Extension Bulletin 351
October 1958

POTATO PRODUCTION
In Michigan

MICHIGAN STATE UNIVERSITY
Cooperative Extension Service · East Lansing

TABLE OF CONTENTS

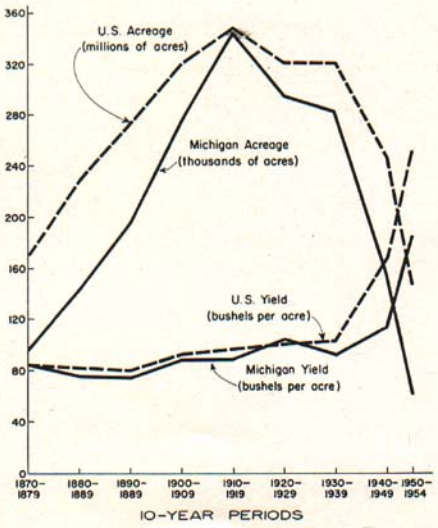

Fig. 1. This chart shows the trend in acreage and yield per acre for potatoes in the U. S. and Michigan. Note that as yields per acre go up, rather drastic reduction in acres planted are necessary to avoid surpluses.

Potato Production in Michigan

By D. L. Clanahan
Extension Specialist in Farm Crops

Potato growers have felt a greater impact of technology since 1946 than other crop producers. Growers using new labor-saving machinery and applying research results have made potatoes an intensive crop. With higher yields per acre, acreage has been reduced to avoid surpluses.

Potatoes are now being grown mostly in areas where soil and climate are favorable for their best growth. Though yields per acre have risen, a grower's acreage must be large enough to justify his investment in special equipment.

Changes in production practices, equipment use, and harvesting techniques are likely to continue for some time. Figs. 1 and 2 give details on the present status of potatoes in Michigan, and on crop trends through the years for both Michigan and the United States.

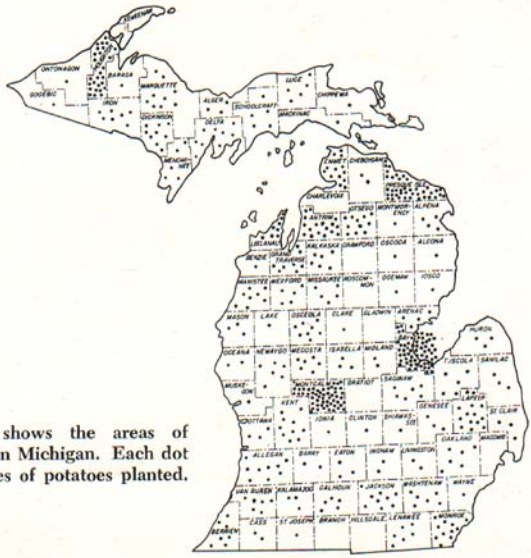

Fig. 2. This shows the areas of potato production in Michigan. Each dot represents 100 acres of potatoes planted.

SOIL PREPARATION FOR POTATOES

Potato growers generally know and use good soil management practices in growing the crop. Potatoes respond to generous use of organic matter commercial fertilizer. Therefore, you must prepare the soil far enough in advance to give it good structure and leave it loose and friable. Manure is a good source of organic matter, and a winter cover crop is a must. A 400-bushel-per-acre potato crop (including tops and roots) contains 184 pounds of nitrogen, 43 pounds of phosphoric acid, and 230 pounds of potash. There must be enough fertilizer in the soil to supply the crop with these amounts.

The year before potatoes are planted, apply manure, if available, at the rate of 8 or 9 loads per acre and summer fallow fields with alfalfa or clover sod. If quack grass is a problem you may need to work the field every week for 6 or 8 weeks, or you can use chemical weed killers. (See Chemical Weed Control, page 12.)

Plant fall rye the last half of August, using 1½ bushels of seed and 350 pounds of 5-20-20 fertilizer per acre. (See Figs. 3 and 4.) Early in the spring, topdress this rye with 40 pounds of elemental

Fig. 3. County Agricultural Agent, Victor Beal examines a field of rye that was seeded the previous fall with a seeding box attached to the digger.

