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*Oakley Lardie*

Special Bulletin No. 129

April, 1924

# BEAN GROWING IN MICHIGAN

J. F. COX and H. R. PETTIGROVE



AGRICULTURAL EXPERIMENT STATION  
MICHIGAN AGRICULTURAL COLLEGE

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FARM CROPS SECTION

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East Lansing, Michigan

## SOME BEAN POINTERS

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### Clean Seed Will Grow Clean Beans

Plant clean, plump, viable seed.  
Cull out discolored, diseased and immature seed.

### Plow Bean Land Early

Give the seed bed time to settle.  
Prevent damage from bean maggot by early plowing.

### Fit Seed Bed Thoroughly

Firm with cultipacker or roller to break clods and to fill air spaces.  
Follow with harrow to fit surface.

### Disc and Harrow at Weekly Intervals

Kill weeds as they germinate.  
Lessen labor of later cultivation by thorough fitting.

### Fertilize for Bumper Crop

Manure and Phosphate increase yields.  
Complete fertilizers are also effective.

### Plant on Well-Warmed Seed Bed

Planting time ranges from May 25th to June 25th.  
Plant three pecks per acre in rows 28 or 32 inches apart.

### Cultivate Frequently

Cultivate shallow after thirty days to avoid root pruning.  
Do not cultivate wet plants as diseases are thus easily spread.

### Harvest as Soon as Ripe

Harvest as soon as mature to lessen risk.  
Cure in windrows or small cocks and thresh immediately, or store under roof or in well-made stacks.

# Bean Growing in Michigan

BY

J. F. COX AND H. R. PETTIGROVE.

Michigan produces approximately two-thirds of the white pea beans of the United States and is one of the leading states in the production of red kidney beans. Michigan beans are recognized as the best in quality and flavor for use as dried beans or for canning. Michigan white pea beans have long been a favorite with housewives, since they soak uniformly, cook evenly, and have a distinctive flavor. These same qualities also make Michigan beans the first choice of the cannig industry.

The consumption of beans is increasing rapidly with the development of new uses and the improvement of canning processes. Further increase in the demand for field beans can be expected from year to year, as the population increases and new uses for beans are developed.

The bean crop requires a uniform growing season, characterized by cool nights, ample rainfall, and a comparatively high humidity. The important influence of the Great Lakes on Michigan's climate largely accounts for the particular adaptation of a great part of Michigan land

Table 1.—Michigan Bean Production, 1914-1923.

V. H. Church, U. S. Agr'l Statistician.

Year .	Acreage harvested	Average yield per acre	Total production (000 omitted)	Average price December 1	Total value, (000 omitted)	Average value per acre
	Acres	Bushels.	Bushels.	Dollars	Dollars	Dollars
1914.....	490,000	11.2	5,488	2.02	11,086	22.62
1915.....	506,000	8.4	4,254	2.10	8,925	17.64
1916.....	470,000	6.6	3,102	5.15	15,975	33.99
1917.....	537,000	6.1	3,294	7.60	25,034	46.62
1918.....	543,000	9.0	4,887	5.00	24,435	45.00
1919.....	315,000	13.8	4,347	4.20	18,257	57.96
1920.....	286,000	13.0	3,718	2.50	9,295	32.50
1921.....	263,000	11.3	2,972	2.40	7,133	27.12
1922.....	458,000	10.5	4,809	3.65	17,553	38.32
1923.....	568,000	11.5	6,532	2.70	17,636	31.05
Average.....	443,600	10.1	4,340	3.73	15,533	35.28

to bean production. In southern Michigan counties, the frequently prevailing hot weather of mid-summer, which greatly favors the corn crop, prevents the suitable setting and filling of bean pods. The leading bean

producing areas of Michigan are west and south of the Saginaw Bay, the Thumb district of eastern Michigan, and the south-central part of the state.

