
AGRICULTURAL ALTERNATIVES

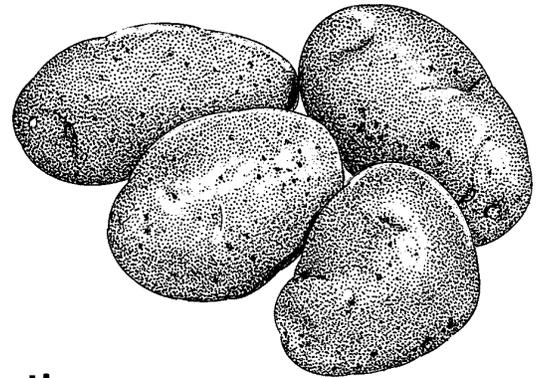
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Potato Production

Potatoes are a crop that can be grown and marketed quite successfully at the retail level, especially at local produce auctions, farm markets, and roadside stands. The diversity of potatoes is just beginning to be realized as more specialty potatoes with different skin or flesh colors are being grown and marketed. The use of different colors adds to the visual appeal of potatoes on display and can attract attention at a retail outlet.

Potatoes are the world's most important vegetable crop. The potato (*Solanum tuberosum*) originated in the Andean region of South America. Potatoes were brought to Spain from the mountains of Colombia by Spanish explorers and were marketed there as early as 1576. The potato was then introduced into Europe, where the Irish were the first to recognize it for its high food value. By the early 1600s potatoes became the staple food of the Irish, with the majority of the people depending on them for their existence. When late blight disease came to Ireland from America, it caused a national famine from 1845 to 1848 that resulted in the death of nearly one million people and the mass overseas migration of one million more. Late blight caused the death of the potato vines and decay of the tubers, resulting in a total loss of the crop.

Potatoes were introduced into the United States in 1719 from stock brought from Ireland and grown in Londonderry, New Hampshire. Today, the United States produces about 460 million cwt of potatoes annually on 1.3 million acres with an approximate value of \$3 billion. Pennsylvania produces approximately 3 million cwt on 14,000 acres each year, generating approximately \$21 million in gross receipts. The potatoes supply both the processing (primarily for potato chips) and fresh (or tablestock) markets.



Marketing

Potatoes grown for the fresh market are marketed in Pennsylvania from mid-July through late September if not stored and from mid-September until mid-May if held in storage. Potato varieties recommended for Pennsylvania are listed in Table 1. Fresh-market potatoes are sold loose, in containers, and in 3 lb to 50 lb paper or poly bags.

Five basic marketing alternatives are available to the potato grower: wholesale markets, producer cooperatives, local retailers (grocery stores), roadside stands, and restaurants. In wholesale marketing, producers negotiate price with the retail chain stores. Cooperatives such as the Pennsylvania Potato Growers Cooperative market potatoes to a wide variety of outlets. Local retailers (individual grocery stores) are another possibility, but you must take the time to contact produce managers and provide high-quality potatoes when the stores require them. Roadside stands (either your own or another grower's) provide opportunities to receive higher than wholesale prices for your potatoes, but you may have some additional expenses for advertising, building and maintaining a facility, and providing service to your customers. Some growers sell to local restaurants. Processors are not likely to contract with small acreage growers.

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Table 1. Recommended potato varieties for Pennsylvania.

POTATO VARIETY	SKIN COLOR	FLESH COLOR
Superior	white	white
Eva	white	white
Katahdin	white	white
Dark Red Norland	red	white
Chieftain	red	white
Yukon Gold	white	yellow
Norwis	white	light yellow
Kueka Gold	white	light yellow
Michigan Purple	purple	bright white
S45-5 (Cornell University)	purple	purple
S48-6 (Cornell University)	red	red

Production Considerations

Planting and Fertilization

Potatoes grow best in deep to moderately deep, loose, well-drained soils. The soil should have a pH of 5.5 to 6.5. The best method to determine lime and fertilizer requirements is by soil testing. Some factors to consider in the fertility program are the method of fertilizer application, crop use (fresh or processing), variety, length of the growing season, and manure applications. The fertility value of a legume crop grown the previous season should also be considered. Excess nitrogen fertilization delays maturity, while excess potassium greatly hinders the uptake of magnesium and reduces specific gravity. Magnesium is recommended when soil levels of magnesium are low or potassium levels are excessively high.

Use only certified seed or seed known to be free of virus diseases. Space seed pieces 7 to 12 inches apart in the row. Spacing varies with potato variety, soil type, amount of moisture available, fertility and the amount of fertilizer applied, and potato size desired at harvest time. The amount of nitrogen applied can range from 160 to 200 lbs/A depending on the variety. Cultivation is often recommended to break the soil crust, promote aeration, and kill the first flush of weeds not controlled by herbicides. Later the potatoes should have soil ridged over the rows (“hilled”) to prevent greening and to control weeds in the row. When hilling is delayed, be careful to minimize root damage caused by tillage. Hilling should be completed before the potatoes start to bloom. Potatoes are typically fertilized twice; first at planting when a band of fertilizer is placed along side the row and later when the plants are sidedressed during cultivation or at hilling.

A production system that uses plastic mulches and drip irrigation can be used quite successfully to grow potatoes.

The advantages are earlier production and high yields of quality potatoes. This system is best suited for smaller growers (1–5 acres of potatoes) growing for high-end markets such as specialty food stores, roadside markets, and restaurants.

Pest Control

Weed control can be achieved with herbicides, plastic mulch, and crop rotation. Several preplant and postemergence herbicides are available for potatoes, depending on the specific weed problem and potato growth stage. Early cultivation can help minimize weed problems.

Several insects can cause severe problems in potatoes. Colorado potato beetles, flea beetles, aphids, leaf-hoppers, wireworms, and corn borers all attack potatoes. Monitoring insect populations by scouting is critical in determining when you should use insecticides and which materials you should spray. Some of the newer insecticides are put down at planting.

Several potato diseases can cause severe crop losses if not properly managed. These include early blight, late blight, scab, blackleg, leafroll and mosaic viruses, rhizoctonia, verticillium wilt, fusarium dry rot, and bacterial soft rot. Help control diseases by using disease-resistant varieties, having a good crop-rotation program, and proper use of and timing of fungicides. It is also important to be aware when weather conditions are favorable for the spread of certain diseases such as late blight.

Harvest and Storage

Depending on the variety grown, potatoes are generally harvested from mid-July through October in Pennsylvania. Care should be taken to prevent bruising potatoes during harvesting, storing, grading, and marketing. Potatoes are harvested when they are mature or when the skins are set. In any case, harvest when the air and soil temperatures are above 45°F.

When storing potatoes, ventilation, storage temperatures, and relative humidity are important factors to consider. Storage conditions during the first 10 to 14 days are critical to heal cuts and bruises in newly harvested potatoes and to have a high-quality crop to market. Make sure there is good air movement, a temperature about 65°F, and high relative humidity (85 to 90%) in the potato storage during this period. Temperature should then be reduced very slowly (one degree per day) to the final storage temperature. Potatoes stored longer than three months for the fresh or tablestock market should be held at 38–40°F. Maintain relative humidity at 85 percent or higher to help prevent shrinkage, pressure bruising, and to keep the potatoes firm. When building a new potato storage or renovating an older facility, it is advisable to consult an agricultural engineer who is familiar with the construction of potato storages.

Budgeting

The sample budget included in this publication summarizes the costs and returns for tablestock potato production. This budget should help ensure that you include all costs and receipts in your calculations. Costs and returns are often difficult to estimate in budget preparation because they are numerous and variable. Think of this budget as an approximation and make appropriate adjustments using the “your estimate” column to reflect your specific production conditions. More information on using crop budgets can be found in *Agricultural Alternatives: Enterprise Budget Analysis*.

Prepared by William J. Lamont Jr., associate professor of horticulture, Jayson K. Harper, professor of agricultural economics, and George L. Greaser, senior research associate in agricultural economics.

For More Information

Brook, R. C., R. J. Fick, and T. D. Forbush. *Potato Storage Design and Management*. East Lansing, MI.: Michigan State University Agricultural Engineering Information Series. AEIS#627. 1995.

Christ, B. J. *Potato Diseases in Pennsylvania*. Pennsylvania College of Agricultural Sciences, University Park, PA. 1998.

Dunn, J. W., J. K. Harper, and G. L. Greaser. *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers*. University Park, PA: Penn State Cooperative Extension, 2000.

Greaser, G. L. and J. K. Harper. *Agricultural Alternatives: Enterprise Budget Analysis*. University Park, PA: Penn State Cooperative Extension, 1994.

Lamont, W. J., A. R. Jarrett, G. L. Greaser, and J. K. Harper. *Agricultural Alternatives: Irrigation for Fruit and Vegetable Production*. University Park, PA: Penn State Cooperative Extension, 2001.

Maynard, D. N. and G. J. Hochmuth. *Knott's Handbook for Vegetable Growers 4th Ed.*, New York, NY: John Wiley & Sons, Inc. 1997.

Orzolek, M. D., P. A. Ferretti, W. J. Lamont, K. Demchak, A. A. MacNab, J. M. