THE growing of crops on which chinch-bugs will not feed is one of the most effective means of reducing their numbers. Chinch-bugs will not feed or increase on the following crops:

Soybeans  
Cowpeas  
Fodder Beets  
Buckwheat  
Sunflowers  
Rape
Fig. 1.—Soybeans often produce yields of as much as twenty-five bushels of seed per acre.
FIGHT THE CHINCH-BUG WITH CROPS

By W. L. Burlison, Chief in Crop Production, and W. P. Flint, State Entomologist, Illinois Natural History Survey

The chinch-bug is a grass-feeding insect; it has never been known to cause damage to any crop that does not belong to the grass family. Corn, as well as all of our small grains, belong to the grass family, and therefore is subject to chinch-bug depredation, altho some varieties are to a certain extent chinch-bug resistant. There are, however, many crops which are not grasses that can be grown profitably in sections of Illinois now infested with chinch-bugs. By means of raising these crops each farmer can independently protect himself from chinch-bug injury, for all these crops are just as free from chinch-bug injury when grown on one farm in a heavily infested area as when grown on all the farms in the community. The use of such crops will mean fewer chinch-bugs the following year because these insects will not increase on crops on which they will not feed.

There are good reasons for growing more of these crops other than grasses aside from the fact that they are chinch- bug proof. More legumes, in particular, are needed in every section of the state. They supply high-grade feeds rich in minerals and in protein, which is the most expensive food element the farmer has to purchase in dairy, hog, and cattle feeding. Moreover, they are soil builders, because of the fact that they can take nitrogen from the air, use it in their own growth, and thru their decay place it at the disposal of other crops to follow. Other crops than legumes which will escape chinch- bug damage are rape, fodder beets, sunflowers, and buckwheat.

It is the purpose of this circular to give in brief the methods of culture, rate of seeding, best varieties, and other information concerning the growing of some of the more important crops on which chinch-bugs will not feed.

SOYBEANS

The soybean has rapidly gained popularity in Illinois during the last ten years because it fits so well into systems of farming when clover fails, and because it thrives in this climate under soil conditions which either exist naturally or which the farmer can provide.

Uses.—Soybeans may serve a variety of purposes, but up to the present time the crop has been cultivated in this section of the country primarily for seed production. There is, however, an increasing demand for soybeans as an oil crop. On a more or less

Note.—This circular is a revision of Extension Circular 30 published in February, 1919.
limited scale soybeans will be found profitable as a soiling crop for cattle and sheep. As a hay crop they are satisfactory for most classes of live stock. When pastured with hogs and cattle they give profitable returns. When clover fails, soybeans may well be grown as a green manure for soil improvement. They are often planted with corn and hogged down.

When soybeans are planted with corn they afford some protection to the corn from the attack of the second-brood chinch-bugs. This protection is due to the fact that chinch-bugs avoid damp or shaded places. Where soybeans are planted at the rate of two or three to the hill, they make a dense shade around the base of the corn stalks by the latter part of July and August. Actual counts of the numbers of bugs on hills of corn with and without soybeans, made in fields in Randolph county in 1920, showed an average of 219 to the stalk on corn without soybeans and 55 to the stalk where the corn was planted with soybeans. Under a moderate infestation of chinch-bugs, a higher yield of corn may be expected from fields in which soybeans are planted. In experimental tests where chinch-bugs were numerous, increases in yield varying from 2 to 15 bushels per acre were observed, depending upon the season and the number of chinch-bugs present.

Soil and Climatic Requirements.—Soybeans are not very exacting in their requirements, but they grow best on well-drained soils containing plenty of limestone. For the successful production of soybeans, inoculation is usually necessary.

![FIG. 2.—SOYBEANS MAKE FIRST-CLASS HAY](image)
They can be pastured with hogs and to some extent with cattle. If desired, they serve well as a soiling crop.
The climatic requirements for soybeans are about the same as for corn. Altho they are not particularly sensitive to an abundance of moisture, they will not thrive where water stands for any extended length of time. They are hardy and they will resist drouth and a considerable amount of cold weather even when young, and they are still more resistant when they have advanced toward maturity. It is claimed that in the fall the leaves of some varieties will not be killed when the temperature falls as low as 27° Fahrenheit.

Soybean Varieties.—The choice of varieties is important in soybean production. The rather general use of an unadapted variety (the Mammoth Yellow) in Illinois probably did more to discourage the wider use of soybeans than all other factors combined.

A number of varieties that have been grown satisfactorily in Illinois are grouped in the following lists according to their time of maturity.

**Early Maturing Varieties:** Early Black, Black Eyebrow, Manchu, Ito San (Medium Early Yellow or Early Yellow), Early Brown

**Medium Maturing Varieties:** A. K., Midwest (Medium Yellow, Mongol, Perley Mongol, Roosevelt, or Hollybrook), Ebony (Black Beauty), Peking (Sable or Royal), Hamilton (Ohio 9035)

**Medium Late to Late Maturing Varieties:** Haberlandt, Illinois 13-19, Virginia, Wilson-Five, Lexington, Mammoth Yellow, Mammoth Black (Tarheel)

The following grouping of varieties is so arranged as to give information regarding the best varieties to use in different sections of the state for various purposes, whether for seed production, hay, pasture, or silage.

**VARIETIES RECOMMENDED FOR—**

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<th>Seed</th>
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Seeding.—The same fundamental principles observed for the growing of alfalfa or corn, including the preparation of a good seed bed, are applicable to soybeans.

It is a very common practice in Illinois to seed soybeans immediately following the planting of corn. Earl maturing varieties may be seeded as late as June 15, or even a little later. A number of instances have been reported where soybeans have been planted as late as June 20 and good results obtained.

Thirty to forty pounds of seed per acre will be found sufficient when the beans are planted in rows, provided the seed germinates well. If sown broadcast, a bushel to six pecks will be found advisable with the medium-sized bean. For some time the Illinois Experiment Station has been conducting investigations with reference to the most desirable distance at which to plant the rows of seed. The meager data thus far secured indicate that, all things considered, the seed should be sown in rows about 28 inches apart, in narrow drills 6 to 8 inches apart, or broadcast. When the plants are to be used for hay, sowing broadcast or in narrow drills may be preferable under good conditions, but where much cultivation is likely to be necessary to destroy weeds, planting in rows is usually the best practice.

The common wheat drill is satisfactory for planting soybeans. In the investigations carried on at Urbana, the seven-inch drill has given good results. It is possible to stop a part of the holes so that rows may be planted at desired distances.

Inoculation.—The first time, and preferably the first two or three times, that soybeans are grown on a field the seed should be inoculated. This may be done in any one of several ways. The more common methods are:

1. Applying a pure culture
2. Sprinkling inoculated muddy water over the seed and then stirring thoroly to make sure that every seed has been moistened. For this purpose a quart of soil obtained from a field in which soybeans have produced nodules abundantly is mixed with about a gallon of water and stirred well. After it has settled for a few minutes, the muddy water is sprinkled on the seed.
3. Sprinkling dry inoculated soil on seeds that have been slightly moistened with a solution of glue (five or six ounces of carpenter’s glue to one gallon of water)

The second method is satisfactory for Illinois conditions, except where it is necessary to use very sandy soil for inoculation purposes. In such case the glue method should be used. Care must be taken in inoculating soybeans not to get the seeds soaked; they should be just slightly moistened. If the beans are too wet, the seed coat will wrinkle or come off; and if heaped up while in this condition, the seeds will swell and cause trouble at the time of sowing.
Cultivation.—Methods of cultivating this crop are the same as those ordinarily used for corn. The weeder and rotary hoe are useful implements and may be used even when the beans are seeded broadcast or in narrow drills. Soybeans are fairly good weed fighters but they should be helped as much as possible in their struggle.

Harvesting.—When grown for hay, soybeans may be harvested successfully with the mowing machine, binder, or a regular pea harvester. When the beans are cut with the mowing machine, it is best to follow immediately with the fork and throw the cut plants aside so that when the mower comes around the field again it will not run

FIG. 3.—THIS PLANT IS WELL SUPPLIED WITH NODULES
over the swath previously cut. If the beans are of an upright variety and are not blown down, the crop can be harvested with the binder. If the plants have lodged badly, it may be necessary to put lifters on the cutter bar.

Soybeans should be cut for hay as soon as the pods are well formed. At this stage of growth the plants have not begun to lose their leaves. Later than this period many of the leaves fall and the plants become woody. The same rules which govern the making of timothy or alfalfa hay apply for soybean hay.

In cutting soybeans for seed it is safest to cut them just before there is any danger of shattering. Some varieties shatter badly and should be watched carefully for this reason.

**Threshing.**—The seed may be separated with an ordinary threshing machine with the coneaves set low and half the teeth removed. The speed of the cylinder must be reduced to about six or seven hundred revolutions a minute in order to avoid splitting the beans.

For further information on soybeans, especially with regard to varieties, the reader is referred to Circular 255 of this Station, "Growing Soybeans in Illinois."

**COWPEAS**

Cowpeas are better adapted to southern Illinois than to other parts of the state. In general, methods of cultivation for cowpeas are the same as those described above for soybeans. Cowpeas may be grown

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**Fig. 4.—Cowpeas May Completely Cover the Ground with a Dense Growth of Foliage**
in corn in the same manner as soybeans and will afford protection from chinch-bugs in the same way.

**Varieties.**—The Whippoorwill, Sable, and Clay cowpeas are desirable varieties for the chinch-bug section of Illinois.

**Cultural Methods.**—Cowpeas should be planted soon after the best date for planting corn. They usually vine too much to permit harvesting with a binder. Otherwise, methods of seeding, cultivating, harvesting, and threshing are the same for cowpeas as for soybeans. Cowpeas are cross-inoculated with bacteria from many other common legume crops, but unless the soil is known to contain the proper bacteria it is advisable to obtain soil from a field on which well-inoculated cowpeas were previously grown. Proceed according to the method outlined for soybean inoculation.

**FODDER BEETS**

Fodder beets, sometimes called mangels, can be grown in every part of the state of Illinois, for they are not very exacting as to soil requirements. Better returns, of course, are produced on the richer types of land. As a rule, corn soils are good beet soils.

**Use.**—Mangels are a very satisfactory, succulent feed for live stock, especially for dairy cows. They are cut into small pieces and fed at the rate of 20 to 50 pounds per day.

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**FIG. 5.**—**FODDER BEETS PRODUCE FROM 15 TO 35 TONS OF SUCCULENT FEED PER ACRE**
Varieties.—There are several varieties of mangels. The varietal name seems to be governed somewhat by the color and shape of the root. The Long Red, the Red Globe, and the Golden Tankard are three common varieties which are satisfactory.

Seeding.—The seed bed for this crop should be plowed deep and well prepared. Special precautions should be observed in cleaning out weeds, since the small beet plants are not especially good weed fighters. Germination is slow and the plants do not develop rapidly when young. At this time weeds are a source of great trouble.

Fodder beets are seeded about the time corn is planted. Seeding may be done somewhat earlier as well as somewhat later than the planting of corn, without danger of reducing yields. It is advisable to seed in rows from two to three feet apart. The rate of seeding varies from 5 to 10 pounds per acre. It is best to cover the seed from one-half inch to an inch in depth, never more than an inch. Beet seeders are used in sections where the acreage is extensive. Where this implement is not available, an ordinary grain drill may be used by closing the holes so as to make a distance of 28 to 36 inches between rows.

Cultivation.—The rotary weeder can be used profitably when the plants are small. After the plants are up and well developed, so that the rows can be followed with ease, the ordinary small-shoveled corn cultivator can be used advantageously.

It is best to begin thinning the plants when they have developed four leaves. In blocking out, bunches of plants should be left about every 8 to 10 inches in the row. As soon as the blocking is finished, these bunches should be thinned down to one good, strong plant in a place.

Harvesting.—Fodder beets are harvested in the following manner: The first process consists of lifting, or merely loosening, the roots. This is done by running a small furrow beside the row or by using a double-pointed plow, known as a beet lifter, the points of which pass on either side of the row. The second operation consists in pulling the beets; this is ordinarily done by hand. The roots are then topped with a sharp knife and piled, to be hauled away for feed or storage. The yield varies from 15 to 30 tons per acre.

Storing.—The beets may be stored in a pit or underground silo. Such a silo is prepared by digging a pit 4 to 6 feet deep and lining the bottom and sides with straw. The beets are placed in this pit and are heaped up above the level of the ground. They are covered first with a layer of straw and then with an 8- to 12-inch layer of the soil taken from the excavation.
BUCKWHEAT

Uses.—Buckwheat is a good weed fighter and can be used as a smother crop because it makes such a rapid growth. It is also a satisfactory green-manure crop, altho it does not possess the advantage of a legume in being able to fix atmospheric nitrogen. The grain has fair feeding value but is somewhat lower in total nutrients than are the leading cereals. The grain is used for chicken and hog feed. In the United States buckwheat cakes are considered a delicacy by many people.

Character of the Plant.—Buckwheat is an erect-growing plant. It lives one season only. A single stem is produced from each seed. The plants vary in height from two to three feet.

Climatic and Soil Requirements.—Buckwheat is sensitive to cold and is easily killed by freezing weather. Neither will this crop thrive well under high temperature. The period between blooming and maturity of the grain is the critical time in the life of the plant. If hot weather comes on during this period, the grain yield will be materially reduced.

Buckwheat does better on poor soil than almost any other crop, altho it responds to good soil and good cultivation. It is interesting to note that buckwheat will produce greater returns from acid soils than do the common corn-belt crops. Soils containing large supplies of nitrogen are not well suited to buckwheat because of the tendency of the plant to lodge.

Varieties.—Three varieties of buckwheat are grown rather extensively in the United States. These are the Japanese, the Common Gray, and the Silver Hull. Probably the Japanese is the most commonly grown of the kinds mentioned.

Seeding.—The seed bed for buckwheat is prepared in the same manner as the seed bed for most of the ordinary crops. It is best to plow in the fall or very early spring. The land should be kept clean until seeding time.

Since buckwheat is sensitive to cold it should not be planted until danger of frost or freezing weather is passed. The crop may be seeded soon after corn planting and as late as the middle of June. The time required for maturing is 80 to 85 days.

As a rule, the rate of seeding varies from 3 to 5 pecks per acre. A common method of seeding is by broadcasting and then harrowing the seed in. Where there is a drill on the farm, it should, of course be used in preference to broadcasting. It is best to plant the seed about the same depth as corn, or slightly shallower.

Harvesting and Threshing.—Harvesting should begin about the time the first seeds are mature. The binder is the best implement
for harvesting this crop. It is desirable to cut early in the morning when the dew is on, or during moist weather. Buckwheat is usually left in the shock until threshed. The common threshing machine can be adjusted for handling buckwheat by removing the concaves and substituting a smooth board. By this method the seed can be easily threshed without cracking it badly.

SUNFLOWERS

Sunflowers are deserving of wide recognition in southern Illinois, particularly as a substitute for corn in the chinch-bug infested area. This crop fits well in many rotations where corn should be omitted on account of chinch-bug damage. The sunflower seems to be subject to fewer diseases and insect pests than are most other crops grown in Illinois. About the only trouble thus far reported in Illinois is the leaf rust, which in some cases causes the loss of most of the lower leaves. It is reported in Kansas that grasshoppers cause some trouble, and in Colorado that the stands have been somewhat reduced by cutworms. Thus far in Illinois, however, there have been no reports of damage from either of these pests. Sunflowers thrive under con-

Fig. 6.—ILLINOIS IS ONE OF THE LEADING STATES IN THE PRODUCTION OF SUNFLOWERS
Note the height and general vigor of the plants.
ditions of drouth which would prevent corn from making a crop. They require less time for maturing than corn.

Yields vary greatly but sunflowers may be expected to outyield corn as a silage crop grown under similar conditions. Where corn yields 8 to 10 tons of silage per acre, sunflowers may be expected to yield 15 to 20 tons. In some instances much greater yields have been reported.

Use.—Sunflowers make excellent feed as silage. Present information as to their feeding value is not so complete as might be desired, but data available indicate that silage made from sunflowers, if put up at the proper stage of maturity, makes a fairly good substitute for corn silage, altho its feeding value is not so high. Sunflower silage is not so palatable as corn silage; however, this it not a very serious matter, inasmuch as the cows become accustomed to it.