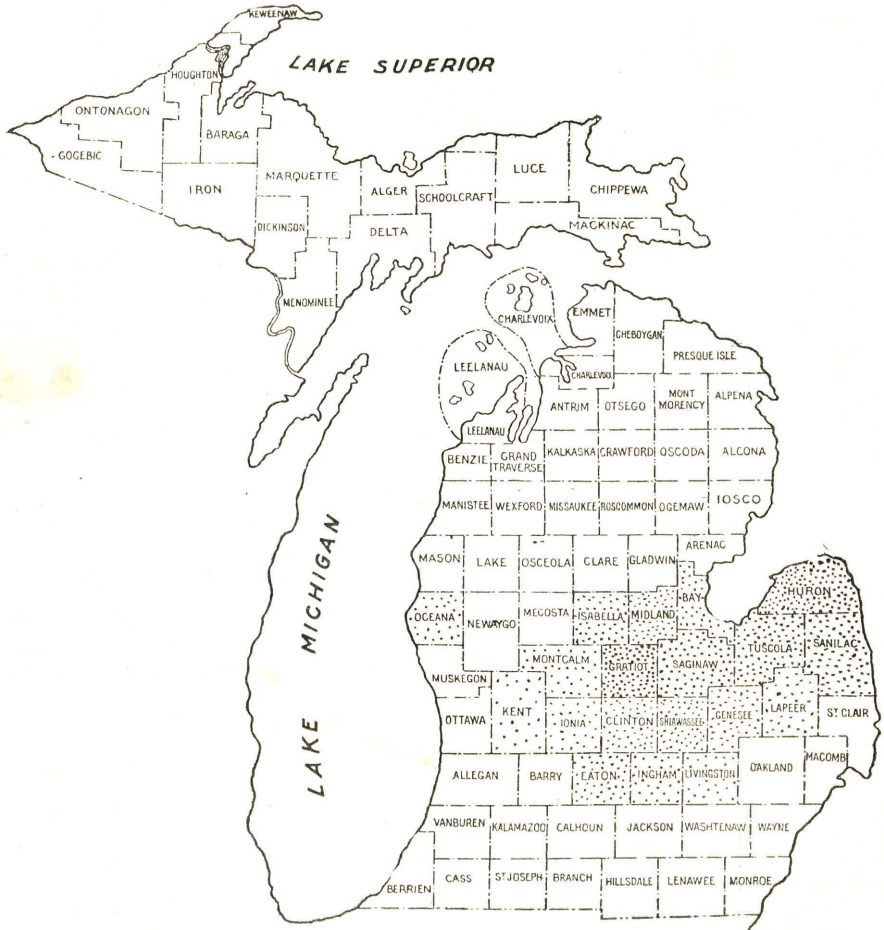


Fig. 1.—The Bean acreage in Michigan. Each dot represents 500 acres in 1923.

The best bean soils are well drained, fertile loams, silt loams and clay loams, such as those of the Saginaw Bay and Thumb districts. These are moisture retentive soils, well supplied with organic matter and the mineral elements of fertility, particularly lime. Like most leguminous crops, beans require a soil well supplied with lime. They do not do well on acid soils. Muck soils and soils very rich in organic matter tend to produce a rank growth of vine and a late maturing crop. Heavy clay soils, if not well drained, are inclined to be too late and wet for beans. Light soils are likely to be too droughty but may be improved for bean growing by applying manure and turning under green manure crops.

The profitable production of beans is limited, by a combination of climatic and soil factors, to favored areas of Michigan, other Great Lakes States, California, and limited irrigated areas in Colorado, Arizona, Utah, and Idaho.



Fig. 2.—Beans are best adapted to fertile loams, silt loams and clay loams. The crop responds to the proper use of manure and commercial fertilizer.

### LEADING COMMERCIAL BEANS

The types of commercial beans most widely grown in Michigan are the white pea bean and the red kidney bean. Of these the white pea bean is in greatest demand on the market and constitutes approximately ninety per cent of the Michigan crop. Red kidney beans make up about eight per cent of the crop and are increasing in acreage. The remainder of the crop is made up of the Brown Swedish, white kidney, Boston Yelloweye and soup beans.

The common white pea bean, or navy bean, is of American origin and was first known to white men when the territory which is now New York State was settled. The Iroquois Indians grew this small, round white pea bean with corn. This "Indian bean" rapidly became a favorite with early settlers. Later it became known as the "navy bean" because of the large demand which developed for this bean for naval and marine food supply purposes. The navy bean, when properly matured and dried, has remarkable keeping qualities. It may as appropriately be called the "army bean," since it furnishes one of the important foods of our army. Navy beans are of two types—the white pea bean, almost round in shape, and the medium pea bean, somewhat larger and more oval.

The Robust variety, a medium pea type, developed by Professor F. A. Spragg of the Michigan Experiment Station, has given the highest results in yield tests at this station and at points over the state. It has met with widespread favor by Michigan bean growers and by bean growers in other white pea bean growing regions. The Robust is partially resistant to Blight and Anthracnose, and apparently is immune to

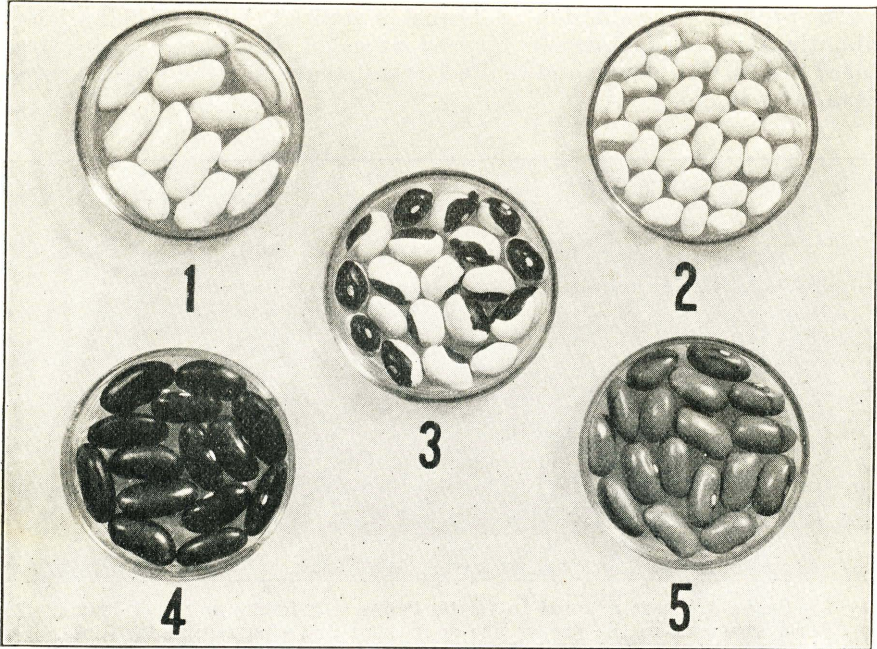


Fig. 3.—Leading commercial types of field beans. No. 1, White Kidneys, No. 2, Pea Bean, No. 3, Yellow Eye, No. 4, Red Kidney, and No. 5, Brown Swedish.

the Mosaic. In addition to outyielding the common pea beans, this bean, if properly handled, has a much lower percentage of pick due to discoloration by bean diseases. The Robust is from four days to a week later in maturing than the common Michigan pea bean. It should, therefore, be planted in late May or during the first half of June.

