
UNIVERSITY OF MISSOURI.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

Agricultural Experiment Station

BULLETIN NO. 73.

COWPEAS

COLUMBIA, MISSOURI.

October, 1906.

University of the State of Missouri.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

Agricultural Experiment Station

BOARD OF CONTROL.

THE CURATORS OF THE UNIVERSITY OF MISSOURI.

THE EXECUTIVE COMMITTEE OF THE BOARD OF CURATORS.

HON. WALTER WILLIAMS, President
Columbia, HON. H. B. BONFORY,
Unionville, HON. CAMPBELL WELLS,
Platte City.

ADVISORY COUNCIL.

THE MISSOURI STATE BOARD OF AGRICULTURE.

OFFICERS OF THE STATION.

THE PRESIDENT OF THE UNIVERSITY.

H. J. WATERS, B. S. A.	Director
PAUL SCHWEITZER, Ph. D.	Chemist
J. C. WHITTEN, M. S., Ph. D.	Horticulturist
J. M. STEDMAN, B. S.	Entomologist
J. W. CONNAWAY, M. D. C.	Veterinarian
F. B. MUMFORD, B. S., M. S.	Animal Husbandry
B. M. DUGGAR, A. M., Ph. D.	Botany
C. H. ECKLES, M. S.	Dairy Husbandry
M. F. MILLER, M. S.	Agronomy
R. L. HOWARD, Ph. D.	Assistant in Horticulture
R. M. BIRD, Ph. D.	Assistant Chemist
E. B. FORBES, B. S., B. S. A.	Assistant in Animal Husbandry
R. H. SHAW, B. S.	Assistant in Dairying
E. H. FAVOR, * B. A.	Assistant in Horticulture
B. F. FLOYD, A. B.	Assistant in Botany
H. L. SHANTZ, Ph. D.	Assistant in Botany
J. E. TIFFANY, D. V. S.	Assistant in Veterinary Science
A. E. GRANTHAM, A. B., B. S. A.	Assistant in Agronomy
LEONARD HASEMAN, A. B.	Assistant in Entomology
C. H. HECHLER, B. S.	Assistant in Animal Husbandry
W. H. CHANDLER, M. S.	Assistant in Horticulture
E. A. TROWBRIDGE, B. S. A.	Assistant in Animal Husbandry
L. F. CHILDERS, B. S.	Assistant in Agronomy
GEO. REIDER	Meteorologist
J. M. DOUGHTY, B. S.	Herdsmen
JOHN SCHNABEL	Gardener
J. G. BABB, A. B.	Secretary
R. B. PRICE	Treasurer
S. E. KENNEDY	Clerk and Stenographer

*Absent on leave.

The Bulletins and Reports of the Station will be mailed free to any citizen of Missouri upon request. A cordial invitation is extended to all persons to visit the Station grounds at any time. Address, Director Agricultural Experiment Station, Columbia, Boone County, Missouri.

COWPEAS.

A. E. GRANTHAM, Instructor in Agronomy.

SUMMARY.

1. Cowpeas can be grown successfully on all types of Missouri soil and in any section of the State.
2. As much forage can be produced from cowpeas in 80 days as red clover will yield in 15 months.
3. The feeding value of cowpea hay is fully equal that of the best red clover and is almost equal to alfalfa.
4. Cowpeas make an excellent pasture, especially valuable as a supplementary feed for growing animals, particularly hogs.
5. In southern Missouri cowpeas may be planted with corn and cut together for silage to good advantage.
6. The quick maturing habit of the cowpea renders it admirably adapted for sowing as a catch crop between the regular crops of the rotation. In the southern half of the State cowpeas may follow wheat or oats and produce a crop for hay or pasture before time for fall seeding. In northern Missouri this practice will be successful only in favorable seasons and where an early maturing variety is used.
7. Where clover is not adapted or frequently fails cowpeas may be substituted, and may be used to improve soil conditions so that clover will catch.
8. The growing of cowpeas increases the productive capacity of the soil by storing and by making available plant food.
9. An improvement in the physical condition of the soil is always noted where cowpeas have grown. The soil becomes more open, friable, more easily worked, holds moisture better and dries out earlier in the spring.

10. Because of their nitrogen content, heavy growth and rapid maturity, cowpeas are especially well adapted for green manuring.

11. Varieties of cowpeas differ widely in their habits of growth. These vary from an upright, bush-like form to low trailing vines many feet in length. Some mature in 60 days, other require 120 days or more.

12. The variety to be selected for planting depends upon the purpose for which crop is grown and upon the length of the growing season.

13. The Whippoorwill variety is recommended for the general grower. The New Era is best suited for a catch crop or for a short growing season.

14. Cowpeas respond generously to thorough soil preparation. The seed bed should be given as good treatment as that for corn.

15. When peas are not to be cultivated four or five pecks of seed per acre will be required; if to be cultivated, five to eight quarts.

16. Cultivated peas require less seed, more labor and the yield is usually but little heavier than when not cultivated.

17. When peas are intended for the main crop, planting should begin not earlier than two weeks after the usual time for corn planting. For a catch crop sow at the earliest date possible after wheat or oats have been cut.

18. The vines should be cut for hay when the first pods turn yellow, and before the leaves begin to fall.

19. Cowpeas yield from one to four tons of hay per acre and from eight to twenty-five bushels of seed.

20. The average crop of cowpeas has a value not exceeded by that of any other crop in the State, equally well adapted and distributed.

COWPEAS.

A. E. GRANTHAM, Instructor in Agronomy.

INTRODUCTION.

The cowpea is not an unknown plant to Missouri. For nearly a half century cowpeas have been grown in certain localities in the southeastern part of the State. Yet the average Missouri farmer has but little experience in growing the crop and has still less knowledge of value of the plant for farm conditions. In a few sections of the State where the merits of the plant have become recognized, the cowpea has for several years been one of the leading crops of the rotation. Most farmers, especially in the central and northern portions of Missouri, are not familiar with the advantages to be secured by growing the cowpea. The plant has been tried in a limited way, perhaps, by some farmer in nearly every locality for a year or two, but owing to the lack of knowledge of the best methods of sowing, harvesting and utilizing the crop, satisfactory results were not obtained in many cases. Others have secured good results but the high price of seed and the difficulty of securing it have prevented them from following up their success. Where a farmer has planted peas for two or three seasons, he is generally enthusiastic in his recommendation of the plant and considers the cowpea almost indispensable to his system of farm management. The reason why cowpeas are not more extensively grown is not because they are difficult to grow but due to the failure to recognize the many purposes for which they may be used. It can be said safely that the cowpea culture has long since passed the experimental stage and that it is destined to become a very important factor in Missouri agriculture. The increased interest manifested in the growing of cowpeas within the past five

A THRIFTY GROWTH OF COMPEAS



years is evidence conclusive that the merits of the crop are becoming widely recognized and appreciated. It is with the purpose of setting forth the advantages to be secured by growing cowpeas and of making known the best methods of handling and utilizing the crop that this bulletin is issued.

THE COWPEA PLANT.

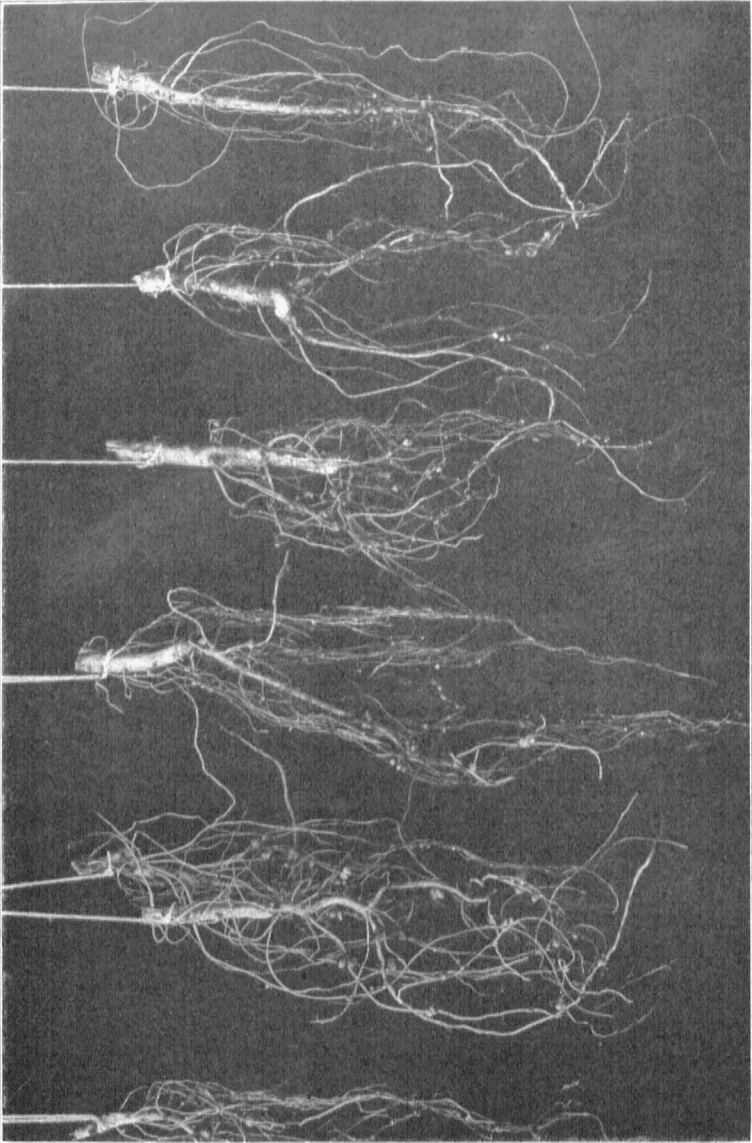
The cowpea (*Vigna catjang*) belongs to the general family of leguminous plants and is closely related to the lima bean of the garden. Contrary to its name the cowpea is, in its botanical relations, of nearer kin to the bean than to the pea. In appearance the cowpea plant resembles the bean and like it is an annual very sensitive to frost. The plant varies in habit of growth from an upright, bush-like form, a foot or more in height with tendrils a few inches in length, to a mass of low, trailing vines many feet long. The form of the cowpea plant varies not only with the variety but also with the length of season, soil, moisture, and cultural conditions. It is the nature of the plant to adapt itself readily to the environment in which it is placed. For example, varieties that require several months to mature in the South, will, when brought to a more northern latitude, cut short their growing season. Thus it has been possible to develop varieties which will mature in 60 days and which can be grown successfully as far north as the Great Lakes. Some varieties which produce a small amount of vine on a soil of average fertility will, when planted on a rich soil, vine profusely. The amount of rainfall during a season will largely determine the extent of vining as well as the quantity of seed produced. These modifications of the plant due to conditions under which the peas have grown have given rise to many varieties. The blossoms vary in color from white to purple, while the pods, usually of a light straw color, are in some varieties a brown, purple, or dark color, varying in length from five inches to nearly a foot. The size and color of peas vary greatly. The peas of some

varieties are more than twice the size of others and the color ranges from white to jet black. Some varieties produce seed which so completely fill the space in the pod that they are so crowded together as to flatten the ends of the peas where they touch one another.