Fig. 4. On potatoes dug early enough in the fall, a rye cover crop may be planted at the same time, by attaching a seeder box to the digger.

nitrogen per acre. This will be 125 to 150 pounds of ammonium nitrate or its equivalent.

Before the rye is a foot high in the spring, either disc or field cultivate the field. Continue this operation, by using first the cultivator and then the disc, at intervals until planting time. The object is to mix the organic material in the soil and to keep the rye crop from becoming too fibrous. Plow it under just before planting. Plant the crop without further working of the soil (to prevent soil compaction).

SEED

The greatest single factor in the success of a potato crop is the quality of seed used. Freedom from disease and the way the seed has been handled prior to planting are important to seed quality. Both affect the stand and final yield from the crop. The amount of seed used per acre depends on the spacing of the plants and the size of the seed pieces. These are also very important to crop yields.

Certification programs help to keep up seed quality in the important potato-growing states. Certification aids in insuring disease-free

seed stocks that are true to variety. The use of certified seed is a logical first step in producing a high-quality crop.

Growers often ask about using small uncut tubers. Using B size certified seed planted whole is a good practice. Using uncut seed helps insure a better stand. However, small seed from uncertified stock may result in a build-up of disease.

The rate of planting will depend on the width of row, spacing in the row, variety, and size of seed piece. Some varieties, because of their growth habits, need different spacing and should be planted with more or less seed per acre. Successful potato growers in Michigan use a 34- or 36-inch row with plants 10 to 12 inches apart in the row for all varieties except the Russet Burbank.

If you use 2-ounce seed pieces and space the plants 10 inches apart in 34-inch rows, you will need 38 bushels of seed per acre. Russet Burbank growers place their seed about twice as far apart in the row, so they need only half the seed used by growers of other varieties.

COMMERCIAL FERTILIZER

A high-yielding potato crop uses large amounts of plant food. Because fertilizers are quite cheap, compared to the whole cost of producing the crop, you cannot afford to let the crop "go hungry." First, have the soil tested. Every county extension or S.C.S. office offers soil-testing laboratory service.

Test the soil early enough to leave time for ordering fertilizer materials. The 1-4-4 ratio is the most popular (for mineral soils) among potato growers in Michigan. Growers usually use 800 pounds per acre of a 5-20-20 or 4-16-16 fertilizer at planting. They apply this in the row about 2 inches to the side of the seed piece and on a level with the seed piece.

When using irrigation on upland soil, increase the rate of application of fertilizer by 50 percent (use about 1200 pounds per acre). For muck soils, you should use 1200 pounds per acre of a 0-10-20 or 0-9-27 fertilizer.

Many growers have found that adding 40 pounds of elemental nitrogen as a side dressing during the growing season is profitable. This is especially true where no clover or alfalfa grew in the rotation or where strawy materials were turned under for the potato crop.

There is some danger in using large amounts of fertilizer in the row at planting time. Generally, anything over 800 pounds per acre should be applied before planting and thoroughly worked into the

soil. This is to prevent injury to the sprouts, which would result in a poor stand of plants.

GREEN SPROUTING

Results of many experiments have shown that yields are higher from green-sprouted seed. Modern potato growers have found that the same results can come, with less labor, from seed that has been simply warmed up in storage before it is planted. Expose the seed to temperatures of 60° to 70° F. for 2 weeks before planting.

DATE OF PLANTING

Potatoes must be mature to be a top-quality crop. There is no better way to raise a mature crop of potatoes than by planting them early. Most late-crop varieties need from 120 to 130 days to mature.

In Michigan, the time to plant potatoes is May 20 to 25. Soil temperature is a factor in plant growth. Do not plant potatoes until the soil reaches a temperature of 45° F. The warming-up period in storage ahead of time will help the plants emerge quickly.

DEPTH OF PLANTING

Place potato seed pieces 3 to 4 inches below the surface of the surrounding soil, but give them only a shallow covering of from 1½ to 2 inches of soil. (Fig. 5). Growers often misunderstand this deep planting-shallow covering method. A simple adjustment of the covering discs on the planter will get these results.