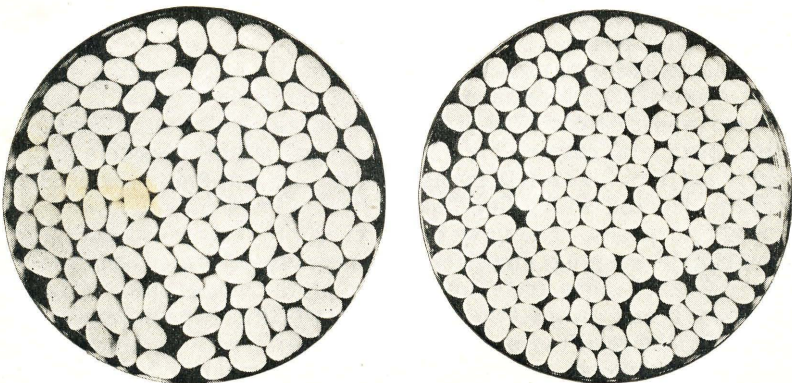


Fig. 4.—Medium and Round types of white navy bean.

The common Michigan pea bean is a round, white variety, somewhat earlier in maturing than the Robust. For planting late in the season or on poorly prepared seed beds, it is possibly the best variety to use.

The Early Wonder is a particularly early strain of the common pea bean.

The Vermont white pea bean has given excellent results in several Michigan localities. It is very regular in shape and early in maturing.

The red kidney bean is next in importance to the white pea bean. Both the dark red and light red kidneys are in demand. During the past few years, these beans have brought a premium over the white pea bean. On the average they do not yield quite as much as the white beans, though skilled growers often get unusually high yields.

The marrowfat, a white bean larger than the navy bean, is grown to a slight extent in Michigan but has not yet become an important commercial variety in this state. The Boston Yellow Eye, an eastern variety, is also grown to a limited extent.

The Brown Swedish bean is increasing in use in Michigan and frequently meets with a good demand. It is a brownish bean, shorter seasoned than the kidney type, and a favorite with those who plant late, due to the fact that it does not show discoloration to the same extent as white beans.

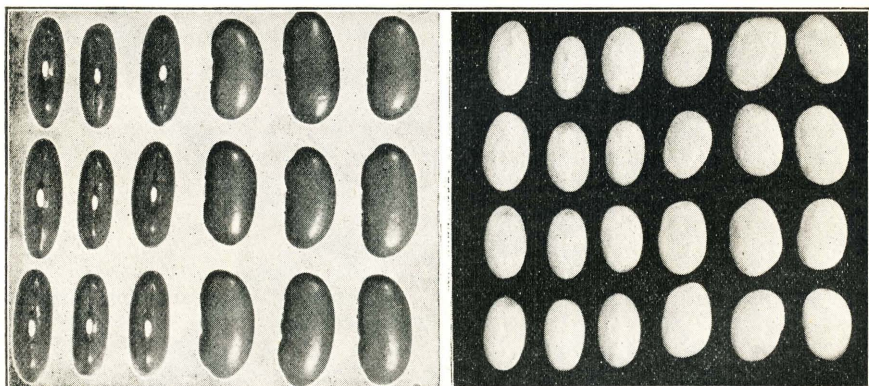


Fig. 5.—Market favorites—navy bean on right, red kidneys on left. Navy beans make up over 90% of Michigan's crop: Red kidneys 8%.

### PLANT GOOD SEED

Good seed is of the highest importance in bean growing. Extensive losses, frequently caused by bean diseases, are very largely due to the planting of infected seed.\* That "clean seed tends to yield clean beans" is a current saying among bean growers. Good seed beans should be clean, free from diseased or otherwise discolored beans, immature beans, and foreign matter. They should be of high germination and of uniform type. The careful hand-picking of beans to be used for seed is strongly recommended. Hand-picking, however, even if carefully done, will not make good seed of a badly diseased lot, since apparently clean beans may come from diseased plants. Beans of a high pick should not be used for seed purposes. No dips, sprays,

\*Two Mich. Bean Diseases, Michigan Agricultural Experiment Station Special Bulletin No. 68.



or seed treatments are known which are effective in making a diseased sample fit for seed. Good seed beans should come from clean, high yielding fields.



Fig. 6.—Discolored beans, due to blight, anthracnose, or weathering, are unfit for seed purposes.

If growers are dissatisfied with their seed, they should secure seed from the highest yielding fields of lowest pick in the neighborhood, or from clean fields of other localities. County agricultural agents and local elevator managers can usually direct attention to the best sources of seed. Sending north for seed does not always result in securing clean beans. The northern grown seed is only superior when the beans come from clean fields. When possible, samples should be secured and carefully inspected, and information should be secured in regard to conditions under which seed beans were produced, before the purchase is made. As a general rule, it is wisest to use for seed purposes, beans grown in the home locality, carefully hand-picking the home-grown beans of lowest pick.

