of $10.42 and in corn a profit of $3.13, and the fifth time in corn a profit of $5.63.

The first year Plot C was in corn it resulted in a loss of $3.68, and the second year no loss, and the third time it was in corn it gave a profit of $4.50, and the fourth crop of corn a net profit of $9.63; this change being brought about in twelve years. We take the corn from the fact that the results are more striking, and the crop least profitable from value of the harvest. Possibly it is not altogether fair to take Plot C, as it shows these facts more pronouncedly than the other plots.

I have left out of consideration the results of 1896, the year of the great and unprecedented drought. In 1896, North Louisiana for the first time had a complete failure of crops. Fifty thousand dollars was drawn from the State Treasury to send
bread to the hungry. Carloads of provision and grain were donated by generous-hearted people to prevent great suffering. That year the acre of corn fertilized as here described made 10½ bushels, and the acre of cotton produced 791 pounds seed cotton. The unfertilized acres made absolutely nothing. We may never again have so severe a test of the resistance to drought, but the land on which compost has been used shows to advantage every time there is a deficiency of moisture. We commonly explain this by saying it is due to the vegetable matter incorporated into the soil. Corn of itself may not pay, as well as cotton; oats, and hay crops may not, but they pave the way and prepare the soil for larger yields and more profitable crops of cotton.

On the lands at Calhoun the cow peas do not grow as vigorously as they do in stronger land, and, therefore, the fertilizing value would not be as great.

At Baton Rouge the results are quite different. This is partly due to the fact that the soil is naturally more fertile; partly to the fact that commercial fertilizer alone has been used on the rotation plots, and partly to the presence of black heart in the cotton, reducing the yield. Ten years’ experiments at Baton Rouge give the following results:

**Table III.**

<table>
<thead>
<tr>
<th></th>
<th>COTTON</th>
<th></th>
<th>OATS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Two Years</td>
<td>Three Years</td>
<td>Four Years</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fertilized</td>
<td>Unfertilized</td>
<td>Fertilized</td>
<td>Unfertilized</td>
</tr>
<tr>
<td>Plot A</td>
<td>1488</td>
<td>1181</td>
<td>47.3</td>
<td>31.8</td>
</tr>
<tr>
<td></td>
<td>Three Years</td>
<td>Three Years</td>
<td>Three Years</td>
<td></td>
</tr>
<tr>
<td>Plot B</td>
<td>1312</td>
<td>1119</td>
<td>44.4</td>
<td>36.7</td>
</tr>
<tr>
<td></td>
<td>Three Years</td>
<td>Two Years</td>
<td>Three Years</td>
<td></td>
</tr>
<tr>
<td>Plot C</td>
<td>928</td>
<td>803</td>
<td>43.7</td>
<td>39.1</td>
</tr>
<tr>
<td>Average three plots</td>
<td>1242.6</td>
<td>1034.3</td>
<td>45.1</td>
<td>35.8</td>
</tr>
</tbody>
</table>
Estimated in dollars and cents, gross receipts for the fertilized areas, the largest money value comes from cotton, being $47.42 per acre, against $43.92 in oats and peas, and $41.00 for corn and peas; counting cotton at 10, oats at 45c, corn at 60c, hay at $14.00 per ton and cotton seed at $14.00.

We shall not go into the cost of producing the various crops, except to say that the cost is not greatly different. The increased cost of seeding and plowing for peas and oats about balances the cost of seeding and cultivating the cotton crop and the corn crop. Of course, the cost of harvesting is against the cotton. On the other hand, the danger of damage of hay from bad weather is much greater than for cotton, yet I believe few of us realize the real losses we suffer in the cotton crop from exposure to bad weather.

However desirable it may be to use the compost here described, this method of fertilization is practicable only to a very limited extent, as it requires stable manure as an ingredient of the compost, and this cannot be secured in large quantities, under our present system of farming. Cotton seed are also advancing in price, and when more than $15.00 can be realized for seed it will be equal to their fertilizing value. Thus, again, we have emphasized the necessity of raising more live stock, that they may consume grain and forage crops, and the meal from our cotton seed, and return the fertilizing ingredients to the soil.

I know of no way of permanently increasing the fertility of the land except through the agency of vegetable matter. I know of no more profitable way of securing this vegetable matter than raising hay and forage crops, feeding it to live stock and applying the resulting manure to the land. Nature has given us a great advantage in preserving the fertilizing elements of our soil if we but heed our opportunities. When we sell cotton lint, we sell cellulose, composed of hydrogen, oxygen and carbon, which was derived from the air and water.

When we sell our seed, we sell the fertility of the land, as the northern and western farmer does when he sells his grain. The oil, however, has no fertilizing value, being, like the lint, composed of elements taken from the air and water, and cannot be used again by the cotton plant; so if we sell only the lint
and the oil, returning the hulls and meal to the land, we have not reduced the fertility appreciably.

The utilization of grain crops also makes it easier to adapt labor-saving implements. Grain and hay crops can be harvested by machinery, and the labor rendered less arduous than gathering the cotton crop. The crops herein discussed other than cotton have not paid, in themselves, as brought out in previous figures, as well as the cotton crop, but they have made possible the heavy yields of cotton by increasing the producing power of the soil, and the whole area has, we believe, been as profitable as it would have been if devoted continuously to cotton production, with the aid of commercial fertilizer alone. The advent of the boll weevil makes it necessary to devote a less acreage to cotton, so that the crop can be handled with greater dispatch, and in many instances the system of rotation offered above may prove satisfactory. In case a longer period of rotation is desired it can easily be arranged after the following order:

**A FOUR-YEAR ROTATION SYSTEM.**

Instead of devoting one-third of the cultivated land to cotton, one may divide the area into four parts, and devote two to cotton, one to corn and peas and one to oats and peas. For illustration, let us say we name the areas A, B, C, and D. Plant A and B in cotton, C in oats and peas and D in corn and peas. The following year B and C in cotton, D in oats and peas, A in corn. The third year, C and D in cotton, A in oats and peas, and B in corn. The fourth year, D and A in cotton, B in oats and peas, and C in corn.

The fifth year the arrangement of crops would be the same as the first year. In four years each area would produce two crops of cotton, one of corn, one of oats and two of peas.

The addition of phosphate to the pea crops has seemed advisable from the fact that cow peas may draw upon the air for nitrogen, but no source of phosphoric acid is available except what may be drawn from the subsoil, and experience has shown that this is not sufficient to meet the demands of crops.

The addition of 150 pounds of acid phosphate per acre to each crop of peas has caused the peas to make much more
vigorou growth, thereby increasing the amount of nitrogen
secured from the air, and also increasing the amount of vege-
table matter left in the soil.

**VARIETIES OF OATS TO PLANT.**

The Stations receive a great many inquiries about varieties of
oats. It is almost useless to plant other than genuine rust-proof
oats. Seed grown in Louisiana are to be preferred. Much of
the seed sold as rust proof by seedsmen is quite subject to rust.
Texas produces a considerable quantity of seed oats that are
good, but there is danger of securing Johnson grass seed in
Texas oats. Strains of oats propagated by J. Burress McGehee,
Laurel Hill, Louisiana, and by R. F. Patterson, Baton Rouge,
Louisiana, are the most desirable varieties we have cultivated.

**PLANTING OATS.**

The best results are to be expected by planting oats from the
first of October to the first of December. If the field can be
pastured during dry weather in the fall and winter, October
planting is to be preferred. If the field is not to be pastured,
late October or early November is to be preferred. Sow at the
rate of one and a half to two bushels to the acre, on well-pul-
verized soil, and harrow in, or, better, plant with a seed drill,
about one and one-half inches deep.

In some soils hairy vetch, red clover or crimson clover makes
a desirable combination with oats. A bushel and a half of oats
and a half bushel of hairy vetch, or ten pounds of clover seed
per acre make a good seeding. Crimson clover is desirable for
sandy lands, red clover and vetch for loam soils.

**SUPPLEMENTARY FERTILIZATION OF OATS.**

In North Louisiana we have found that a top dressing of
nitrate of soda, fifty pounds per acre, applied in early spring,
has greatly increased the yield. At Baton Rouge we have tried
various fertilizers, applied as top dressing, outside the rotation
areas, with variable results.

**OATS AS A GRAZING CROP.**

We have found by grazing test, results of which will be pub-
lished in detail in another bulletin, that oats are the best crop
we can raise for winter grazing, where alfalfa does not thrive. If they are grazed too much, however, the yield of seed is reduced. If the winter is warm, so as to favor rapid growth, early oats should be grazed; otherwise they may become too far advanced and be killed by a sudden freeze. When the stems begin to joint and show evidence of formation of heads, the stage commonly designated as being "in the boot," they are subject to severe damage by light freezes. In retarding excessive growth, grazing is an advantage to the crop.
ADDITIONAL PLANS FOR ROTATION.

A considerable number of systems of rotation that are desirable may be formulated, some of which will include almost any desired crop, and yet have cotton follow one or more crops of legumes, thus utilizing the best effect of the legumes on the cotton crop. The following plans are suggested:

ROTATION OF COTTON, CORN AND PEAS, OATS AND LESPEDEZA.

Let us again divide the total acreage into four equal parts. Plant two parts in cotton, one in corn with cow peas sown in the corn at last plowing, and one part in fall sown oats with Lespedeza sown in the oats in February or early March, at the rate of one bushel per acre, without covering. The oats will be harvested in May, and the stubble and Lespedeza pastured, or a moderate crop of Lespedeza may be harvested in the fall. This plot then remains in Lespedeza the following year.

Where corn and peas have been planted, Lespedeza will be planted each even year of the rotation and in cotton each odd year. Each plot will be in cotton two successive years, then in corn and peas, then in oats and Lespedeza.

The following diagram will represent the arrangement of crops successive years:

<table>
<thead>
<tr>
<th>Year of Rotation</th>
<th>Field A.</th>
<th>Field B.</th>
<th>Field C.</th>
<th>Field D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cotton</td>
<td>Cotton</td>
<td>Corn and Peas</td>
<td>Oats and Lespedeza</td>
</tr>
<tr>
<td>2</td>
<td>Cotton</td>
<td>Corn and Peas</td>
<td>Cotton</td>
<td>Lespedeza</td>
</tr>
<tr>
<td>3</td>
<td>Corn and Peas</td>
<td>Oats and Lespedeza</td>
<td>Cotton</td>
<td>Cotton</td>
</tr>
<tr>
<td>4</td>
<td>Cotton</td>
<td>Lespedeza</td>
<td>Corn and Peas</td>
<td>Cotton</td>
</tr>
<tr>
<td>5</td>
<td>Cotton</td>
<td>Cotton</td>
<td>Oats and Lespedeza</td>
<td>Corn and Peas</td>
</tr>
<tr>
<td>6</td>
<td>Corn and Peas</td>
<td>Cotton</td>
<td>Lespedeza</td>
<td>Cotton</td>
</tr>
</tbody>
</table>

If it is desired, Lespedeza may be left for a third crop, and this would make four crops of legumes between cotton crops on one-fourth of the land.
In some cases on small farms sugar cane can be substituted for Lespedeza as a two-year crop, but of course the effect on the land will be quite different.

**SORGHUM, SWEET POTATOES, ETC.**

Instead of planting full area to oats, or corn and peas, other crops may be substituted in part or in full. Hairy vetch is a good crop to mix with oats, using a half bushel of seed per acre. Unfortunately, the seed have been rather expensive.

Stock beets and rutabaga turnips make good winter feed for hogs, sheep and cattle. The seed can be planted after the corn crop, and the resulting crop harvested in time to plant cotton. The rutabagas mature in advance of the stock beets, but are not as desirable otherwise.

**SPANISH PEANUTS.**

Spanish peanuts are a desirable crop for small areas in sandy land, and are valuable in adding fertility to the soil.

Velvet beans are the best crop we can grow for fertilizing purposes, if the plants can be allowed to grow from early spring till checked by frost, and they also are the best crop we can grow for shading out noxious weeds and grasses.

Good crops of German millet can be grown after a crop of oats, but this succession would bring two crops together that draw heavily from the fertility of the soil.

With a little study one will not have much trouble in arranging a system of rotation that will give a leguminous crop on the land at least every third year, or two crops in four years, thus taking advantage of the cheapest possible source of nitrogenous fertilization.