

Potato Facts

Producing Potatoes Organically in Maine

Bulletin #2419

Consumers are willing to pay for the direct and indirect benefits of organic farming practices.

Why Organic?

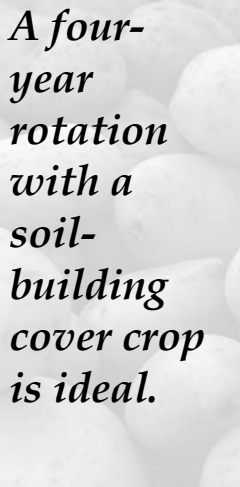
Organic farming is the fastest growing segment of U.S. agriculture, and potato production follows the trend of other commodities. In 1986 the Maine Organic Farmers and Gardeners Association (MOFGA) certified fewer than 10 farms selling potatoes. In 2005 MOFGA certified nearly 100 small- and moderate-sized farms marketing organic potatoes. Most organic potatoes are sold directly to consumers at farmers markets and farm stands, but some are directed toward the high-value restaurant and specialty-store market. Some are sold as organic potato seed. Organic potatoes generally demand a much higher value in the marketplace, usually two to three times that of conventional potatoes. The premium rewards the farmer for more expensive inputs and greater management demands.

In the marketplace, consumers commonly buy organic potatoes to avoid perceived pesticide residue and some chemical treatments. However recent surveys have shown that many consumers are also aware of and support the values of organic production that include taking care of the soil and protecting the environment. Organic potatoes command

a premium price because consumers recognize and are willing to pay for the direct and indirect benefits of organic farming practices.

Organic production is based on soil husbandry practices that build reservoirs of plant nutrients, increase the level of organic matter and biological activity in the soil, and improve soil structure. A key practice on organic farms is crop rotation out of potatoes into green manures that build the soil. Other practices include adding recycled organic matter to the soil such as crop residues, compost, and livestock manures. Pesticides are avoided as much as possible because they can disrupt beneficial biological activity. These practices are required – and





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synthetic pesticides and fertilizers are regulated – by USDA National Organic Program standards.

This bulletin is an introduction to the key practices of organic potato production. It is a basic guide to organic soil care and pest management. All of our recommendations meet National Organic Program standards. If you are interested in managing soil sustainably, protecting the environment, and receiving a premium in the market-place for your efforts, read on and see if organic potato production is for you.

Soil

A soil test should be one of the first steps in potato production. Standard soil tests will provide basic information on the chemical condition of the soil and level of organic matter. Soil tests by the University of Maine will provide specific recommendations for the production of organic potatoes. While not required, a soil test is highly advisable.

Potatoes will grow in many types of soils but prefer fertile, well-drained soils. Heavy, wet soils with poor drainage tend to cause tuber rot problems. Current organic certification standards require a crop rotation between potato crops. This helps control soil-borne pathogens such as *Rhizoctonia* and *Verticillium*. Growers must rotate to manage the soil, pests, and pathogens. Longer rotations provide greater benefits – four-year rotation with a soil-building cover crop is ideal. Pay attention to rotation crop choices to help break pest cycles.

Maine has many acidic soils. The measure of soil acidity is the pH. Potatoes do well across a wide range of pH, but a soil pH of 5.3 to 6.0 is typical for potato production in Maine. The addition of lime to soil can be used to raise the pH above 5.0. A soil test will provide a

recommendation for wood ash or lime. The best time to incorporate wood ash or lime into the soil is in the fall, but this can also be done in the spring before planting. Better fertilizer efficiency is obtained at neutral (7.0) pH than at 5.3, but this higher pH is more conducive to scab, a disease caused by a soil-borne pathogen. Prepare for planting by plowing and disking the field to create a smooth seedbed.

Cutting and Storing Seed

Potatoes are traditionally produced from seed pieces. These are not true “seed,” but rather pieces of or whole potato tubers. Always plant certified seed. Certified seed has been specifically produced to be replanted under strict guidelines to ensure the health of the tubers. By Maine regulation, certified seed is required for plantings larger than one acre. Earlier generation seed is closer to tissue culture and more desirable.

Seed that is received before planting should be kept cool. Warm seed for seven to ten days before planting to encourage rapid sprout development. Many suitable varieties are available; let your markets determine the variety you plant.