The certified Robust beans and other varieties of certified seed, produced by the growers of the Michigan Crop Improvement Association, are very dependable, since they must pass a rigorous field and threshed bean inspection and careful germination test. The average bean grower can add greatly to his profit from beans by securing varieties which will yield more to the acre than many of the common ones in use.



Fig. 7.—A good seed sample of red kidney beans—plump, clean, and free of diseased beans.



Fig. 8.—A good sample of white pea beans—clean, plump, of good color, and free of diseased beans, weathered beans and foreign material.

**FERTILIZING THE BEAN CROP**

Manure is an effective fertilizer for beans under average soil conditions: It should be applied where possible to the previous crop or during the fall or winter before planting to beans. Applications of manure, made just before planting, may be followed by considerable loss from the bean maggot. From six to eight tons of manure to the acre, supplemented with two hundred or three hundred pounds of acid phosphate, should pave the way for a big crop of beans. Where acid phosphate alone or in connection with manure is used, the bean crop tends to ripen more evenly and at a noticeably early date.

Dr. M. M. McCool of the Michigan Agricultural College Soils Department makes the following recommendations in regard to fertilizing the bean crop:

**Fertilizers for Beans on Sands and Light Sandy Loams\***

Previous Treatments.....	No mixed meadow manure or green manure in rotation	Mixed meadow, clovers, alfalfa or soybeans in rotation	Manure in Rotation
Beans.....	3-12-4	0-16-0 2-12-2	0-16-0

**Fertilizers on Heavy Sandy Loams, Silt Loams and Clay Loams**

Previous Treatments.....	No mixed meadow manure or green manure in rotation	Mixed meadow, clovers, alfalfa or soybeans in rotation	Manure in Rotation
Beans.....	0-16-0 2-12-2	0-16-0	0-16-0

\*Circular Bulletin No. 53, Agricultural Experiment Station, Michigan Agricultural College, E Lansing.

It is best to apply commercial fertilizer broadcast before planting, especially when three hundred pounds or more per acre is applied. When beans are planted with a grain drill, a fertilizer attachment may be used. Acid soils should be limed before being planted with beans. On such soils, the lime should be applied in preparation for the clover crop, in order to be most effective when beans follow in rotation.

**BEANS IN ROTATION**

For continued success in production, the bean crop must be included in a good rotation. Beans cannot follow beans successfully year after year, because of the rapid decrease in organic matter and the increased injury due to bean diseases and insects. A good clover sod is considered the best preparation for the bean crop. Such a rotation as the following is well adapted to beans:

1st year—beans.

2nd year—wheat, rye, barley or oats, seeded with clover.

3rd year—clover.

Corn or potatoes can be included in such a rotation either before or after beans. If the clover sod is very weedy or is plowed late, or if strawy manure has been applied late in the spring, corn, because it is a gross feeder, will do better under such conditions than the bean crop.

A longer rotation can be secured by seeding timothy or alsike, or both, with the clover and using two or more years for hay and pasture.

The following are suggested as strong rotations:

1. On farms with little live stock—  
 (1) beans; (2) oats; (3) clover; (4) corn or beets; (5) wheat; (6) clover.
2. For combined stock and crop farming—  
 (1) corn or beans; (2) oats or barley or wheat; (3) clover, alsike, timothy (hay); (4) pasture.
3. (1) corn; (2) beans; (3) oats or barley seeded; (4) alfalfa; (5) alfalfa; (6) alfalfa.

### FIT SEED BED THOROUGHLY

It takes at least from four to six weeks after plowing to get a seed bed in the best condition for planting beans. Plowing should be done in the fall, or as early in the spring as possible. Early plowing gives opportunity for the seed bed to settle and also gives time in which to secure a seed bed comparatively free of weeds by proper use of the harrow and disc. On cloddy soils, the cultipacker and roller are useful in packing and pulverizing.



Fig. 9.—Beans should be planted on a thoroughly settled, well surfaced seed bed. The cultipacker and bar roller are effective in seed bed preparation.

Beans planted on late-plowed fields are likely to be affected more by diseases and are more difficult to keep free from weeds during cultivation. Early plowing and proper fitting will greatly lessen the labor of later cultivation and will effectively control the bean maggot, which often causes injury on newly plowed clover sod or on newly manured land.

### PLANT BEANS ON A WELL-WARMED SEED BED

The planting time for beans in Michigan ranges from May 25 to June 25. About June 10 is the usual date for most of the bean districts. It is best to wait until the seed bed is well warmed and worked into an excellent condition of tilth, rather than to plant when it is cold or wet.



Fig. 10.—Crop failure may result on poorly drained land in wet seasons.



Fig. 11.—A high yielding bean crop on tile drained land in the same locality. Good drainage increases yields of beans and insures profitable production during wet years. The cost of adequate tile drainage is rapidly repaid in increased returns from the bean crop.

Beans require almost ideal conditions for even germination. Every bean seed planted is pushed out of the ground; hence the need for a well-prepared seed bed. Unless the start is uniform, the harvested crop is likely to be uneven in its maturing, which means a higher pick and difficulty in curing and threshing.

The amount of seed used in planting an acre varies with the variety. From thirty-five to forty-five pounds (about eighteen quarts to three pecks) of ordinary pea beans, and five or six pecks of kidney beans, are the usual rates. An ordinary eleven-holed grain drill is commonly used in planting. Every fourth drill hole is left open, and the drill wheel is allowed to follow its own track on the return, thus planting with each passage three rows twenty-eight inches apart. Special bean drills, which plant rows twenty-eight to thirty-two inches apart, are available in bean growing districts. Two-row corn planters, equipped with special bean plates and narrowed up to plant twenty-eight to thirty-two inch rows, are also used in drilling beans.

Beans are usually drilled on fertile soils, free of weeds and grass. On light loams and on soils where the control of weeds and grass is difficult, beans are frequently planted in hills thirty-two inches apart, planting five to seven beans per hill using 14 to 20 pounds of seed. In experiments at the Michigan Agricultural College, planting in drill widths, as compared with hill planting, gave an increased yield of two bushels per acre. Beans should be planted at a depth of from three-fourths inch to one inch, on a firmly rolled seed bed. After the planting, they may be harrowed with spike-tooth harrow or weeder at least once before showing above ground.

### GIVE THOROUGH CULTIVATION

The first cultivation should be made as soon as the plants are high enough so that the rows can be easily followed. This cultivation should go close to the plants and be fairly deep. The next cultivation, coming within a week or ten days, should be further from the plants and not so deep. The following cultivations should be shallow, since the feeding roots of the bean plants come close to the surface.

Cultivators carrying numerous small or medium-sized shovels or blades are most desirable for later cultivation. The blade types of equipment, known as "duck-feet" "sweeps" and "half sweeps," are particularly effective in weed control and are desirable, since root pruning is reduced to a minimum.

From three to five cultivations are as a rule necessary. Beans should not be cultivated when wet with dew or rain, since at that time the spores of anthracnose and germs of blight are most easily carried from plant to plant.

## HARVESTING AND THRESHING

The early method of harvesting was to pull the mature bean plants by hand, cure in stacks or piles in the field, and thresh with a flail. At present, the bean harvester is used, and it greatly lessens the labor of bean pulling. This implement consists of a frame, on wheels, which carries two heavy knives. These knives or blades slip along underground just beneath the surface, pulling and throwing together two rows of beans at a time.



Fig. 12.—After pulling, beans are forked into small piles for curing. The crop should be threshed as soon as sufficiently cured, since risk of damage from wet weather is greatest after pulling.

The harvesting should be done when the plants are mature, but should not be delayed until the pods are too ripe and shattering is likely. After pulling, the beans are forked into piles, or, if the field is free from straw or trash, a side-delivery rake may be used in windrowing. After several hours' drying, the crop should be forked into small cocks, built high and of narrow diameter at the bottom so as to allow rapid curing. After a period of from one to four days in good drying weather, the crop should be threshed or hauled from the field and stored under roof or in a well-constructed stack.

If the crop is mature, weather favorable, and a thresher available, beans may be threshed from the field to good advantage, thus greatly lessening the risk at harvest time. Bean growers, with large acreages of beans, increase the risk from weather damage by pulling the entire crop at once. It is a much safer practice to pull units of four or five acres at a time, cure on the ground and store under roof or in stack. Beans on the plants are much less injured by periods of wet weather than in cases where the crop is rained on while on the ground after pulling. When beans in the cock are rained on, they should be opened up and turned to accomplish drying.

A special bean separator is used in threshing. The bean thresher carries

one cylinder, operated at a low speed, and a second operated at a high speed. The first cylinder threshes over-ripe beans with a minimum of splitting. The second, or rapid cylinder, threshes immature pods much more effectively. An ordinary grain separator can be used in threshing beans by removing every other concave and regulating the speed of the cylinder. Bean straw is a valuable roughage, particularly in sheep and cattle feeding, and should be carefully saved for feed.

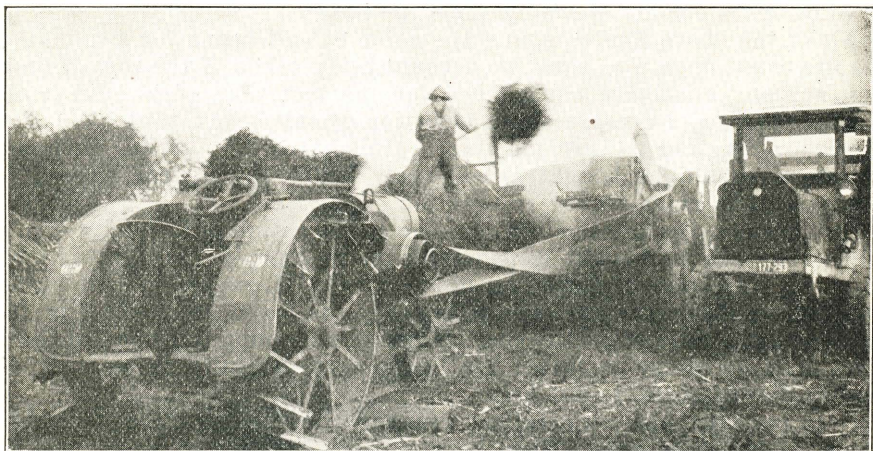


Fig. 13.—Threshing beans. A special separator, equipped with two cylinders, is used.