The root system of the cowpea is rather extensive and consists of a number of irregular shaped roots which divide into many fine rootlets. The latter find their way deep into the subsoil and enable the plant to draw freely upon the sources of food and water even in a dry season. The smaller roots found in the upper layers of the soil bear the tubercles which are always found on plants of the best development. The Kansas Station found that cowpea roots penetrate readily to a depth of four feet. In this respect the cowpea compares very favorably with red clover. This habit of growth is responsible for the remarkable freshness and vigor with which the development of the plant is attended. Even in the hottest and driest weather the well established cowpea plant will thrive as will no other crop on the farm.

ADAPTABILITY OF COWPEAS TO MISSOURI CONDITIONS.

Climate. The cowpea has such a wide range of climatic adaptation that Missouri lies well within the latitude suited to its perfect development. There is no section of the State where peas will not mature. The long hot days of the Missouri summer are conditions under which the plant thrives. Cowpeas are even better adapted to this latitude than to regions either north or south. At the north the growing season is so short after the removal of small grain crops that cowpeas cannot be brought to maturity before frost, thus they are not suited for a catch crop for Northern States. While farther south the winters are so mild that much of the fertility left in the soil by the growing of cowpeas is leached away by the winter rains. Often the soil is loosened to such an extent by the peas that fields where they are grown are subject to severe



COWPEA ROOTS WITH NODULES.

washing during the winter months. In Missouri the length of season is such as to allow two crops to mature and at the same time the freezing weather prevents much loss of plant food by leaching. It is here that maximum results can be expected from the proper management of the crop. Wheat and oats mature early enough to allow peas to follow as a catch crop, to mature and to be removed in time for fall seeding.

The hot dry weather of late August and early September offer fair opportunities for the curing and handling of the hay. While the weather is not always ideal for hay making, yet September conditions are usually more favorable for curing pea hay than June weather is for making clover hay.

Frost does not usually appear before the 20th of October in central Missouri. Thus the growing season may be extended until late and will allow peas to be pastured to good advantage.

Soil. The cowpea is adapted to all types of Missouri soil. There is no forage plant known to the corn belt that can be grown successfully on such a variety and such diverse conditions of soil. The plant has long been known for its ability to extract plant food from soil infertile and almost barren for other crops. It is this characteristic that renders the cowpea a sure crop on all kinds of soils. Like most other plants cowpeas do best on a good soil but the fact that they will grow well on a worn-out soil has given the plant prominence as a soil renovator. For many years in the South peas have been grown for the purpose of bringing up the fertility of thin land; and the expression regarding soil, "too poor to grow cowpeas," is a significant one and is indicative of the thrift of the plant. Reports from practical farmers from all sections of the State indicate that cowpeas can be grown readily on all types of Missouri soil. From the rich loess and the alluvial deposits of the Missouri and Mississippi rivers to the thin upland of the Ozarks, the cowpea will make a profitable crop. The plant is better suited to an open, friable soil, somewhat sandy than for the heavy clay uplands. An open soil

allows good aeration and promotes bacterial activity which is necessary for the best development of the plant. Such soil produces the cowpea to perfection. Heavy clay soils will not produce a heavy crop the first year but the peas will succeed much better the second year, as the root systems seem to penetrate and enliven the soil. A very rich soil is not conducive to the best results with cowpeas. While a great growth of vines is produced the yield of grain is often small, and the vines growing in such profusion that they are very difficult to cure. A soil of moderate fertility will in most cases produce the most satisfactory results for both hay and peas. Soil that is worn out or poor will produce a crop that is short in production of vine, but will generally yield a good proportion of seed.

Cowpeas will not grow on wet soil. In this respect they are similar to other legumes and for the same reason that a wet soil will not allow good soil ventilation, so necessary to plants that use nitrogen from the air.

On the Farm. On the average Missouri farm as well as in the other farming districts of the corn belt it is the general practice to include clover as one of the crops of the rotation. It is a well-established fact that some legume must be used in the rotation if the soil is to yield the most profitable returns. The legumes, as clover and the cowpea, are the only crops grown in a short rotation that are able to draw upon the nitrogen of the air for maintenance and at the same time store up that valuable element of plant food in the soil for other crops. These crops not only increase the fertility of the soil by increasing the store of nitrogen but also at the same time the organic matter content of the soil is increased. This is especially true when a clover sod is turned under. The crop producing capacity of a soil is largely determined by the amount of organic matter present. The growing of clover supplies these constituents as does no other crop grown on the farm. To maintain properly the state of fertility necessary to produce maximum crops clover must be grown or some other crop must be introduced in its stead.

The farms of Missouri include many types of soil. On some of these soils clover is not naturally adapted. For example, the sandy soils of Southeast Missouri and the post oak flats of the Ozark uplands. On the former soil clover does not grow because of the open texture of the soil and its consequent lack of water-holding capacity. It is doubtful whether this type of soil can be improved so as to grow clover profitably. On some soils of the upland Ozark region, particularly true of the post oak flats, clover is rarely a success because of the lack of available plant food and the shallow soil which tends to burn out clover during the summer. The problem here is to liberate plant food and to deepen the soil by plowing under green manure. This together with the improved physical condition of the soil may induce a stand of clover.

There is another class of farms, especially in the central and northern parts of the State, where clover once thrived but at present owing to the impoverishment of the soil or to poor management it is difficult to get a stand. As a consequence the same fields are being cropped to grain year after year and thus are becoming less and less adapted to the growing of clover. The organic matter of the soil is becoming exhausted and the yield of grain crops is rapidly becoming smaller. Reports from a large number of farmers show that 67 per cent, or, two farms out of every three, have been so mismanaged as to refuse to grow clover well. Attendant upon this failure to grow clover the farm is not producing enough leguminous crops to balance properly the more carbonaceous feeds, corn and stover, that are so generally fed. Indeed, there are but few live stock farmers who produce enough protein to satisfy their demands, or in other words, to bring about the best results in feeding. The most profitable stock farming cannot be carried on without the annual production of some legume. Thus the failure to grow clover is a loss to the farmer in two ways, the gradual depletion of the soil and the lack of the proper kind of feed for stock. The problem of

soil fertility is the most fundamental in farm management and upon it rests finally the material welfare of every farming operation.

A study of Missouri soils and farming conditions reveals the following facts: 1st. Considerable areas of the State are not naturally adapted to the growing of clover. 2nd. A still larger area was naturally adapted to clover but now through lack of proper management of the soil fails to get a stand of clover. 3rd. That the average farm does not, because of failure of clover, produce a sufficient quantity of protein to properly balance the feeding ration of live stock. 4th. Investigation shows that 67 per cent of the farms of the State have difficulty in growing clover. 5th. That it is not uncommon for farmers to buy hay for work animals.

The above conditions have a solution in the growing and the proper utilization of the cow pea. It is not claimed that the cowpea should take the place of clover, but peas may be used to bring up the soil so that it will grow clover, or peas may be substituted for clover where the soil is not naturally adapted to it. That the cowpea can be made to fill in a large measure the office of red clover both as a soil renovator and as a feed, it is the purpose of the following pages to show.

METHODS OF UTILIZING COWPEAS.

Cowpeas for Hay. When properly cured cowpeas make an excellent hay. Few farmers realize that cowpea hay has a feeding value nearly equal to alfalfa and fully equal to the best of red clover hay. It is equally as profitable a feed as alfalfa, and when fed to dairy cows or growing animals will produce as good results. Work animals can be maintained on cowpea hay with the addition of but very little grain. The chief value of cowpea hay lies in its large percent of digestible protein as is shown by analysis and which has been verified by numerous feeding tests. It will be noted from the table that cowpea hay contains practically the same amount

of digestible protein as alfalfa, but considerably more than red clover.

The following data taken from Henry's "Feeds and Feeding" show the comparative feeding value of the more common grain and hay products.

DIGESTIBLE NUTRIENTS FROM DIFFERENT CROPS.

Material	Digestible Nutrients per 100 lbs.		
	Protein	Carbohydrates	Fat
Cowpea hay	10.8	38.6	1.1
Clover	6.8	35.8	1.7
Alfalfa	11.0	39.6	1.2
Timothy	2.8	43.4	1.4
Wheat bran	12.2	39.2	2.7
Corn	7.9	67.7	4.3
Oats	9.2	47.3	4.2
Cowpeas (grain)	18.3	54.2	1.1

As compared with timothy hay, cowpea hay contains about four times as much protein. The average farm does not produce enough protein to balance properly the more carbonaceous feeds as corn, stover and timothy. Such a combination of food compounds is necessary if the best results are to be secured from feeding.

Experiments in feeding carried out by this Station show conclusively the necessity for balancing the rations of live stock. The following table shows the superiority of cowpea hay over timothy hay, when fed with corn, for wintering yearling steers:

COMPARISON OF COWPEA HAY WITH TIMOTHY HAY FOR
WINTERING YEARLING STEERS.

*First trial—1899-00—104 days—4 steers in each lot—4 pounds of corn per day per head.

Kind of feed.	Corn eaten, lbs.	Hay eaten, lbs.	Total gain, lbs.	Av. daily gain, lbs.	Gain per pound, gain lbs.
Corn and timothy hay	1,568	6,536	260	.64	6.00
Corn and cowpea hay	1,568	7,757	624	1.54	2.51

In this trial the substitution of cowpea hay for the timothy more than doubled the gain.

Further tests were made which show the relative efficiency of timothy, red clover and cowpea hay for balancing the rations of fattening animals. The following tables present a summary of results:

COMPARISON OF COWPEA HAY WITH CLOVER AND TIMOTHY
HAY FOR FATTENING STEERS.

*First trial—1899-1900—119 days—4 two-year-old steers in each lot—full fed on shelled corn.

Kind of feed.	Corn eaten, bu.	Roughness eaten lbs.	Total gain, lbs.	Av. daily gain per steer, lbs.	Pounds grain per lb. of gain.	Gain per bushel of corn, lbs.
Corn and timothy hay	166	3,813	802	1.69	11.51	4.87
Corn and cowpea hay	188	3,662	1,257	2.64	8.31	6.74

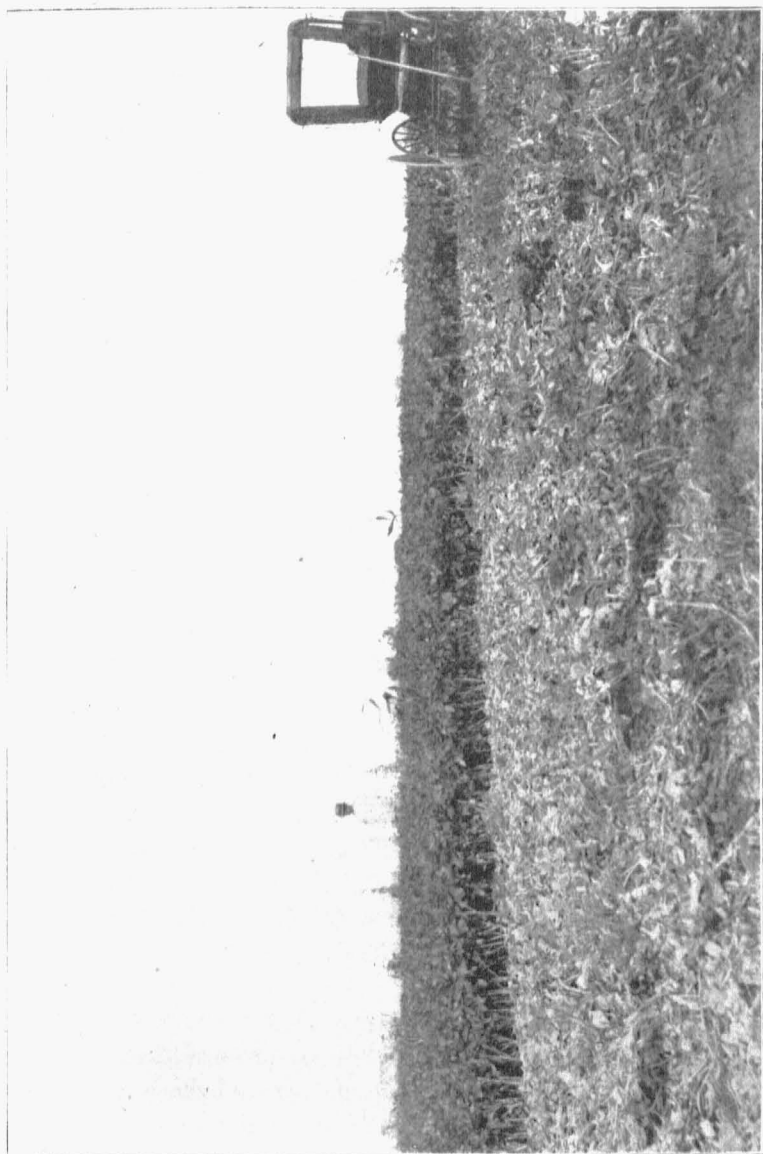
*Circular of Information, No. 11, Missouri Experiment Station.

Second trial—1900-01—105 days—4 two-year-old steers in each lot—full fed on shelled corn.

Kind of feed.	Corn eaten, bushels....	Roughness eaten lbs...	Total gain lbs....	Av. daily gain per steer, lbs..	Lbs. grain per lbs of gain....	Gain per bu. of corn, lbs.
Corn and timothy hay.....	157.5	2,540	789	1 97	11 19	5.00
Corn and clover hay	176.2	4,768	1,135	2.84	8.69	6.44
Corn and cowpea hay.....	175.3	4,783	1,134	2.84	8.65	6.47

As the table indicates, there was a much more rapid gain where the animals received a ration with considerable protein as is found in red clover and cowpea hay. The steers made nearly 50 percent better gains where fed cowpea hay than where timothy was used. The experiment also shows that cowpea hay and red clover hay have nearly the same feeding value.

On the other hand, if those feeds carrying large amounts of digestible protein be fed alone the most profitable returns will not be made. To supply the lack of protein food on the farm commercial feed stuffs such as bran are often bought and sometimes alfalfa. Bran has but little greater feeding value than cowpea hay and costs about \$20 per ton, while the best grade of the latter can be had for \$10 per ton. An equal quantity of the two feeds will produce nearly the same amount of milk, energy or growth. For dairy men and stock feeders who are obliged to buy bran considerable expense may be saved by using cowpea hay as a part of the ration. Much land is not adapted to the growing of alfalfa and that valuable feed in this neighborhood is an expensive item that can be readily eliminated by substituting cowpea hay for the alfalfa. Large tracts of Missouri do not grow clover well and still more extensive areas are not adapted to alfalfa, but the entire State will grow cowpeas. The average yield of cowpea hay for the past five years, as reported by the State Board of Ag-



FIELD OF CLAY COWPEAS ON FARM OF NATHAN KING, COLUMBIA, BOONE COUNTY, MO. PHOTOGRAPHED SEPTEMBER 22.

riculture and by practical farmers, is 1.6 tons per acre as compared with an average of 1.2 tons for all hay.

Cowpeas yield well for hay and are a sure crop. The average farmer should not be obliged to purchase hay of any kind. The so-called prairie hay so commonly used in parts of Missouri is a very inferior feed. In some sections of the State it is not uncommon to find farmers purchasing hay for their work animals during the spring and early summer. While clover and timothy may not be adapted to these soils, yet there is little question but that cowpeas could be made to produce sufficient hay for the demands of the farmer for the entire year.

As yet, cowpea hay is little known on the general hay markets of the country. This is due largely to the fact that peas are grown to such a limited extent that there is never a surplus, and for the reason that the true merits of the feed are not widely recognized. The fact that pea hay is not in the market is no objection; the best systems of farm management raise and feed all their own hay.

From reports of many farmers who have been growing cowpeas the following decisions were given by them as to the comparative feeding value of red clover hay and cowpea hay: 96 reported cowpea hay better than red clover hay; 77 reported cowpea hay as equal to red clover hay; 13 reported cowpea hay inferior to red clover hay. Or 93 per cent reported cowpea hay equal to or better than red clover.

Cowpeas for Pasture. The cowpea on account of its habit of growth is not well adapted for a strictly pasture plant. Yet peas do furnish a pasture crop for a brief period at the time of year when such forage can be used to the best advantage. From the latter part of August until frost cowpeas make a pasture that, used to supplement the fattening ration of hogs and sheep, cannot be excelled. All animals relish highly the succulent and nutritious forage. Reports from practical farmers show that good results are obtained by pasturing peas with any kind of

live stock. If peas are sufficiently mature frost will not greatly lessen the feeding value of the vines. At that stage of maturity when many of the pods are yellow and before any of the leaves fall is best to begin pasturing. If stock is turned on before the pods have reached full size the plants are much more easily wasted by trampling, and further, the forage has not its full feeding value, because it is too watery. Cowpea vines that have attained their growth are not so likely to cause bloat in sheep or cattle. The most common practice in pasturing peas is to hog them down. This may be done where peas are sown alone or where they have been planted in corn. In the latter case the hogs have a full fattening ration and do exceptionally well. For young hogs the peas are a splendid feed and but little grain is required to bring them to market weight. Hogs will eat off the mature pods first as they are the richest part of the plant and leave some of the vines, especially when dry, so that cattle or sheep may be used to pasture off the more bulky vines. Sheep may be pastured on peas in the same way as hogs and will clean up every vestige of the plant. When sown in corn the stover blades and peas make a very fine ration for fattening fall lambs as well as wethers. Dairy animals show the effect of such pasture in a much increased flow of milk.

A Dunklin county farmer writes: "I have made more clear money pasturing hogs and cattle on peas than on anything on the farm. I also pasture my horses and mules and they do well."

A Monroe county farmer says: "I believe cowpeas will put more fat on a sheep than any other feed and do it quicker."

A Jackson county farmer states: "Hogs will fatten on cowpeas almost equally with corn."

A farmer of Barton county relates: "A neighbor fattened 60 hogs from 20 acres of peas and they equalled in feeding value 600 bushels of corn, valued at \$300 that season, 1902."

A Barry county farmer says: "I think for milk production cowpea hay is better than clover or any other kind of hay."

One advantage in using cowpeas for pasture is that a large amount of high class feed is provided the animals without the expense of handling. Another is, that the soil is not only benefited by the growing of cowpeas but the waste vines and droppings from the animals are also left on the land. The vines that are not eaten are not wasted as they are valuable for manure. The weather at the time of year when cowpeas are usually pastured is such that the ground is rarely injured by tramping. The soil following peas that have been hogged off is in excellent condition of fertility for the fall sowing of wheat.

If cowpeas are not pastured too closely they will make considerable after-growth in a favorable season. Where the primary object in sowing peas is not soil improvement, it will be found more profitable to pasture off the vines or take them off for the hay rather than plow them under.

As a result of inquiry among cowpea growers in various parts of the State regarding their opinion of cowpeas as a pasture for all kinds of stock, it was found that of 130 farmers who had tried the pasture, 127 declared the pasture good to excellent. Only one found cowpea pasture to be unprofitable.

COWPEAS FOR SOIL IMPROVEMENT.

The growing of cowpeas has a marked influence on the productive capacity of the soil. The beneficial effect is due to the increased amount of available plant food in the soil and to its improved physical condition. The cowpea like red clover and other legumes has the power of taking nitrogen from the air by means of the bacteria which live on the roots of the plant. This supply of the element nitrogen serves to increase greatly the growth of the plant and at the same time leaves the soil richer when the crop is removed. The



THE VIGOROUS GROWTH OF THE COWPEAS PRESENTS A STRIKING CONTRAST TO THE CONDITION OF CORN ON VERY POOR THIN LAND LEASED BY THE STATION FOR EXPERIMENTS IN RENOVATING WORN OUT SOILS. CORN YIELDED 6 BUSHELS PER ACRE. COWPEAS YIELDED 1600 LBS. CURED HAY.

cowpea, alfalfa, and the clovers are the only plants grown as farm crops in the State that are able to draw upon the nitrogen of the air, and hence are the plants we must depend upon to maintain and increase the supply of this element in the soil. The roots of the cowpea penetrate rather deeply into the subsoil and enable the plant to feed upon the mineral food that is not readily extracted by other crops. These mineral compounds, phosphoric acid and potash, thus gathered from the depths of the soil are, when the plant decays, left in an available form near the surface to be utilized by the more shallow-rooted crops. Further, the decomposition of organic matter in the soil tends to render soluble the mineral elements and to increase its capacity for holding moisture. The root system of the cowpea has the effect of making more loose and open the soil layers and to promote aeration and drainage. The growing of cowpeas may be said therefore to increase the productive capacity of the soil; 1st, By increasing the supply of nitrogen; 2nd, By making available the mineral compounds of phosphoric acid and potash. 3rd, By improving the physical condition of the soil.

The cowpea has a large capacity for gathering and storing nitrogen. It is more active in this respect than red clover, as a ton of cowpea hay contains 46.5 pounds of nitrogen while a ton of clover has but 40 pounds. The quality and quantity of green manure that is produced by cowpeas recommends the crop highly for such purposes. Yields of 10 to 12 tons of green vines are not uncommon. The cowpea has a distinct advantage over other legumes of making considerable growth on soils that are not adapted to clover, and on soils that will not produce a profitable yield of grain crops. The fact that cowpeas are able to secure plant food from soils too poor to induce a growth of red clover renders the plant invaluable as a soil improver. It is possible by growing a few crops of peas and plowing them under to increase the available plant food in, and to improve the physical condition of a very poor soil so that it will produce fair yields of other crops. Soils

that have been in cowpeas will be found to work more easily, have a greater moisture content during the growing season and to dry earlier in the spring. The improved condition of such soil is favorable to a stand of clover or grass. Much land that refuses to grow clover may be put in such a condition by cowpeas that a perfect stand can be secured. Particularly is this true of land that once grew clover and has been badly run down.

Cowpeas as a Catch Crop. Cowpeas have much to recommend them as a soil improver. Their quick maturing habit makes it possible to grow as large a crop of cowpeas in 80 days as can be grown in 15 months by red clover. For this reason cowpeas are admirably adapted for a catch crop between the main crops of a rotation. In the latitude of Missouri cowpeas may follow wheat or oats and secure a crop before time for fall seeding. In the northern part of the State owing to the shorter season this practice will not generally be successful after oats are removed, unless the season is very favorable and a quick maturing variety is used. A crop of cowpeas is worth as much as a crop of red clover, and a gain is not only secured from the hay or forage, but also from the increased fertility of the soil. Then, the rotation of the regular crops is not disturbed. A portion of the growing season not ordinarily utilized may thus be turned to a profit. Cowpeas should not be expected to take the place of clover on soils that grow clover well, but too much cannot be said of growing cowpeas in addition to clover in the rotation. Where clover will not catch cowpeas must be used. If it is found that a stand of clover has not been secured by spring seeding on wheat or with oats, the land should be sown to cowpeas as soon as the grain crop is removed. By such practice a crop of hay can be secured in time for fall seeding, but if not desirable to sow to grain the land may be again planted to cowpeas the following spring. Two crops of peas may thus be secured in place of the clover. Cowpeas

may be rotated with wheat and clover to good advantage. For example, land on which clover is sown in wheat in the spring of 1907 may be plowed early after the clover crop is removed in 1908, seeded to cowpeas and harvested and sown to wheat again in the fall. By this method two crops of leguminous hay may be secured from the same land in one year. Another method by which cowpeas may be used to improve the soil is to sow them in corn at the last cultivation. They will make considerable growth before frost and do not interfere with the following crop. Even where clover is a reliable crop it is advisable to keep plowed or fallow land covered with a growing crop during the summer months. It is during the heated portion of the year that nitrification goes on most rapidly under the proper conditions of temperature and moisture. Land after wheat or oats is often left almost bare, and, instead of promoting nitrification there may be an actual loss of nitrogen caused by the burning out of the organic matter in dry, hot weather. A cover crop of peas will shade the ground, prevent evaporation, and utilize and store nitrogen for succeeding crops.

Cowpeas for Green Manure. Cowpeas are of marked benefit to open sandy soils where clover will not grow. These soils have little water-holding capacity, are deficient in organic matter, and the nitrogen is easily lost by burning out or by leaching. A very considerable increase in yield may be expected from this class of soils when sown to cowpeas. The thinness of the soil will determine whether or not a green crop should be plowed under. After the first crop the vines may be taken from the land and the stubble followed by grain.

There are many stiff, clay soils that may be greatly improved by the proper use of cowpeas. The first year the crop of peas may be light but the second year it will be heavier. On such soils it is desirable to plow under the first crop of peas early in September, sow to rye which should be turned under the next spring, and the land sown to peas again. This

crop may be harvested for hay and the land disked and sown to grain in the fall. Where the entire crop is turned under care should be taken to have the ground well settled before sowing to wheat. In this way it is possible to place two crops of green manure in the soil and to secure a crop of pea hay in one year. Each grain crop should be followed by a catch crop of peas which should be turned under for a few years, or, until the soil becomes open and loose. By this method some of the thinnest soils can be made to produce fair crops. If the land is not too rolling fall plowing is best, letting the plow cut a little deeper each time so that the up-turned soil will be subjected to the freezing weather.

On land producing good crops the object should be to keep the soil in such condition that the yield may not only be maintained but even increased from year to year. With the proper management this is within the limits of possibility on every farm. The constant growing of grain crops without clover or cowpeas soon depletes the soil of its available nitrogen and the amount of organic matter is greatly lessened. It is the organic matter that promotes nitrification and also gives the soil an enlarged capacity for retaining moisture. Cowpeas, if grown whenever possible as a catch crop in addition to clover in the rotation, will serve very considerably to increase the stock of nitrogen and humus.

Increase in Yield of Crops after Cowpeas. The increase in the yield of crops after cowpeas will depend largely on the character of the soil. A rich soil in good tilth cannot be expected to show so much gain, but a fertile soil in a poor physical condition or a poor soil even in a good physical condition will always be materially benefited. Where a soil is both thin and in bad tilth two or more crops of peas will have to be grown in order to correct these conditions and to get a marked increase in the yield of grain. On soils of average fertility the plowing under of the entire crop is not attended with so marked an increase over the yield from land

from which the peas have been harvested, as to justify this expense. Under such circumstances the vines are worth more as a feed than they are as a manure, the roots and stubble being sufficient for the present requirements of this class of soils. Peas should be plowed under, therefore, only when the soil is decidedly lacking in nitrogen or organic matter. Whenever possible the peas should be utilized as hay or pastured off. In the latter case a large percent of the fertilizing value of the peas is returned to the soil in the animal manure.

Experiments at this Station on our upland soil show some very favorable returns from cowpeas as a fertilizer. During the season of 1906 corn on land that had been in cowpeas as a main crop in 1904 and 1905 yielded 63 bushels per acre. While exactly similar land that had had no peas, but had been otherwise similarly treated, produced at the rate of 34 bushels per acre. Oats sown on land that grew oats in 1905, followed by cowpeas as a catch crop, produced 43.2 bushels per acre in 1906. On land that had no catch crop of peas, oats made 25.8 bushels per acre. Wheat on land that had been in rotation with wheat and peas as a catch crop yielded 21 bushels per acre. The same soil without the peas gave a yield of 14.1 bushels. In other words, corn after two crops of cowpeas made an increase in yield of 79 per cent. Oats following a catch crop of peas made an increase of 63 per cent; while the yield of wheat was increased 49 per cent.

Reports have been received from farmers in many sections of the State regarding their opinion of cowpeas as a soil improver.

A Greene county farmer says: "In May, 1904, we sowed 15 acres to cowpeas at the rate of one-third of a bushel per acre. In September we turned the crop under and the next spring the land was planted to corn. The crop was double what it had been for years before."

A Howard county farmer writes: "Wheat following cowpeas made twice the yield of that on similar land that had

had no peas and the wheat was of a superior quality, so that I got an advanced price for it for seed."

A Perry county farmer reports: "When cowpeas are pastured down with hogs and the vines left on the ground over winter I can raise as good corn as on clover sod."

A Mississippi county farmer states: "I think that cowpeas add one-fourth to the yield of corn following peas."

A Clay county farmer reports: "In 1904 I sowed 5 acres in cowpeas for hay which made 8 tons. I plowed the field that fall and planted to corn in 1905. Gathered 250 bushels from the field. The yield per acre before was 35 bushels."

A Monroe county farmer says: "Except stable manure I think cowpeas the best fertilizer I ever used."

A Montgomery county farmer relates: "I sowed 40 acres to cowpeas in 1904 and plowed them under in the fall on thin land and planted to corn in 1905. Gathered 50 bushels of corn per acre that fall while my neighbors did not average over 25 bushels."

A Bates county farmer declares: "Cowpeas will make a ton of excellent hay to the acre and the soil is in fine condition for the next corn crop, and the yield will be 5 to 10 bushels more."

A Bollinger county farmer says: "The yield of wheat and corn will be almost doubled when grown after the pea crop is taken off."

A Mississippi county farmer writes: "I let a piece of land that had been in corn for years lie out one year and put it in peas in spring of 1905; then it into wheat in the fall and this year, 1906, I threshed 28 bushels per acre on 100 acres."

As a result of a number of questions sent out to farmers in various sections of the State it was found that in answer to the query as to whether cowpeas had increased the productivity of the soil that out of 230 replies received, 227 were in the affirmative, or 99.9 percent had found that cowpeas improved their soil.

VARIETIES OF COWPEAS.

There are more than fifty varieties of cowpeas. These differ widely in their habit of growth, development of vine, yield of seed and length of time required for maturity. From their habit of growth two general classes are recognized; those varieties of upright form known as bunch varieties, and those with low, widely spreading vines known as running varieties or trailers. The cowpea is readily influenced by environment; some varieties which grow upright on a thin soil, will, when placed on rich land have a strong tendency to become a rank growing trailer. Also, the amount of moisture and earliness of planting will often cause variation in the form of the plant. Yet these varietal differences are such as to have an important bearing upon the selection of varieties to be grown for various purposes. The failure to select the proper variety or to understand the conditions under which the plant may vary is often the cause for unsatisfactory results to the grower. The best variety to sow depends upon the purpose for which the crop is to be grown and upon the soil. If hay is sought, it is desirable to select a variety of upright growth, uniform maturing habit, that will hold its leaves well and bears a good proportion of seed. The fineness or coarseness of stems and number of leaves should also be given consideration. A variety that has a tendency to blossom until late in the season after some of the pods are fully matured, or a variety that is subject to excessive after-growth following a period of wet weather, should not be selected for hay. Much of the difficulty in curing hay arises from the fact that the vines are not well matured or have put out an after-growth.

The variety selected for pasture should vine moderately, grow late into the fall, and produce pods in abundance. Where the crop is to be hogged down less attention need be paid to the foliage, but a prolific seed bearer should be chosen as the peas are the richest part of the plant. For grazing purposes

the variety selected should hold its leaves well into season. When the prime object is green manuring for soil improvement, the variety that will produce the largest amount of vines is desirable.

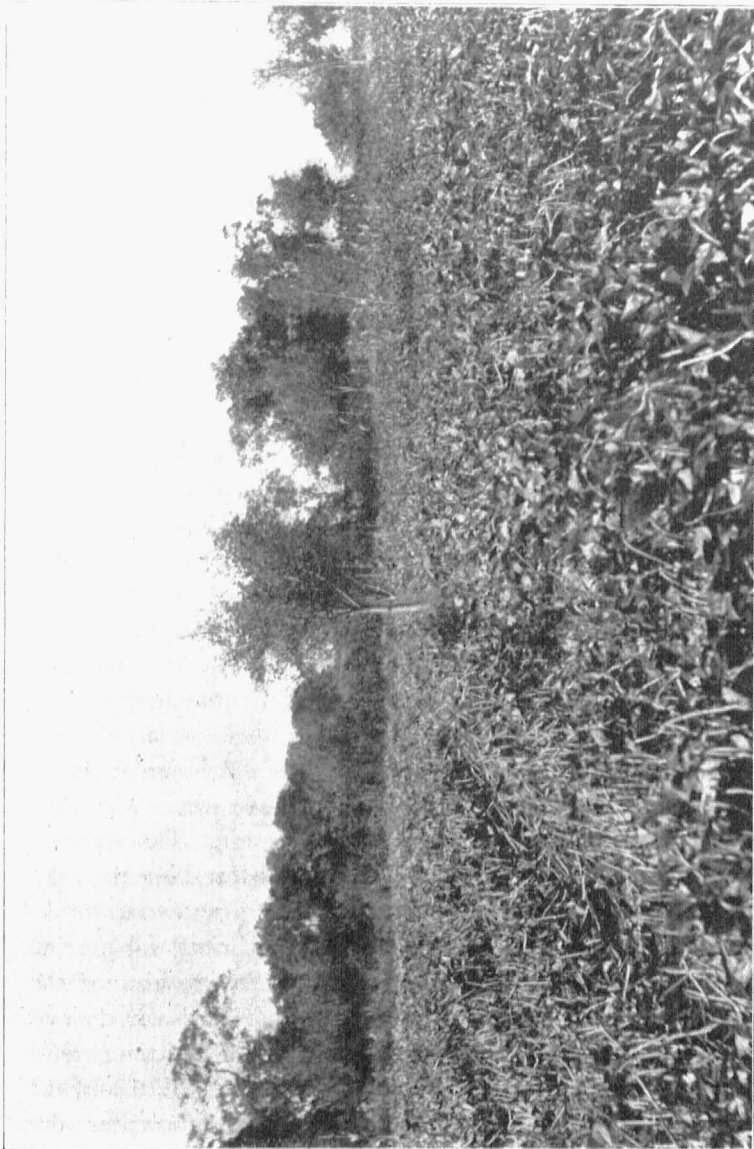
Variety Tests of the Station. For nearly twenty years the Experiment Station has been growing cowpeas and the crop has produced the most satisfactory results when varieties have been selected for the purpose in view. During the past three years the Station has tested 15 varieties of cowpeas to determine with reference to the yield of hay and seed and to study the characteristics of the plant for general adaptability. The following table gives yield of seed for the season of 1906 and yields of hay for 1905 and 1906. The hay plots were sown with a wheat drill at rate of 5 pecks per acre. The seed gathered was

YIELDS OF HAY AND SEED-VARIETY TEST.

Variety	Hay Yield per acre 1906	Seed bu. per acre 1906	Hay Yield per acre 1905	Character of vine.
Whippoorwill	3720	14.0	3550	upright
California Blackeye	4880	12.5	3900	spreading
New Era	3660	14.0	3400	upright
Black	4420	18.6	2550	spreading
Michigan Favorite	3350	11.4	3150	spreading
Warren's Extra Early	3660	11.8	2900	spreading
Groite	3550	14.8	4800	upright
Early Boolock	4570.	9.1	4200	upright
Warren's New Hybrid	3360	6.8	2400	spreading
Black Early	3200	18.3	3450	spreading
Iron	3350	17.5	2550	upright
Red	4270	8.3	3300	spreading
Extra Early Blackeye	3050	10.6	3200	spreading
Blackeye	3290	14.8	4500	spreading
Clay	3660	14.4	4800	spreading

taken from rows cultivated at the side of each of the plots of the respective varieties. These rows were planted 44 inches apart and the plants thinned to 10 inches apart in the row. Had the rows been closer together it is probable that more seed would have been produced. The varieties were planted June 12th and had equal conditions of soil, moisture and cultivation so that the differences shown are due to the variety planted. It will be seen from the table that several varieties produced more hay than the Whippoorwill or New Era which are most generally grown in this State. The two standard varieties were also excelled by the Black, Early Black and Iron in yield of seed. However, they were surpassed by but one variety in yield of both hay and seed, the Black. The table also shows that some of the heaviest yielding varieties of hay produced the smallest amount of seed, for example, the Red, Early Boolock, and the California Black-eye. Other varieties gave a fairly low yield of hay and a considerable yield of seed as the Blackeye, Iron, and Groite. It will be found generally that there is more or less of a constant relation between yield of hay and the production of seed. The heaviest vining varieties as the Red grow late into the fall a light crop of seed while the more medium vining varieties mature earlier and produce the maximum amount of both hay and seed. Very early maturing varieties as the Warren's New Hybrid do not in all cases produce seed heavily, but it will be noted from the table that those varieties which mature in from 65 to 80 days produce the greatest yield of seed.

The yields of hay for 1905 do not show the same relation in all cases with the crop of 1906, but as the season that year was quite wet during the time of maturity many of the varieties were so low on the ground that it was with difficulty that the entire crop was harvested. As has been stated above a variation in season will often cause quite a variation in the yield of hay.



VARIETY TEST OF COWPEAS, MISSOURI EXPERIMENT STATION. ROWS ON LEFT SHOW VARIETIES WITH TENDENCY
TOWARD HEAVY SEED PRODUCTION. *

As a result of inquiry among farmers in all sections of the State it was found that 65 per cent of the cowpea growers use the Whippoorwill. Next in order are the New Era, Black, Clay, and Red.

The varieties tested at the Station may be classed as regards maturity as follows: Early: Michigan Favorite, Warren's New Hybrid, Warren's Extra Early, Groite, Extra Early Blackeye and New Era. Medium: Early Black, Whippoorwill, Early Boolock, Iron, California Blackeye and Black. Late: Red and Clay.

The Whippoorwill seems to be best adapted for general farming purposes as it produces a good yield of vines and seed and is early maturing enough to meet average conditions. For a short growing period or as a catch crop after wheat or oats the New Era variety is best. A moderate vining or bunch variety should be chosen for a rich soil as they will not produce an excessive amount of vine and grow so late in the season. If the object is pasture or soil improvement on a thin soil, better results will be had from a variety that tends to trail considerably, as the Clay. The natural habit of the vine to grow rank is somewhat checked and a better crop results than if a bunch variety were used.

For seed production, an upright, prolific bearing, early and uniformly maturing variety should be sown. The New Era is one of the best for the general grower. The peas are rather small and are less readily split by threshing than the larger sized peas of other varieties.

During the past year, 1906, an experiment was carried on with varieties of cowpeas to determine something of the yielding capacity of the individual plants of each variety and at the same time get an idea of the prolificacy of the several varieties. In June, 50 hills, one seed in a hill, 18 by 18 inches apart, of each of the different varieties of cowpeas were planted in a block. These plants were given the same treatment throughout the summer and the seed from each plant

was harvested and weighed separately. In the table below is given in the first column the average weight in grams of the ten best yielding plants. The second column shows the average yield of the whole number of plants in each block:

YIELDS OF INDIVIDUAL COWPEA PLANTS OF DIFFERENT VARIETIES.

Variety	Average yield of the ten best yielding plants in grams.	Average yield of all plants of each variety in grams.	Number of peas in an ounce.	No. of days required for maturity.
New Era	31.3	24.2	172	62
Extra Early Blackeye	71.5	49.1	101	66
Early Black	56.5	43.6	148	71
Black	51.0	38.5	100	80
Groite	72.4	59.8	184	64
Iron	68.6	53.3	180	72
Whippoorwill	55.5	43.7	142	75
California Blackeye	74.5	56.1	116	72
Clay	60.1	31.1	194	95
Warren's Extra Early	37.2	23.1	114	65
Warren's New Hybrid	35.0	25.1	208	60
Early Boolock	35.5	25.9	191	73
Red	29.6	18.8	143	100
Michigan Favorite	48.4	43.1	139	66

A similar relation exists in most cases between the yields of the individual plants and the yield of the varieties grown under field conditions. There are some exceptions as in the case of New Era variety which falls next to the lowest yield, with the Red as the lowest and the California Blackeye the highest. It is difficult to determine whether or not the New Era and Groite are the same variety as in habit of growth, form of vine and color of seed are nearly identical in the two varieties. The highest yielding variety produced peas at the rate of 51 bushels per acre, the lowest at rate of 20 bushels per acre.

In the third column will be noted the number of peas of each variety required to make an ounce. The variation in size of peas ranges from 100 to 208 per ounce. This difference in size should be taken into account when sowing seed of various varieties. It is possible to sow a field at a less cost for seed if some of the varieties producing small peas are sown. Thus it will require only about one-half as much seed to sow an acre of the New Era as of the Blackeye.

CULTURAL METHODS FOR COWPEAS.

Preparation of Soil. The seed bed for cowpeas should receive as thorough preparation as for corn. To insure prompt and uniform germination it is necessary to provide a warm, moist, mellow soil. When peas are planted late in season as a catch crop after wheat and oats it is essential to break the land again. This must be done to get the soil in proper condition for prompt germination and to retain the moisture. Stubble land is sometimes disked but unless the soil is loose and moist the peas will not make a good stand. This practice cannot be recommended. A perfect stand is especially desirable where the peas are not to be cultivated as weeds will interfere if the ground is not well covered. Cowpeas respond as generously to good treatment as do other crops and it will be found to pay to put the soil in a good condition of tilth before sowing. In case the land is plowed after wheat or oats a second plowing is not necessary or advisable before fall sowing to wheat. In fact, soil from which has been removed a crop of cowpeas is in as nearly perfect condition as it is possible to make it for seeding to wheat, to alfalfa or to grass.

Planting and Cultivation. The method of planting peas will depend upon whether they are to be cultivated or not. Where cultivation is intended they may be planted in rows varying in width from 20 to 44 inches. A common practice among farmers, and a method we have used successfully at

the Station, is to seed with an ordinary corn-planter with drill attachment straddling each alternate row and this making the rows 22 inches apart. The field is drilled as for corn placing the peas 6 to 10 inches apart in the row at a depth of about two inches or at a depth sufficient to insure plenty of moisture. This method of planting requires about 6 to 8 quarts of peas per acre so that a bushel planted in this manner will sow as much as four or five bushels broad-cast. However, the saving in cost of seed is about equalled by the cost of the subsequent cultivation. Where a corn planter is not accessible an ordinary two-horse wheat drill may be used by plugging up all the holes except each third one.

Under proper soil conditions peas will come up quickly and cultivation may begin early. The plants are very tender when they first appear above ground and are broken easily so that care must be exercised in working among them. At this time neither harrow nor weeder should be used as they will seriously injure the plants. A weeder may be used after the plants have formed several leaves. It sometimes happens that ground planted to peas is packed by heavy rains immediately after planting. In such a case a harrow should be used to break the crust so that the peas may come through easier and better. Unless the peas have germinated and are very near the surface little damage can come from harrowing. The ordinary implements used in corn culture will be found satisfactory in cultivating cowpeas. In fact the cultivation of peas should be essentially the same as that for corn. Two or three plowings at intervals up to time the blossoms appear will usually be sufficient. Little good is done by cultivating after the plants have begun to vine. Late cultivation will cause peas to vine more and mature later. The soil should not be stirred while the plants are wet with dew or rain as the leaves are then readily broken off and it appears that soiling the foilage encourages the development of a leaf disease.

Another method of planting is with the two-horse 8-hoed



NEW ERA COMPENS 44 DAYS AFTER PLANTING. MISSOURI EXPERIMENT STATION, COLUMBIA, MO.

wheat drill, sowing exactly as for wheat at the rate of 4 to 5 pecks per acre. The advantage of sowing with wheat drill is that cultivation is not necessary. If the ground is in good condition the peas will come up uniformly and vigorously and the weeds will be choked out completely. This method of sowing is generally practiced after wheat and oats, and if the soil is well prepared will insure a good crop. Peas sown in this manner will make a hay not so coarse as that from cultivated peas. Further, the land is left more compact and level so that the crop is easier to cut and less dirt is raked up with the hay. Cultivated peas generally make a better yield of hay, set more peas, and is the more profitable method of sowing where the area of the crop is limited and where the peas are sown as a main crop for the summer. But where a large acreage is sown, or where the peas are used as a catch crop, non-cultivated peas are grown to the best advantage.

When peas are sown in corn at last cultivation they may be put in with a one-horse wheat drill two or three rows in each corn row. Or, they may be broadcasted by hand and plowed in. Broadcasting by hand in the open ground cannot be recommended. As a result of testing different methods of sowing, the Station has found that peas broadcasted by hand and harrowed in, seeded at the rate of one and one-half bushels per acre failed to produce a crop worth cutting. Adjacent plots sown with wheat drill produced nearly two tons of cured hay per acre. Where sown broadcast the lack of uniform depth of covering and the consequent poor stand allowed the weeds to outgrow the peas.

A test made by the Station during 1906 to determine the best rate of planting and to compare the yield from cultivated and uncultivated peas is reported as follows:

YIELD FROM CULTIVATED AND NON-CULTIVATED PEAS.

	Hay lbs.
Plot 1 1½ bu. per acre, drilled, not cultivated	3480
Plot 2 1 bu. per acre, drilled, not cultivated	3340
Plot 3 ½ bu. per acre, drilled, not cultivated	2880
Plot 4 1½ bu., broadcasted by hand, harrowed in . .	no crop
Plot 5 1 pk. per A., rows, 18 inches apart, cultivated.	3100
Plot 6 ½ pk. per A., rows, 35 inches apart, cultivated	1910

From the above test it seems that one bushel of seed per acre is the most economical quantity of seed to sow per acre especially when seed is high. The difference in yield of hay between one and one-half bushel rate and the one bushel would barely pay for the extra one-half bushel of seed. Experiments at other stations have also found that a moderate to liberal quantity of seed will produce the heaviest crops.

The difference in yield of cultivated and uncultivated plots seems to be clearly in favor of those not cultivated. Reports from other experiments indicate that in some cases the yield is somewhat greater with cultivated peas. The saving of seed and the slight increase in yield when peas are cultivated are generally offset fully by the expense of cultivation, so that there is but little difference in the real cost of the two methods of sowing.

For ensilage peas are sometimes planted at the same time with the corn. When the corn is at the proper stage of maturity for silage the peas have made sufficient growth almost to envelop the corn stalks. The entire crop, peas and corn, is then cut and stored in the silo. This practice is to be recommended only for the southern third of the State. North of this it will hardly prove profitable, except on very thin land or where the corn does not shade the ground too much. Peas for silage may be grown separately from the corn and the silo filled with alternate layers of peas and

corn. Peas alone do not make first class silage. Another method of utilizing corn and peas planted together is to pasture the peas and stalks after the corn is husked, or to cut both corn and peas and place in shock for winter feeding.

Time of Planting. The time of planting will depend upon the purpose for which the crop is grown. If the peas are intended for a main crop on the land to take the place of corn or oats, they should be planted not earlier than two weeks after the usual corn-planting time. However, they may be sown as late as the middle of July in central Missouri and then mature. Early planting of peas causes a heavy growth of vine with an increased tendency for the vines to run, and in some cases the yield of seed is considerably lessened. Rather late sowing tends to promote seed production and lessen the growth of vine.

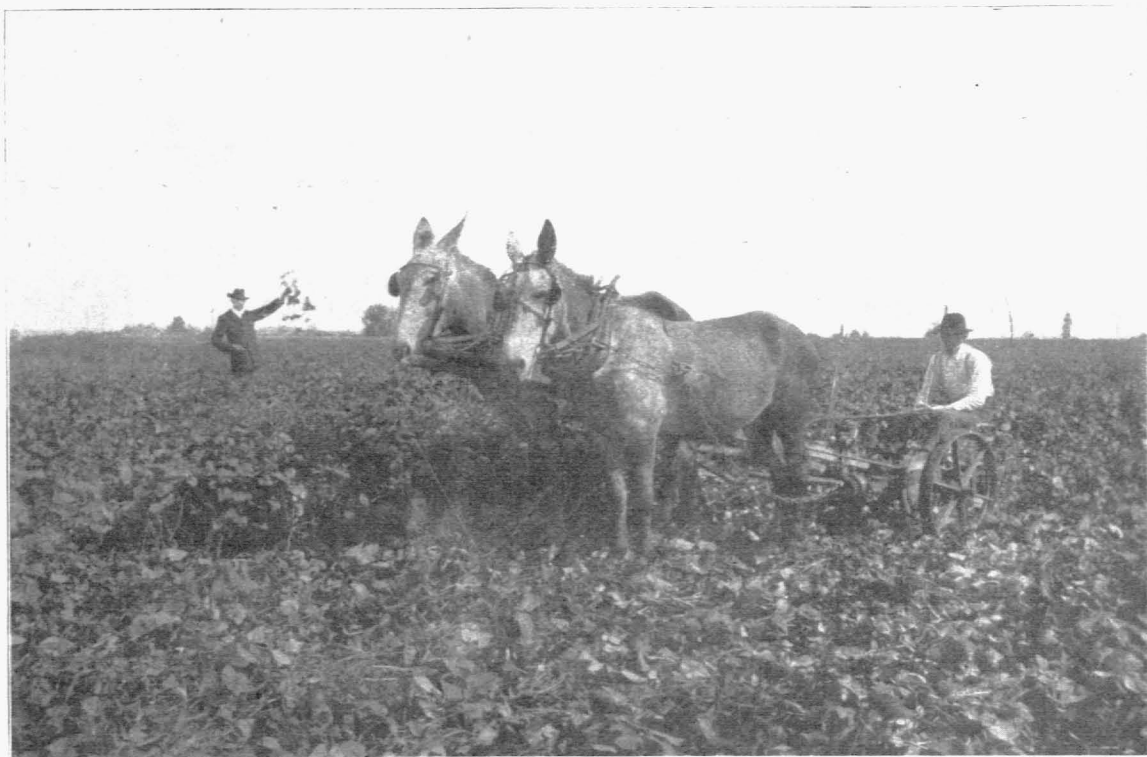
Care should be taken to have the ground thoroughly warm before planting. Peas are very sensitive to cold, wet soils and the seed will rot very readily when sown under those conditions. A short period of cool weather immediately after sowing will often seriously interfere with the growth of the plants. When peas are to follow wheat and oats they should be sown at the earliest possible moment after the crop is cut. This practice necessitates the stacking of the grain or very early threshing from the shock. Yet time and effort spent in stacking the grain is not wholly lost as the labor of threshing is thereby lessened.

HARVESTING AND CURING COWPEA HAY.

The methods employed in the harvesting and curing of cowpea hay are not unlike those practised with red clover and alfalfa. The readiness with which cowpea hay is cured depends largely upon the maturity of the vine and upon its habit of growth. Both harvesting and curing are greatly facilitated by the use of varieties upright in growth and of uniform maturing habit. The ordinary mowing machine will

readily cut and save the entire plant if of upright growth, and for the reason that vines of this character do not lie so closely together is of advantage in curing. Vines that bear a large percentage of pods are cured with less difficulty than those of excessive growth. The length of time required for curing will depend upon the maturity of the vines, thickness of planting, rankness of growth, and upon the weather. If the vines are ripe as indicated by the color of the leaves the hay can usually be cured in about 48 hours under favorable weather conditions. If the vines are green and in vigorous growth when cut they may not cure at all, especially if the crop is very heavy. The greener the vines the greater the liability from loss during bad weather. Some varieties of peas when nearly matured tend to produce an after-growth of vine following a period of wet weather. This is a serious drawback in curing for hay. But when vines are well matured when mown and are well cocked after lying a day or two they will endure several days of rainy weather.

Cowpeas should be cut when the pods are full-grown and when a considerable number of them have turned yellow. At this stage none of the leaves have dropped and the plant has practically attained its growth. Begin cutting in the morning as soon as the dew is off, if indications are favorable for a number of fair days. Leave in the swath until the exposed portion is well cured, but not dry enough to crumble and break. The vines should then be teddered, or, if a tedder is not available rake into small windrows. Always be careful to use the tedder early in the morning when the dry leaves are "incase" so as to avoid breaking them off by the teddering process. When the upper side is well-dried the windrows should be turned over. Where the hay is heavy a tedder should immediately follow the mower. This practice insures uniform drying and if the vines are handled before the leaves are dry enough to break no loss will occur. The hay should be thrown into cocks at this stage, preferably cocks made as high and



CUTTING COWPEAS IN MISSISSIPPI COUNTY SOWN ON WHEAT STUBBLE JULY 10th. CUT SEPTEMBER 20th. PEAS. $2\frac{1}{2}$ TO $3\frac{1}{2}$ FEET HIGH. FARM OF C. J. MOORE, CHARLESTON, MO.

narrow as will stand well, in order to admit circulation of air. Time may be saved if the windrows are bunched just before cocking. If the peas are well matured and the ground dry, they may be raked as soon as well wilted and not turned, but cocked at once. If the part of the cocks nearest the ground is slow to dry they may be turned over to the north a few hours before hauling begins so that the under portion may be exposed to the sun and the process of curing hastened. Cocking need not be resorted to if there is favorable weather, but in any case this method of curing will be found to produce a sweeter, brighter hay than when left to scorch in the sun. Care must be taken that the hay does not become too dry before handling as much of the best feeding value of cowpea hay is lost when the leaves are lacking. When cured the pea hay may be placed under roof or in the stack. The latter method is not desirable, unless grass, straw or timothy be used for topping out the stack or rick.

Cowpeas are difficult to cure if not properly managed, but with strict attention to maturity of the plant and to weather conditions little more trouble will be experienced in making cowpea hay than red clover hay. The weather conditions for September are generally more favorable than June for hay making. In the fall the ground is warmer and contains less moisture than in the spring. The following table was compiled from the data of the U. S. Weather Bureau at Columbia and shows the monthly conditions which affect hay making. The data represent the average for 11 years, 1893-1904.

COMPARISON OF JUNE AND SEPTEMBER WEATHER CONDITIONS FOR MAKING HAY.

	June	July	Aug.	Sept.
Monthly Temperature	73.2	77.1	76.5	69.3
Precipitation—_inches	4.93	3.69	3.14	3.66
Days with rain	15.1	12.7	12.7	11.1
Clear days	7.1	12.6	13.0	13.7
Cloudy days	9.7	8.2	6.2	6.6
Days partly cloudy	13.2	10.2	11.8	9.7
Maximum Temperature	93°	98°	99°	96°
Days above 90° F	6.1	12.7	14.0	7.8
Wind movement, miles	4637	4450	4378	4869

It will be seen from the above that the monthly temperature is a little higher for June than for September, but the rainfall for the former month is 4.93 inches and for the latter month 3.66 inches. There are 15.1 rainy days in June as compared with 11.1 days in September. In June there are 7.1 clear days while in September there are 13.7. For June there are 9.7 cloudy days, for September 8.6; for June 13.2 partly cloudy days against 9.7 days in September. The maximum temperature for June is 93 degrees Fahr. as compared with 96 degrees for September, and there are 6.1 days in the former month when the temperature is above 90 degrees while September has 7.8 days. The aggregate wind movement for the month of June is 4637 miles; for September 4869 miles. All except one of the above conditions favor September above June for making hay. There is less rain, more clear days, a higher maximum temperature and more wind for September than for June.

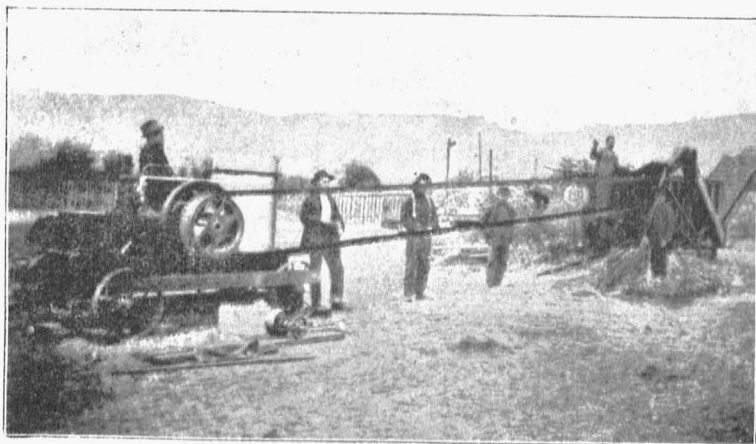
Cowpeas for Seed. All varieties of cowpeas are not well adapted for seed production. Those varieties that are late maturing, heavy vining, lying close to the ground, that are shy bearers and do not mature their pods uniformly should

not be selected for this purpose. Trailing vines leave so many of the pods so near the ground that during wet weather they are rotted. The upright sorts are better suited for seed as they hold their pods well above ground, mature uniformly, and may be cut readily with the ordinary mower.

Cultivated peas will produce more grain than those not tilled but there is some expense in the labor of cultivating. Where sown with the wheat drill the yield of seed is fairly satisfactory, generally ranging from 8 to 12 bushels per acre. Cowpeas intended for seed should not be cut until most of the pods are yellow or at a riper stage than is recommended for hay. Care should be taken not to allow the pods to become too dry before cutting as they will shatter easily. The machine ordinarily used for cutting in this State is the mower. While a few pods are occasionally cut yet this method is fairly satisfactory. The bean harvester made especially for the purpose of cutting beans will work well with cowpeas when planted in rows. It cuts the vines beneath the surface and thus avoids cutting the pods. After cutting, the vines soon dry so that they may be taken direct from the windrow to the thresher or stacked temporarily and threshed later. In southeast Missouri where many thousand acres are planted for seed the vines are cut with a mower and threshed from the windrow or stack. The threshed pea straw passes directly from the separator into a baler and is baled as other hay. It is claimed that vines because of the shredding make better hay than they would otherwise. On the small farm or where peas are grown on a smaller scale it has been the practice to pick the pods by hand and flail out the peas—a process both slow and expensive. Sometimes the whole vines are put through a wheat separator with blank concaves and run at a low speed. This method is not satisfactory as it splits a considerable percent of the peas. Split peas will not grow. The best results are secured with a machine made especially for the purpose. Such machines are now on the market and are

in use where peas are grown in sufficient quantities to warrant a thresherman to invest. These threshers are so constructed and geared that the peas pass two cylinders several feet apart instead of one cylinder and are run at reduced speed while the cleaning and elevating parts of the machine run at usual thresher speed. This type of machine is said to do perfect hulling and to split none of the peas.

One of the drawbacks to the growing of cowpeas is the high price of seed, due largely to the lack of machinery with which to handle the small crop. When the farmer can raise



A PEA THRESHING OUTFIT AT WORK.*

his own seed and have some to sell, peas will command a more moderate price. With the proper cultivation one acre can be made to produce 20 to 25 bushels of peas, so that the difficulty of securing seed lies in the threshing. A pea huller is now made on a small scale which will thresh peas readily

*Courtesy of the J. L. Owens Manufacturing Co., Minneapolis, Minn.

from the vine and can be run with 5 to 6 horse power. Such a machine might be owned by a half dozen farmers in a neighborhood and the peas threshed on a co-operative plan. Other machines of smaller type are made to thresh peas from the pod. Ordinary wheat separators are now manufactured provided with a pea hulling attachment which, it is claimed, does satisfactory work. This apparatus can be added to the separator at an additional cost of 30 to 40 dollars. In this way the same machine may be used for threshing either wheat or peas.

The yield of seed varies from 8 to 20 bushels per acre depending on the variety, soil, and season to some extent, and methods of growing. The average yield of the State for 1905 as reported by the Missouri State Board of Agriculture is 10.5 bushels per acre, while reports from farmers in various parts of the State gave an average of 14 bushels. In southern Missouri peas are extensively grown for seed and hay and are a profitable crop. There are doubtless considerable areas of the State where cowpeas can be made a very paying crop for seed.

COWPEAS AS AN AID IN THE PREPARATION OF SEED-BEDS.

On account of their habits of growth and effect on the fertility and physical condition of the soil cowpeas are admirably adapted to precede those crops which require a finely prepared seed-bed. Alfalfa, clover and the grasses should be sown on soil that is in good tilth and free from weeds in order to insure a good stand. The growing of cowpeas prepares the land by smothering out all weeds and by putting the soil in better mechanical condition. Many of the failures in securing a stand of alfalfa and red clover are due to poorly prepared land. Cowpeas are often called a smother crop from the ease with which they suppress other vegetation. The

deep-rooting system of the plant together with the dense shade afforded keeps the ground open and moist so that little labor is required to put such land in condition for seeding. Land intended for alfalfa may be put in good condition at little cost by following wheat or oats with cowpeas, taking off the peas about the first of September and thoroughly pulverizing the ground with a harrow or disc. The grain crop has germinated most of the weed seeds while the cowpeas following destroyed those which attempted to grow later. Soil thus treated will be found to be loose and moist and yet compact enough to insure prompt and uniform growth of the young alfalfa, grass or wheat plants. The increased amount of nitrogen in the soil gathered by the peas is likewise of great advantage in stimulating the early growth of the plants. Truck-gardeners and fruit growers have found cowpeas of great value in regulating soil conditions for setting out vegetable and small fruit plants.

An Ozark county farmer says: "I find that I can get my hogs on the market, turn under the vines, sow to wheat and make about twice the yield per acre and get a stand of clover and timothy without any trouble."

A Dent county farmer writes: "Where timothy was sown on pea land and on adjoining land without peas, the next harvest one could see just how far the pea ground reached as the hay was much heavier."

A St. Francois county farmer reports: "I find cowpeas a great help to the soil and that it is much easier to get a stand of grass sown after peas than in any other way."

A Johnson county farmer relates: "Sowed clover on cowpea land in 1906 and secured a good stand, and on adjoining land not in peas, a very poor stand."

A Stoddard county farmer writes: "I am always sure of a stand of grass or clover after peas."

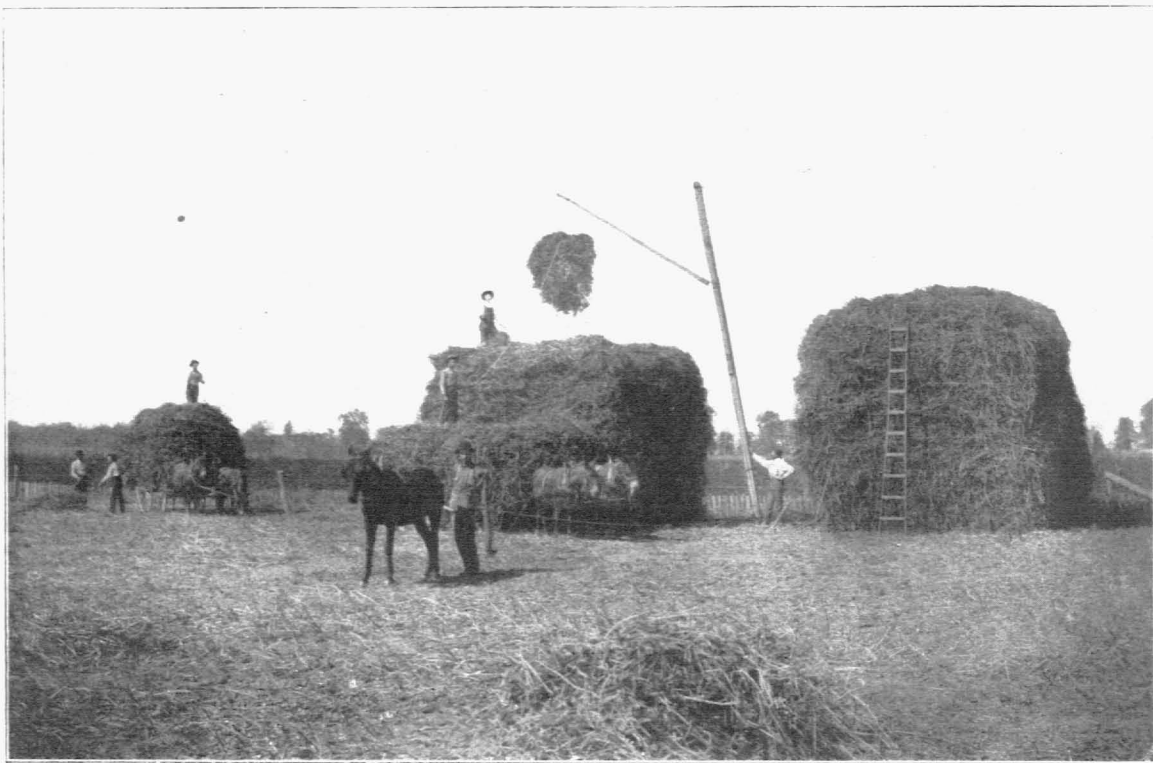
COWPEA SEED IN STORAGE.

Cowpeas are often damaged in storage by weevil. This insect deposits its eggs in the peas in the field while the plant is yet green. Later when the peas are threshed and are stored under suitable conditions of temperature for a time, the eggs hatch, and the larvae feed within the pea until the insect reaches maturity when it escapes leaving a small round opening in the grain. The adult weevil now proceeds to lay eggs among the stored seeds and the process is repeated.

A preventive is so readily obtained that no grower should lose a large amount of seed by this insect. While it is not possible to treat the seed so as to prevent the hatching of the eggs within the pea, yet further loss than that caused by the weevil already in the grain can be avoided by storing the peas in a close bin as nearly air-tight at sides and bottom as possible, and placing a dish of carbon bi-sulphide on top of the seed. The carbon bi-sulphide evaporates rapidly and the fumes of the gas being heavier than air sink into the mass of seed and destroy the newly hatched weevil. The peas should be treated at frequent intervals, especially if stored in a warm room, and during summer weather to insure prompt destruction of any insects which may hatch after the first treatment. Weevil do not multiply or work during cold weather.

Carbon bi-sulphide costs about 20 or 30 cents a pound and that quantity is sufficient to treat effectively 500 cubic feet of space. It must be remembered that the gas will diffuse equally throughout the space of the bin and that the quantity of the solution used must be regulated by the size and tightness of the bin in which the peas are stored. There is no danger from over treatment.

As the liquid and gas are very inflammable all fire should be kept away from it. Smoking should not be allowed near. Seed properly stored and kept free from weevil will retain its vitality 3 or 4 years.



STACKING COWPEAS ON FARM OF J. R. WILSON, MALDEN, DUNKLIN COUNTY. SOWN JUNE 15th AND STACKED SEPTEMBER 1st. RICKS 16X16X28 FEET. TWO RICKS ON 10 ACRES.

VALUE OF THE COWPEA CROP.

By intelligent management cowpeas can be made one of the most profitable crops grown on the farm. It will be noted from the table that cowpeas have a cash value that compares well with that received from other crops. Cowpeas as well as other forage should be fed on the farm to save fertility and the figures are quoted here simply to give an idea of the value of the crop as compared with those more generally grown. The data are taken from the reports of the State Board of Agriculture for the past five years, 1902-1906, with the exception that figures relating to cowpeas were in addition compiled from information furnished by farmers to the Station:

YIELDS AND VALUES OF MISSOURI FARM CROPS.

	Bu. per acre.	Price per bu. Dec. 1st.	Value per acre.
Corn	32.6	\$.35	\$11.41
Wheat	13.8	.65	8.97
Oats	24.9	.32	7.96
Hay—Tons	1.2	7.01	8.41
Cowpea hay—Tons	1.6	8.00	12.80
Cowpea Seed—bushels	11.	1.25	13.75
Threshed Hay—Tons	1.25	4.00	5.00

The above table shows that cowpeas are worth more than the average crop of corn, and where the peas are threshed the value of the seed and shredded straw amounts to \$18.75 or twice as much as wheat, oats or hay. This does not include the improvement of the soil by the growing of peas.

SUMMARY OF PRACTICAL EXPERIENCE WITH COWPEAS IN
MISSOURI.

During the summer of 1906 a number of questions regarding the culture of cowpeas were sent to farmers in every section of the State. To ascertain who had recently grown or were growing peas a request was first sent to two or three farmers in each county asking for the names of cowpea growers. In many cases it was difficult to secure names as the crop was almost unheard of in certain districts. However, reports were finally received from 87 of the 114 counties.

These inquiries, among others, related to the method of sowing, cultivation, yield per acre, varieties grown, and to a comparison of cowpeas with red clover for feeding purposes and for soil improvement. A summary of the answers follows:

1. *How long have you grown cowpeas?*

The average of 365 replies was—6.8 years. This did not include those who had grown the crop but one year.

2. *What area have you in the crop this year?*

The largest acreage was 3000 in Scott county. Nine men reported 100 acres and above. Thirteen farmers had from 40 to 100 acres. The remaining number, 158, who answered this question had an average of 12 acres.

3. *Is your soil rich, medium or poor? Upland, prairie or bottom?*

Every kind of soil had been used for peas but the greater per cent was upland soil of medium fertility.

Those sowing on rich land 18; upland 137.

Those sowing on medium land 184; prairie 44.

Those sowing on poor land 43; bottom 60.

4. *What is your main object in sowing peas—hay, pasture, or soil improvement?*

Soil improvement was the main object in 175 cases.

Hay was the main object in 154 cases.

Pasture was the main object in 71 cases.

5. *How much seed do you sow per acre?*

Average 9-10 bushels per acre. Range 1-4 to 1 and 3-4 bushel per acre.

6. *Do you sow with a grain drill or broad-cast?*

Replied 164—Broadcast 50; Drill 99; Corn-planter 15

7. *What is your average yield of hay per acre?*

Average 1.6 tons. Range from 1 to 4 tons per acre.

8. *What success have you had in sowing cowpeas after wheat or oats and taking off the peas and sowing to wheat the same fall?*

Number tried method 83

Number replies "good" 75

Number replies "fair" 8

Replies "good" 90 per cent.

9. *Do you find that cowpeas have increased the productivity of your soil?*

Number of replies 230

Number of replies "Yes" 226

Number of replies "No" 4

Unable to answer 2

Number of replies satisfactory 99 per cent.

10. *What is your average yield of seed per acre?*

Average—14.1 bushels.

11. *Have you tried sowing cowpeas in corn at last cultivation and do you consider the method successful?*

Number tried	150
Replies "successful"	125
Replies "fair"	8
Number replies "unsuccessful".....	17
Replies "successful"	89 per cent.

12. *What varieties do you consider best for hay or seed?*
Varieties preferred:

Whippoorwill	198.....	65 per cent.
Clay	37.....	10 per cent.
New Era	29.....	9 per cent.
Black	29.....	7 per cent.
Red	16.....	5 per cent.

13. *Is there a market for cowpea hay in your locality?*

Number of replies	164
A market for hay	99
No market	65
Hay market	60 per cent.
Average value as quoted, unsolicited, was \$9.40 per ton.	

14. *What experience have you had in pasturing cattle, sheep and hogs.*

Number of replies	130
Reports "excellent"	127
Reports "fair"	2
Reports "unprofitable"	1
Report a profitable method	99 per cent.

15. *What is your opinion of cowpea hay as compared with red clover hay for feeding purposes?*

Total number of replies	186
Answer "better than clover"	96
Ans. "equal or better than clover"	77
Answer "clover better"	13
Equal or better	93 per cent.

16. *Do you have any trouble in growing clover?*

Total number of replies	210
Number answering "Yes"	142
Number answering "No"	68
Experiencing difficulty	67 1-2 per cent.

17. *How late in the summer can you sow cowpeas and have them make hay under favorable conditions?*

In the southern part of the State as in New Madrid and Scott counties, August 10th is the limit; while in the more northern part of the State as in Shelby and Lewis counties, July 20th.

18. *Do you consider cowpeas a favorable crop for your conditions?*

Total number of replies	212
Answers "Yes"	206
Answers "hardly"	1
Answers "No"	5
Favorable replies	98 per cent.

19. *In your opinion what is the main difficulty in growing cowpeas?*

Total number of replies	98
“Curing the hay”	40
“High price of seed”	25
“Weeds and grass”	13
“Drought”	11
“Baking soil”	5

20. *In your opinion how do cowpeas compare with red clover as a soil improver?*

Total number of replies	180
Answers “better”	72
Answers “equal”	82
Answers “not so good”	26
Cowpeas equal or better	85 per cent.

21. *Have you ever sown cowpeas with some other crop such as sorghum, Kaffir corn, millet, etc.?*

No. growing cowpeas with millet ...	32
No. growing cowpeas with sorghum ..	18
No. growing cowpeas with Kaffir....	9

In answer to a request for such facts and figures as the correspondent had at hand showing the possibilities of the crop and its results on the soil the following reports were received:

FROM NORTHERN MISSOURI.

Evan Davis, Chariton county: An 8 acre field of poor land that would hardly grow corn previous to 1902, and on which I grew that year a crop of cowpeas followed in 1903-1904 in red clover, made 65 bushels of corn per acre in 1905, and I think will do as well this year notwithstanding the dry weather.

R. L. Harbaugh, Clay county: In 1904 I sowed five acres in cowpeas which made eight tons of hay. I plowed the field that fall, planted in corn 1905, and gathered 250 bushels or 50 bushels per acre from it. The yield per acre before was 35 bushels.

W. R. P. Jackson, Monroe county: Except stable manure I think cowpeas the best fertilizer I ever used. I believe it will put more fat on a sheep than any other feed and do it quicker.

Byron McFarland, Monroe county: I turned under a seven week's crop of cowpeas and sorghum on thin land and sowed to wheat. The best wheat I had this year was on that piece of land.

FROM CENTRAL MISSOURI.

W. C. Harrelson, Jackson county: Hogs will fatten on cowpeas almost equal to corn.

J. H. Crawford, Moniteau county: I can plow land three to four days earlier in the spring after peas than land not in peas the previous year. It holds moisture longer and grows larger crops than similar land by its side.

S. H. Pile, Howard county: Wheat following cowpeas made twice the yield of that on similar land that did not have cowpeas and the wheat was of superior quality, so that I got an advanced price for it for seed.

A. P. Standefer, Franklin county: I believe I can get the same amount of plant food out of cowpeas in 80 days that I can get out of clover in eighteen months and not take any chances.

E. J. Albersworth, Gasconade county: Sowed cowpeas in May and pastured them in the fall with hogs. Put in corn next spring. I could see a very good result. Although the ground was better where there had been no cowpeas the year before, the corn was better by ten bushels per acre on the cow-pea land.

J. M. Ward, Johnson county: Sowed clover on cowpea land in 1906 and secured a good stand; on adjoining land not in peas, very poor stand.

W. R. Gilliland, Montgomery county: I sowed forty acres thin land to cowpeas in 1904, plowed the vines under in the fall, and planted to corn in 1905 and gathered fifty bushels per acre that fall while my neighbors did not average over twenty-five bushels.

W. M. Welch, Bates county: Cowpeas will make a ton of excellent hay to the acre and the soil is in fine condition for the next corn crop, and the yield will be five to ten bushels of corn more.

FROM SOUTHERN MISSOURI.

Thos. Hassler, Butler county: In my experience I find that a crop of cowpeas is worth as much as a crop of clover.

Wm. Mooney, Camden county: Two years ago having a field we desired to put down in meadow we sowed half to cowpeas and the other half to millet. On the part sown to peas a good stand of grass was secured, on the millet land a poor stand.

A. O. Evans, Carter county: I can raise one-third more wheat per acre after peas and I had rather feed pea-hay than red clover hay.

Herman Ganschow, Howell county: Last year I sowed twenty-four rows of corn in cowpeas. This year I have same land in corn with other land adjoining on which no peas were sown last year and I can see to a row, in the corn, where the peas were sown last year.

D. E. Ross, Greene county: In May of 1904 we sowed fifteen acres to cowpeas, using one-third of a bushel of seed per acre. In September we turned under the crop and the next spring the land was planted to corn. The crop was double what it had been for years.

Edwin P. Woods, Lawrence county: The four and one-half acres of cowpeas grown after wheat last year is this year in corn and promises a larger yield. The difference is very apparent in favor of cowpeas.

Z. P. Deal, Mississippi county: I let a piece of land that has been in corn for years lay out last year and put it in peas in the spring of 1905, then into wheat in the fall. The ground threshed this year twenty-eight bushels of wheat per acre on one hundred acres.

C. S. D. Field, Mississippi county: Last year I turned

under five acres of peas and cut one hundred and twenty-five bushels of wheat off this five acres. Before, ten and one-half bushels was the best the land had ever done.

W. L. Harper, Mississippi county: We charge no rent on cowpea land as we consider we are well paid without rent.

L. B. Presson, Mississippi county: I think cowpeas add one-fourth to the yield of corn after peas.

Henry Punke, Newton county: I think my farm is producing double now what it did nine or ten years ago and I give most of the credit to cowpeas.

Archie Sellers, Dent county: Where timothy was sown on pea land and on adjoining land without peas, the next harvest one could see just how far the pea ground reached as the hay was much heavier.

Judge E. Swink, St. Francois county: I find cowpeas a great help to the soil and that it is much easier to get a stand of grass sown after peas than in any other way.

T. F. Neill, Ozark county: I find that I can get my hogs on the market, turn the vines under, sow to wheat and make about twice the yield per acre, and get a stand of clover and timothy without any trouble.

Clem Schindler, Perry county: When cowpeas are a good crop and are pastured down with hogs and the vines left on the ground over winter, I can raise as good corn as I can on clover sod.

Emanuel Shelton, Bollinger county: Wheat and corn will almost double the yield when grown after the pea crop is taken off.

J. C. Gustin, Wayne county: We have corn on land that was in peas last year and it is good, notwithstanding the land is the poorest on the farm.

Louis Larson, Stoddard county: I am sure of a stand of clover or grass after peas.

Julius Leowe, Vernon county: When oats are sown on cowpea ground they will produce forty bushels as compared

with a yield of twenty-five bushels on similar land not grown in cowpeas.

W. B. Gregson, Dunklin county: I have made more clear money pasturing hogs and cattle on peas than anything on the farm. I also pasture my horses and mules on peas and they do well.

G. W. McIntosh, Barry county: I think for milk production cowpea hay is better than clover or any other kind of hay.

J. P. Veale, Barton county: A neighbor fattened sixty hogs from twenty acres of peas and they equalled in feeding value six hundred bushels of corn, valued at three hundred dollars in 1902.