The reason for the shallow covering is that soil temperature has a marked effect on the rate of growth and the emergence of the sprouts; this is one way, in early spring, to make use of the few hours of mid-day warming sunshine.

CHOICE OF VARIETY

Choosing the best variety is one of the most important choices in producing a high-yielding, top-quality potato crop. Varieties differ in the cultural treatment they need and in their adaptation to soil and climate. Disease resistance, cooking quality, and appearance also differ with the variety.

Much progress has been made in recent years in the breeding of new varieties having certain characteristics. You, as a grower, will

Fig. 5. This picture illustrates the proper adjustment of the covering discs on the planter to avoid covering the seed with too thick a layer of soil.

be wise if you study these carefully. Check on the newer ones by growing them on a small scale before going "all out."

Below is a description of the leading varieties in Michigan. For more information, or for answers about varieties not listed, write to Department of Farm Crops, Michigan State University, East Lansing.

Chippewa: Medium early, about 3 weeks earlier than Russet Rural. Tubers are white, shallow eyed, and smooth. Has no scab resistance and is susceptible to late blight and leaf roll. Will perform well on acid muck soils.

Cherokee: One of the newer varieties introduced in 1949. Ten days later than Irish Cobbler. Adapted to muck soils as well as mineral soils. Skin smooth and white. Highly resistant to scab and late blight.

Delus: Medium early. Introduced in 1954 by the state of Delaware. High-quality white-skinned variety. Resistant to both blight and scab.

Green Mountain: An old late variety with high dry matter and good cooking quality. Has a white-to-slightly-russeted skin and is

oblong in shape, usually quite smooth. Has no scab or blight resistance and definitely needs a cool, moist climate. Performs well in the northern part of Michigan's Upper Peninsula.

Irish Cobbler: One of the better known early varieties. Skin is white and smooth, but eyes are very deep. Is resistant to mild mosiac, but is susceptible to scab and late blight.

Katahdin: Originated in 1932. Leading variety of potatoes in the United States at present. Medium late in maturity. Tubers have white skins and are shallow eyed. Gives consistent production of good-type tubers under adverse weather conditions. Its susceptible to scab and late blight. Must be planted deep in mellow soil with soil thrown over the row during cultivation to prevent sunburn injury to the tubers. A good variety for muck soils.

Merrimack: Introduced in 1954 by USDA and New Hampshire. Maturity late. Tubers are short, round, and medium thick. Skin smooth with cream buff color. Is immune to most strains of late blight and is highly resistant to ring rot. Has excellent cooking quality similar to the Green Mountain.

Onaway: Introduced in 1956 by Michigan. An excellent early scab- and blight-resistant variety. Tubers are white with shallow eyes. Has met with good favor in the Bay City early-potato area and should work as a replacement for the Irish Cobbler where a smoother, more disease-resistant variety is desired. Not recommended for muck soils.

Ontario: A very late variety. Tubers are oblong and white. Is highly resistant to scab. Market and cooking quality only fair. Because of soggy culinary quality and darkening after boiling, the tubers sell at a discount as compared to Katahdins. Is susceptible to leaf roll.

Pontiac: Introduced in 1938 by the Michigan Experiment Station from seed produced by USDA. Medium-late, red-skinned. High-yielding variety grown for special markets desiring a red-skinnedq potato. Is susceptible to scab, late blight, and air checking in the tuber.

Russet Rural: Michigan's leading commercial variety of potatoes. Is late in maturity, and has a russet skin. The tubers are smooth and shallow eyed. Has some resistance to scab, but is susceptible to late blight. Is highly regarded by the chipping industry because it will recondition after a storage period at lower temperatures, and still produce chips with a desirable color.

Russet Burbank: A heavily netted russet-skinned late variety. Tubers are long and cylindrical in shape. Susceptible to late blight, but somewhat resistant to scab. Does best under irrigation on fertile soil. Very desirable baking potato. Growers who expect to grow this variety should consider the special cultural treatment needed for best results.

Sebago: A late, smooth variety, with white skin. Tubers are elliptically round. Moderately resistant to scab and late blight. Of very good table quality and adapted to both mineral and muck soils. Is subject to heavy sprouting if held in storage late in the spring.

Sequoia: Late in maturity. Tubers are large, roundish, and have white skin. Susceptible to scab but somewhat resistant to mild mosaic and late blight.

Tawa: Introduced as a joint release between Michigan and Iowa in 1956. Early, white-skinned, shallow-eyed variety. Is moderately resistant to scab and late blight. Especially recommended for muck soils.

White Rural: Description same as Russet Rural except the skin is white. Originally known as Rural New Yorker No. 2 or Sir Walter Raleigh Carmen No. 3.

Potato variety usage based on 1954 certified seed production

United States Percent of total production		Michigan Percent of total production	
Variety		Variety	
Katahdin	38.9	Russet Rural	36.7
Irish Cobbler	12.8	Sebago	27.7
Russet Burbank	11.3	Katahdin	9.6
Red Pontiac	10.6	Chippewa	6.9
White Rose	6.4	Cherokee	6.1
Triumph	5.0	Sequoia	4.2
Kennebec	3.7	White Rural	2.5
Chippewa	1.7	Pontiac	2.4
Cheroke	1.5	Irish Cobbler	1.8
Sebago	1.3	Russet Burbank	1.1
Russet Rural	0.8	Green Mountain	1.0
Green Mountain	0.7		
Pontiac	0.3		
Sequoia	0.1		
41 other varieties	4.9		

Fig. 6. This picture illustrates cultivation late in the growing season with the teeth of the cultivator operating mainly from the middle of the row.

CULTIVATION

The two main reasons for cultivating potatoes are to control weeds and to provide soil cover for the new crop of potatoes (to prevent sun burn). The soil cover is very important with some varieties such as the Katahdin, which set their tubers very shallow. All varieties need cultivation for soil cover when they are under irrigation in light soils, where the water washes the soil off the tubers.

Deep cultivation close to the plants will injure roots and reduce yields. Be sure to adjust the shovels on the cultivator, or use sweep type shovels that will bring the soil from the middle of the row. (Fig. 6). Most growers use a weeder before or about the time the potato plants emerge. You should use the weeder when the weeds have germinated but are still very small.

Usually two or three regular cultivations are enough. Heavy equipment travels over the field many times in the spraying operation. Be-

cause of this, avoid soil compaction by holding the number of cultivations to a minimum.

CHEMICAL WEED CONTROL

This newer method of weed control will help to do the job cheaper and with less injury to the roots of the crop. A good example is the control of heavy quackgrass sod on land to be used for potatoes. Treat this sod with 10 pounds per acre of dalapon before planting.

You can do this the fall before planting, but this leaves out the possibility of a fall cover crop. When treated in the spring, the treated grass may be plowed down after 3 to 7 days and the potato crop planted right away. However, if done the previous fall, you'll save time during the busy spring season.

To control annual weeds after planting, use either 1 gallon of preemergence dinitro or 1 to 2 pounds of the ester form of 2-4, D. This treatment is especially helpful during rainy periods when the soil is too wet to cultivate.

Don't use 2-4, D on fields meant for certification. It may mask disease symptoms and interfere with proper roguing. New materials for weed control are being discovered. As they appear, recommendations will change.

SPRAYING FOR INSECT AND DISEASE CONTROL

You cannot expect to get top yields of quality potatoes unless you control insects and diseases. Spraying is a preventive measure, so schedule sprays every 7 to 8 days. If late blight appears or threatens, shorten the schedule to 4 or 5 days until the critical period is past. Early spraying and thorough coverage of the foliage is a must.

To do a good job, you will need to mix 125 to 150 gallons of water per acre, with the necessary chemicals each time you spray. Sprayers should develop 350 to 400 pounds of pressure. Proper timing of the spraying and the thoroughness of the job are often more important than the material used.

Choice of Materials

For early blight and for spraying early in the season, the carbamates sold as Dithane D-14 or Parzate are good materials to use. The

usual rate is 2 pounds per 100 gallons of water. Since these are organic materials and *do* break down, spray at least every 5 days.

For late blight, use either the materials above, Bordeaux mixture 8-4-100, or one of the fixed coppers like Tribasic copper sulphate, Basic Cop, or Bordow. Because copper materials are inorganic, they last longer on the vines. You do not need to add lime to the basic coppers. Strengths of these materials vary, so use amounts that the manufacturers recommend.

DDT at 1½ pounds of 50 percent wettable powder per 100 gallons of spray is good protection from insects damaging the foliage of the plants. Mix this in the fungicide spray. It is especially good against leafhoppers.

If you have not controlled flea beetles, use either dieldrin at 1 pound of the 50 percent wettable powder or 2 pints of the 15 percent emulsion, or heptachlor. Use heptachlor at 2 pounds of the wettable powder or 1 quart of the 23 percent emulsion.

Some fields, especially old grass sods, may be infested with wire worms or white grubs. Use 3 pounds per acre of the actual dieldrin or heptachlor for sandy or mineral soils. Use 4½ pounds per acre for heavier soils, and 6 pounds per acre for muck. Apply these to the soil broadcast with a sprayer, and disc them 3 or 4 inches into the surface.

Fig. 7. This picture shows a field of potatoes receiving extra moisture through irrigation at a critical stage of growth where heavy vine growth requires more water.

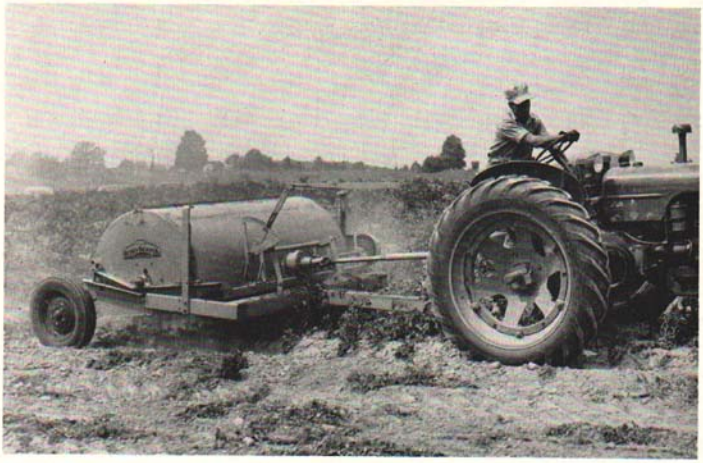

Fig. 8. After the vines have been chemically killed or frosted, the vine beater makes a clean job of the remains for the digger or harvester.

Aldrin was one of the first chemicals to be used for this purpose but it is rapidly being replaced by dieldrin and heptachlor. The volatility of aldrin has caused this switch.

DDT is not a good control for aphids or plant lice. You can control aphids better with parathion, TEPP, or malathion. Use 1 pound of 15 percent wettable powder of parathion or 1 pint of the 25 percent wettable powder per 100 gallons of spray solution. Use malathion at the rate of 1½ pints of the 50 percent wettable powder. Use TEPP at the manufacturer's direction.

Some growers use DDT early in the season when leafhoppers are more troublesome, then use one of the other insecticides later when aphids are building up. Other growers alternate the insecticides. These materials work well for the common Colorado potato beetle and the flea beetle.

Seed potato growers should use an aphicide more often than tablestock growers, because it is known that aphids carry diseases. Therefore, the infection of healthy potato plants with a disease may be more serious to seed potato growers than the actual loss in yield, late in the season, is to a tablestock grower.

IRRIGATION

In humid regions like Michigan, irrigation can be highly profitable some years and not needed at all in others. The potato crop needs about 1 inch of water per week. (Fig. 7, page 13.)

Growers with irrigation equipment should space the plants closer and add more plant food to take full advantage of the extra water. Having irrigation does not mean that you can be lax in other practices concerning organic matter.

HARVESTING

Proper handling of both the time of harvest and the actual harvesting will pay dividends in quality. It takes at least a year and considerable expense to bring the crop to this point. Therefore, these items are important.

Do not dig potatoes for storage purposes until the vines are dead. Late blight makes it unsafe to dig until then. Live blight spores lingering on green tops contaminate the tubers as they come over the digger chain. Also, the tubers themselves are more easily skinned and bruised if they are dug before they are properly cured.

Do not delay the date of harvest. Temperatures below 40° F. will

Fig. 9. A mechanical harvester in operation. A fairly small crew operate the machine that does the job of digging and loading into a self unloading box on the truck.

reduce the quality of potatoes. However, you need to let the potatoes mature. Therefore, you must often compromise. If the vines stay green, you can use vine killers such as the dinitro compounds or sodium arsenite.

Use 2 pounds of dinitro, 5 to 10 pounds of fuel oil, and 20 to 40 gallons of water per acre. Use sodium arsenite at the manufacturers' directions. Sodium arsenite is a better killer to use if the field has grass troubles. Generally speaking, the more rapid the kill the more danger of stem-end discoloration in the tubers.

Copper sulfate at 8 to 10 pounds per 100 gallons of water and no lime is a good disinfectant to use on the field after the vines have been killed. This is added insurance against live blight spores contaminating the tubers.

It is usually not effective enough, even at three or four times the above rate, to do the complete job of vine killing. Use a vine beater or roto-chopper tools for finishing off the job. (See Fig. 8).

Rather specific rules have been set up for the actual digging operation. Do not operate the digger at more than 1½ miles per hour, or the digger chain at more than 150 feet per minute. On light soils and under dry conditions, it is a good idea to replace the kicker chains with smooth rollers (to avoid unnecessary bruising of the tubers).

Set the digger deep enough to avoid cutting the tubers. It should be deep enough to insure enough soil over the digger chain to serve as padding for the tubers. Avoid drops of more than 6 inches. Use rubber-covered digger chains and padding on the sides of the digger. Handle the tubers carefully until they are safely placed in storage. (See Fig. 9.)

STORAGE

The first 2 weeks that potatoes are in storage are known as the curing period. Keeps the temperature at 60° F. and the relative humidity at 90 percent. This is the time during which bruises and cuts on the tubers heal over. The reason for the warm temperature plus the high relative humidity is to make this a healing operation and *not* a drying one.

The holding period will be the next 3 to 4 months, or until the potatoes are ready for marketing. For shorter periods of storage, do not let the temperature go below 50° F. However, for longer periods of time, you can lower this limit to 40° F.

The warming-up period prior to sale should consist of a week or two at temperatures above 50° F. During this time, the accumulated sugars return to starch. This results in much better quality tubers.

Ventilation in the storage bin is needed to keep the same temperature and humidity. Admit fresh air to the storage from time to time and exhaust the stale air from the ceiling. Moisture gathering on the ceiling may mean there is not enough insulation or ventilation, or both. Your investment in good fans and controls will pay dividends.

FOOD VALUE OF POTATOES

The food value of 100 grams of raw potatoes (all edible) is as follows. This amount makes a scant half-cup if mashed, or an average serving (according to the United States Department of Agriculture).

Ingredient	Amount	
Water	77.8	percent
Calories	85.0	
Protein	2.0	grams
Fat	.1	grams
Carbohydrate	19.1	grams
Calcium	11.0	milligrams
Phosphorus	56.0	milligrams
Iron	7.	milligrams
Vitamin A	20.0	international units
Thiamine	.11	milligrams
Riboflavin	.04	milligrams
Niacin	1.20	milligrams
Ascorbic Acid	17.00	milligrams

The above table shows that the potato carries only about as many calories as an apple or an orange. Important is the fact that one medium-sized potato will furnish one-fifth of the vitamin C for the daily diet plus worthwhile amounts of the B vitamins. Note also that worthwhile amounts of many of the minerals are present.

NOTES

NOTES

Cooperative extension work in agriculture and home economics. Michigan State University and the U.S. Department of Agriculture cooperating. Paul A. Miller, Director, Cooperative Extension Service, Michigan State University, East Lansing. Printed and distributed under Acts of Congress, May 8 and June 30, 1914.

10:58—10M