The average yield per acre of beans in Michigan is about twelve bushels. Yields of from eighteen to twenty bushels are considered good, but occasionally very high yields of thirty-five bushels or more are reported. Cultural methods which increase yields per acre reduce the production cost per bushel and increase the profit in bean growing.

#### FEEDING CULL BEANS AND BEAN PODS\*

Cull beans, when cooked and combined with carbohydrate feeds such as corn, barley, or cooked potatoes, make an excellent ration for either growing or fattening pigs.

In trials conducted at this station by R. S. Shaw and A. C. Anderson with young pigs fed a mixture of three parts beans (cooked) and four parts corn meal, it was found that one hundred and forty-five pounds of beans and one hundred and ninety-three pounds of corn meal would produce one hundred pounds of pork.

Selling the hogs for \$6.50 per hundredweight, and paying for the corn meal at \$35.00 per ton, the one hundred and forty-five pounds of beans fed with one hundred and ninety-three pounds of corn meal to produce one hundred pounds of pork would be worth \$3.12, or \$2.15 per hundredweight after being cooked.

With older fattening hogs, fed equal parts of corn meal and cull beans

\*G. A. Brown, Animal Husbandry Section.



(cooked), two hundred and three pounds of corn meal and two hundred and three pounds of beans produced one hundred pounds of pork. Selling the hogs at \$6.50 per hundredweight and paying for the corn meal at \$35.00 per ton, we would have left \$2.95 for two hundred and three pounds of beans, or \$1.45 per hundredweight for the beans. Where cooked cull beans alone were fed to fattening hogs, four hundred and twenty-one pounds of beans (cooked) produced one hundred pounds of pork. Selling the hogs at \$6.50 per hundredweight would give a return of \$1.54 cents per hundredweight for the beans.

All of the above figures giving the value of cull beans for swine feeding are based upon feed costs, no account being taken of the cost of cooking, nor any allowance being made for the fact that pigs gain more slowly when fed a considerable proportion of cull beans, thus increasing the labor required to care for them. Cull beans for feeding purposes, therefore, should be bought considerably below the figures given if a profit is to be made on the transaction.

Cull beans make an excellent addition to the ration of fattening lambs, when they can be bought considerably more cheaply than corn. One-third of the ration of fattening lambs may well consist of cull beans, and, where the beans are especially cheap, as much as one-half of the ration may consist of cull beans. When this amount is being fed, however, it is necessary to watch the lambs very carefully to see that digestive disturbances do not occur.

Bean pods are also an excellent roughage for feeding either fattening lambs or breeding ewes. They have a value for this purpose which is approximately one-half that of clover hay.

When fed on corn and cull beans, hogs should always have access to mineral matter and also to alfalfa or clover hay in a rack.

Prof. J. E. Burnett of the Dairy Department, Michigan Agricultural College, states that in his opinion the ration for dairy cows should not contain in excess of 25 per cent of cull beans, and that it is preferable to have less than that amount. Cooking increases the palatability.

A small type of mechanical bean picker has recently been developed and is in use by farmers in machine picking their own crop, thus retaining the cull beans for feeding and offering for sale beans of low pick.

### LET'S GET RID OF THE BEAN WEEVIL\*

The Michigan bean crop has been remarkably free from injury from the bean weevil, but during the past two years weevil damage has been more frequently reported than previously. Proper handling and treatment of seed beans will effectively control this damaging pest.

The beetle of the bean weevil lives over the winter in stored beans and occasionally in peas. It flies to the young bean plants (unless we carelessly sow infested beans, in which case it does not have even to fly) and feeds on the young plants until the pods are formed. At this time eggs are laid inside the pod, the beetle boring a hole through the pod. Soon the grubs from the eggs enter the young seeds, feeding therein and remaining there until the beans are harvested. In due time the

\*R. H. Pettit, Entomological Section.

grubs change to beetles and come out, boring their way, sometimes several from one bean. If the weather is warm or if the beans are stored in a warm place, the new crop of beetles soon lays eggs and fresh seeds are attacked, the process going on until nothing remains but a worthless, evil-smelling powder. Clean beans stored near infested ones are practically sure to become infested, since the pests work in stored seeds just as well as in the field.

### Treatment

Perhaps some beans will escape treatment, but let us *always* see to it that our *seed beans* are free from weevils. In order to make sure, let us fumigate all seed beans that contain weevil. The treatment is cheap enough. Carbon disulphide or bisulphide (sulphuret of carbon) is a sure remedy. It costs about six cents a pound if purchased in fifty-pound drums of the makers, and it kills the weevil very efficiently. Buy the carbon disulphide in quantity. Pay for the drum and get your money back after returning the drum. Use about one pound for fifty bushels, in a tight bin, and *take every precaution possible to avoid accident by fire or by breathing the fumes*. Do not try to fumigate during cold weather, since no fumigant works well when the weather is cold. If there are only a few bushels of beans to be fumigated, do the work away from the barns, since the insurance lapses during such operations, and remember to air the beans well to get rid of the odor afterwards.

The pea-weevil works much like the bean weevil, but it does not work in dry peas. It confines its work to peas attacked in the field. One beetle only develops in a pea. The bean-weevil is smaller and works both in peas and in beans. Often several develop in one seed.

### Following are directions for treatment

Place the beans in tight bins or barrels, capable of being tightly and quickly closed. Old carpets, blankets, etc., with newspapers between them, often will be found useful in helping to make the bins tight.

Measure the inside of the bin, including the air space above the seeds if the bin is not entirely full, and place some old pans or plates on top of the seeds. Then, for every cubic foot of space in the bin, put two drams of liquid carbon disulphide in the pans and quickly close the bin. Thus, a pound of the liquid will suffice for about fifty cubic feet of space, or a little more, or for about forty bushels of beans.

The bin should remain tightly closed for from twenty-four to forty-eight hours. A longer exposure is likely to injure the germinative power in the seeds.

The liquid carbon disulphide, on being liberated, will quickly transform into a gas, which, being heavier than the air, settles to the bottom and fills all the air spaces between the seeds. The work must be done in the day time, away from lamps, stoves, or fire of any sort. No fire must be allowed to come near until everything has been thoroughly aired, for the gas and fumes are very explosive when mixed with air. The beans should be shoveled over several times. Great care must be

observed to breathe as little as possible of the fumes, as they are very poisonous and will as easily produce death among men as among insects.

### MARKETING MICHIGAN'S BEAN CROP

More than four hundred bean elevators, equipped with bean picking and handling machinery, are necessary in preparing Michigan's field run bean crop for the market. It is estimated that over twenty million dollars is invested in bean elevator and bean handling machinery in Michigan, both privately and co-operatively owned.

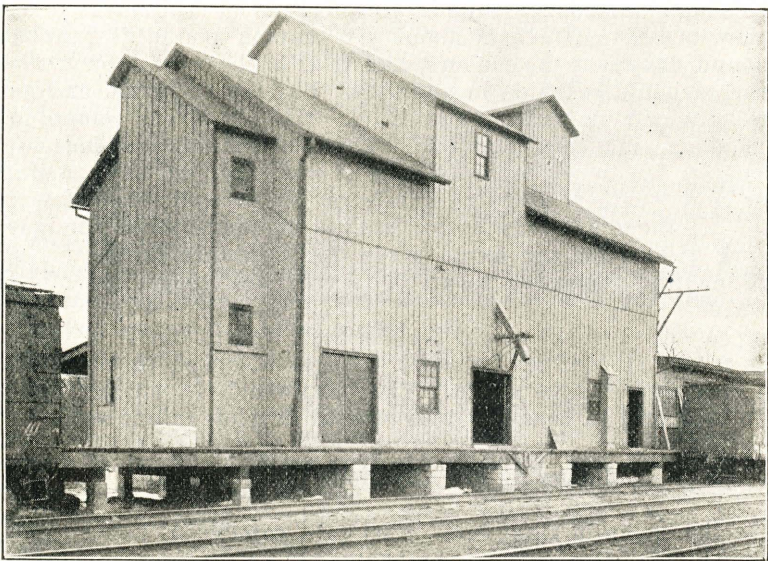


Fig. 14.—A Michigan bean elevator. More than four hundred specially equipped elevators, both privately and co-operatively owned, handle beans in Michigan.

As beans come from the field, they usually carry from four to twelve pounds per hundred of discolored or cull beans. These are removed by first running the beans over mechanical pickers, which take out a large percentage of the culls and small pebbles. They must then be hand-picked to remove undesirable beans which the bean picking machinery cannot pick out.

When the moisture percentage of the bean crop exceeds twenty per cent, the beans must be dried in artificial dryers, which reduce the moisture content to seventeen per cent, or below.

According to President F. E. Nowlin of the Michigan Bean Jobbers Association, the 1923 crop, less the pickage and seed requirements, consisted of 8,214 cars of 40,000 pounds each, of which 5,234 cars were reported shipped between October, 1923, and February 9, 1924.

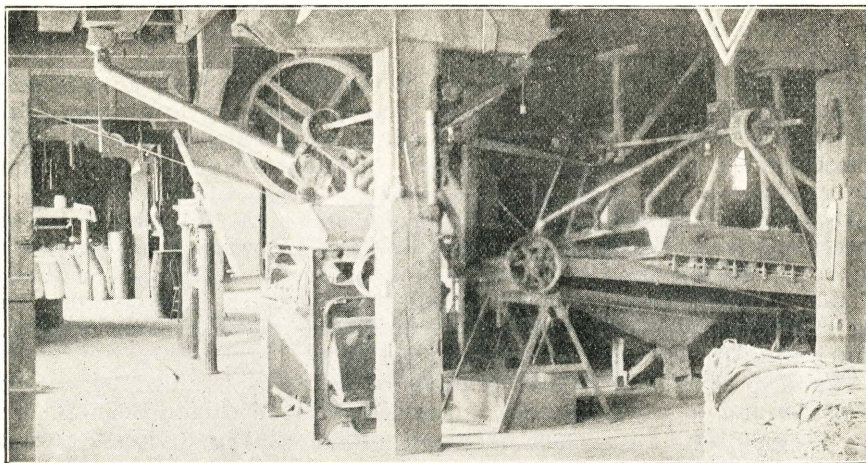


Fig. 15.—Machine pickers remove a large proportion of cull beans, stones and dirt from the field run crop. (Courtesy of Belden Co., Charlotte, Mich.)