Variety.—The Mammoth Russian sunflower is well adapted to Illinois conditions. It is practically the only variety that has been grown in the state.

Seeding.—Sunflowers are usually seeded in rows of the same width as those used for corn. The amount of seed varies from 5 pounds for rather thin seeding (plants 10 to 15 inches apart) to as much as 10 or 12 pounds for thick seeding (plants 5 to 8 inches apart). The ordinary grain drill, using the oat chutes, makes a very satisfactory implement for seeding.

Cultivation.—Sunflowers are cultivated in the same manner as corn and usually require about the same amount of cultivation. The cost of production is practically the same as that of corn.

Harvesting.—In harvesting sunflowers the corn binder is most commonly used to handle the crop. Where the plants have been seeded thin and allowed to form large heads, the crop is difficult to handle in bundles. The large heads are troublesome to put thru the silage cutter as they have a tendency to clog just ahead of the feeder rolls. Farm experience in southern Illinois has shown that when the crop is too immature the silage is likely to be watery, but that when cut as the heads are nearing full bloom and the seeds are beginning to form, the silage is in much the same condition as good corn silage.

RAPE

The value of rape as a pasture crop for hogs and sheep has become well recognized. Dwarf Essex is the principal variety grown in Illinois for hog and sheep pasture.
**Fig. 7.—Rape Produces a Large Amount of Good Succulent Pasture for Hogs and Sheep**

**Seeding.**—Rape is grown in a number of different ways, namely:

1. Sown alone in early spring or late summer on well-prepared seed bed
2. Sown as a catch crop with oats, barley, or spring rye
3. Disked in stubble after harvest
4. Seeded in corn at or after the last cultivation
   (a) Drilled between rows with one-horse drill, or—
   (b) Sown broadcast

This crop may be seeded from the time oats are sown until August. It may be seeded in rows 24 to 28 inches apart, in close-drilled rows, or broadcast. When seeded alone it is a good plan to put it in rows for cultivation. The rate of seeding per acre for the above methods is about as follows:

- Cultivated rows .............. 2½ pounds
- Close-drilled rows ............ 4 pounds
- Broadcast ..................... 5 pounds

Many prefer to seed in rows in order to reduce loss due to trampling by the stock.

The seed should not be covered more than one-half inch. When sown alone, the seed bed should be well prepared.

**Pasturing.**—When the plants are about 12 to 14 inches high, the stock may be turned on, which means that it is ready for pasture from eight to twelve weeks after sowing, depending upon weather conditions.
CHINCH-BUG RESISTANT VARIETIES OF CORN

Experimental work carried out in Illinois during the past five years has shown that several varieties of corn are resistant to attacks of the second-brood chinch-bugs during July and August. The varieties showing the highest degree of resistance are Champion White Pearl or Demoerat, Black Hawk, and Golden Beauty.

These experiments are reported in full in Bulletin 243 of this Station, "Corn Varieties for Chinch-Bug Infested Areas."

OTHER STATION PUBLICATIONS ON THE CONTROL OF CHINCH-BUGS

Bulletin 243, Corn Varieties for Chinch-Bug Infested Areas
Circular 265, Burn the Chinch-Bug
Circular 270, Chinch-Bug Barriers
Extension Circular 39, Crop Rotations to Starve the Chinch-Bug
CHINCH-BUG DAMAGE

In 1887, chinch-bugs destroyed $60,000,000 worth of crops in the Mississippi valley. The damage extended over the entire states of Illinois, Missouri, Kansas, Iowa, Wisconsin, and Indiana. At the present time there are serious infestations in Michigan, Ohio, Indiana, Missouri, Kansas, Iowa, South Dakota, Nebraska, and Illinois. Unless the bugs are checked in these areas, such an infestation threatens again to spread over the entire Mississippi valley and cause a recurrence of the losses of 1887.

Records show that $6,500,000 worth of corn, wheat, and oats were destroyed by chinch-bugs in seventeen counties in Illinois in 1914. Seventy counties in Illinois are now infested.

Chinch-bugs destroy or greatly reduce the yields of corn, barley, spring wheat, oats, millet, winter wheat, rye, broom corn, sorghum, and other grass crops.