Seed tubers that are less than two inches in diameter should be planted whole. Avoid seed smaller than one inch in diameter. If larger seed is used, cut it. Potato seed pieces should be blocky, must have at least one eye, and should weigh between 1 ³/₄ ounces and 2 ¹/₄ ounces. The fewer cut surfaces the better, as less energy is used by the seed piece to heal the cut surfaces. Make sure all cut surfaces are smooth. Any jagged or torn surfaces will invite seed-piece rot to occur. Seed pieces do not have to be healed; they can be freshly cut and planted into soil. If the seed is to be cut well before planting, store the cut seed in an area with temperatures of 50 to 55°F, and over 90 percent

Table 1. Analysis of common organic soil amendments

Source	N percent	P ₂ O ₅ percent	K ₂ O percent
Alfalfa meal	2 to 3	0	2
Compost	1 to 3	0 to 1	1 to 2
Fish meal	9 to 10	6	0
Kalinite	0	0	12
Kelp	0 to 1	0 to 1	4 to 13
Manure (dairy)	1 to 2	1	2 to 4
Manure (horse)	1 to 2	1	1 to 2
Manure (poultry)	2 to 5	5 to 6	2
Manure (rabbit)	2	1	1
Manure (sheep)	3 to 4	1	3 to 4
Manure (swine)	3 to 4	1	1
Rock phosphate *	0	20 to 30	0
Soybean meal	7	1	1
Sul-Po-Mag	0	0	22 (11 Mg)
Wood ash	0	0	5
Potassium sulfate	0	0	50 to 53 (17 S)

* As these are slow release, the University of Maine Soil Testing Service adjusts the required rate of these by the following factors; rock phosphate, increase the rate by 4. These adjustments are to correct a deficiency in the first growing season after application. For long-term adjustment or when this material has been applied in several sequential years, do not use the multiplication factor.

humidity, to allow the cut surfaces to heal. The healed seed pieces can then be held at low temperatures.

“Pipping” or “green sprouting” can be used to encourage early production. Green sprouting can produce short stubby sprouts that emerge quickly and set tubers early. To green-sprout tubers, spread seed tubers out in a single layer in an area exposed to light. This can be done on a floor indoors or out, or in trays that can be stacked, as long as the temperature doesn’t drop below freezing.

Temperatures up to 70°F, with high humidity, produce ideal conditions to green-sprout potatoes. Once sprouts reach about an eighth inch in length, reduce the temperature to around 50°F. This will encourage the sprouts to be green and thick. In reality, many places in a barn or garage during early spring will work well. Turn the potatoes over to encourage uniform sprouts.

Fertilizing

A soil test will provide site-specific recommendations for fertilization. Establish soil fertility before planting. Meet any initial needs for potassium, calcium, magnesium sulfur, and phosphorus with rock powders; then maintain them over the years with organic amendments. Meet nitrogen needs with crop rotations of legumes – residual nitrogen in other soil organic matter will help. Supplemental nitrogen, if needed, often comes from such sources as soybean meal, processed manures, or fish meal.

Table 1 on page 3 provides a guide to the analysis of some common organic soil amendments. Potatoes have high nitrogen and potassium requirements. Most organic potato producers in Maine should consider producing a crop with about 120 pounds of nitrogen, 25 pounds of phosphate (P_2O_5), and about 140 pounds of potash (K_2O) per acre.

Planting

Plant potato seed tubers when the soil warms to 50°F. Potatoes planted earlier in colder temperature soils may emerge a little earlier, but since they will sit in a cold, wet soil, they are susceptible to decay. Space seed from 8 to 18 inches within the row and 34 to 36 inches between rows (Table 2 gives seed requirements per acre).

Make a furrow four to six inches deep, and, after fertilization, place seed in the furrow and cover with two inches of soil. Hill the plants once they are about six inches tall by forming a mound onto the potato row. Avoid late cultivation as this may damage the potato roots and stolons. Up to three hillings may be needed to build a potato hill, depending on conditions. A good job of cultivation will control weeds between the potato rows,

but crop rotations should be designed as your main strategy against weeds. Get grass weeds under control before planting potatoes.

Pest Control

First and foremost, any pest control materials must meet the current standards approved by organic certification bodies. Check with MOFGA* or your certifier for up-to-date information on approved materials. Adherence to pest control practices will not only improve the potato yield; it will help protect the potato industry in Maine.

Weeds

Weeds compete with potato plants for water, nutrients, and light. Weeds can be quite a hindrance in harvest operations. Plan crop rotations to clean fields between potato crops. For very weedy fields, short periods of cover crops separated by fallow periods can be used to help kill perennial weeds and use up the seed bank. For example, plant oats in early spring, followed by buckwheat for the summer and then back to oats or a brassica crop for the fall cover. Separate these cover crops by a few weeks of fallow ground with periodic tilling to stimulate weed seed germination and subsequent killing.

Propane-fueled flammers have shown some promise in weed control. Mechanical weed removal is still the predominant means of weed control. While hand weeding has a place on a small scale, tillage is effective for larger operations. Preemergence cultivation tends to be risky, as the seed tubers and emerging potato sprouts are easily

* Maine Organic Farmers and Gardeners Association, PO Box 170, Unity, Maine 04988-0170; 207-568-4142; <http://www.mofga.org/>

Table 2. Seed tuber requirements

Row spacing in inches	Plant spacing in inches	1.75 oz seed cwt/acre	2.0 oz seed cwt/acre	2.25 oz seed cwt/acre	Seed pieces per acre
34	8	25.2	28.8	32.4	23,061
	9	22.4	25.6	28.8	20,499
	10	20.2	23.1	17.3	18,449
	11	18.3	21.0	26.0	16,772
	12	16.8	19.2	21.6	15,374
	14	14.4	16.5	18.5	13,178
	16	12.6	14.4	16.2	11,531
	18	11.2	12.8	14.4	10,249
36	8	23.8	27.2	30.6	21,780
	9	21.2	24.2	27.6	19,360
	10	19.1	21.8	24.5	17,424
	11	17.3	19.8	21.8	15,480
	12	15.9	18.2	20.4	14,520
	14	13.6	15.6	17.5	12,446
	16	11.9	13.6	15.3	10,890
	18	10.6	12.1	13.6	9,680

damaged. The best results are achieved when the soil is dry at the time of cultivation. Cultivation will dry the soil out. Cultivation performed under wet conditions will tend to compact soils and produce clods. Adjust the cultivator to throw soil around the base of the potato plants and bury weed seedlings. Use standard S tines for between-row cultivation. Up to three cultivations may be required. Avoid very late cultivations, as root pruning is likely to occur. Complete all cultivation and hilling by the time the plants are 10 inches high.

Early weed control is essential for good potato yields. The potato canopy should close within 30 to 45 days after planting. After this, canopy shading will reduce weed germination. Even plant

stands will improve weed shading. Try to keep weed seeds from external sources from entering your potato fields. Do not allow cover crops to set seed.

Insects

Locate potato fields a tenth to a quarter of a mile away from last year's potato crop, or at least as far as possible. This will reduce the movement of overwintered Colorado potato beetles into the new potato crop. Leafhoppers, European corn borers, and aphids occur each year, with very high populations some years. Flamers provide some control. Microbial, biological, botanical insecticides (rotenone, Bt, pyrethrum, neem, etc.) may be permitted in organic production, but only as a last resort.

Check with your certifier for up-to-date information on approved materials. Be sure to follow the University of Maine IPM scouting reports.

Diseases

Late blight and early blight are the two main disease threats to potato plants. Of the two, late blight is the real threat. Late blight can spread and affect potato production miles away. Late blight is a community disease that needs community-wide attention and response.

Sanitation is the best defense against late blight. Eliminate cull piles and control volunteer potato sprouting in the spring. These are the cheapest and best ways to reduce inoculum. While no potato varieties are immune, some varieties have some level of resistance to some races of the pathogen that causes late blight. Preventative copper sprays can be used for late blight control; copper oxide is the most common formulation. Copper is an ingredient in Bordeaux mixture, one of the earliest fungicides. Check with your certifier for up-to-date information on approved formulations of copper fungicides.

Copper is toxic to many forms of life and tends to accumulate in soils over extended use, so be sure to monitor copper levels in the soil.

Harvesting and Storing

Potatoes are traditionally harvested at the end of the growing season. At this time, temperatures have dropped and there has frequently been a frost. If the tops have not died, slash them off 14 to 21 days before harvest. Harvest potatoes with any implement that can lift the potatoes out of the soil without damaging them. Potatoes will bruise – handle them like eggs! Get harvested potatoes out of

the light to avoid greening. Select only intact and healthy potatoes for long-term storage. Don't store diseased or damaged potatoes. Store the harvested potatoes in a cool, moist, dark environment. Ideal storage conditions would be 38°F with 95 percent humidity. As this is not always available, a cool, damp basement usual does fairly well as long as the floor isn't prone to wetness. Maintaining tuber quality beyond two months of storage will require that you adhere carefully to ideal storage conditions.

A Growing Market

Potatoes require more attention than most vegetables, but can be grown in all parts of Maine. Organic potatoes in Maine are an industry that is increasing in scope and in value. Organic potatoes may bring a premium price in the marketplace, because many consumers understand that organic practices not only produce safe, high-quality food; they preserve topsoil and reduce pollution. Organically grown foods are flavorful and nutritious, which is why gourmet restaurants are increasingly seeking organic suppliers. Potatoes and Maine have a long tradition together, perhaps because potatoes can be stored for use during the long Maine winter. Organic potatoes and Maine may have a long tradition together as well.

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