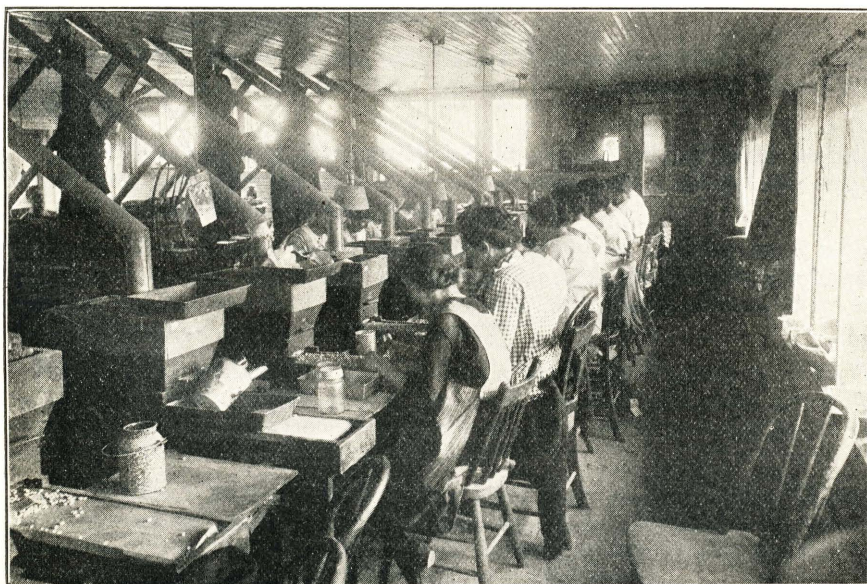


Fig. 16.—A bean picking room. Cull beans are removed by hand in preparing for the retail and canning market. (Courtesy of Belden Co., Charlotte.)

About twenty-three per cent of the 1922 Michigan bean crop was handled by the Michigan Elevator Exchange, affiliated with the Michigan State Farm Bureau, as estimated by Mr. C. S. Benton, in charge of bean marketing for the exchange.

Approximately thirty-five per cent of the Michigan bean crop is used in preparing the highest quality of canned beans by leading canning companies, putting up a quality product nationally advertised. The remainder of the crop is distributed through wholesale and retail grocers.

By the establishment of uniform grades and a carefully regulated inspection system, the Michigan Bean Jobbers Association has markedly improved the market for Michigan beans. Mr. F. B. Dreese, Secretary of the Michigan Bean Jobbers' Association, Lansing, Mich., states that the following rules and regulations, controlling the marketing of Michigan beans, are in effect throughout the state:

The inspection and official grading of beans is handled by a chief inspector and deputy inspectors, appointed by the Michigan Bean Jobbers Association. Cars are inspected at shipping point and certificates of inspection, establishing the grade, are issued.

## MICHIGAN BEAN GRADES

Official grades and regulations adopted by Michigan Bean Jobbers' Association, October 5, 1897; revised December, 1906; September, 1907; January, 1913; January, 1914; September, 1916; September, 1918; October, 1919; October, 1920; September, 1922.

**Choice Hand Picked Pea Beans Michigan Grading** must be bright, sound, dry, well screened, and must not contain more than one and one-half per cent of discolored or split beans, and not more than seven per cent of large or medium beans.

**Prime Hand Picked Pea Beans Michigan Grading** must be fairly good average color of crop year, sound, dry, well screened, and must not contain more than three per cent of discolored and split beans, and not more than ten per cent of large or medium beans.

**Fancy Screened Pea Beans Michigan Grading** must be bright, sound, dry, well screened, and must not contain more than three per cent of discolored beans, splits or foreign substances, and not more than ten percent of large or medium beans.

**Choice Screened Pea Beans Michigan Grading** must be of fairly good average color of crop year, dry, well screened, and must not contain more than five per cent of discolored beans, splits or foreign substances, and not more than ten per cent of medium beans.

**Choice White Kidney Beans and Choice Yellow Eyed Beans** shall permit of the same pickage and moisture content as is allowable in Choice Hand Picked Pea Beans.

**Choice Hand Picked Medium Beans Michigan Grading** must be bright, sound, dry, well screened, and must not contain more than one and one-half per cent of discolored and split beans.

**Choice Hand Picked Red Kidney Beans Michigan Grading** must be light red in color, bright, sound, dry, well screened, and must not contain more than one and one-half per cent of discolored and split beans, and not more than three per cent of Sports or Blue Beans.

**Prime Hand Picked Red Kidney Beans Michigan Grading** must be light red in color, fairly bright, sound, dry, well screened, and must not contain more than four per cent of discolored and split beans and not more than four per cent of Sports or Blue Beans.

**Choice Hand Picked Improved or Dark Red Kidney Beans Michigan Grading** must be dark red in color, bright, sound, dry, well screened, and must not contain more than one and one-half per cent of discolored and split beans, and not more than three per cent of Sports or Blue Beans.

**Prime Hand Picked Improved or Dark Red Kidney Beans Michigan Grading** must be dark red in color, fairly bright, sound, dry, well screened, and must not contain more than four per cent of discolored beans and splits, and not more than four per cent of Sports or Blue Beans.

**A Dry Bean** is defined as one containing not to exceed seventeen per cent moisture at one hundred and seventy-five degrees Centigrade.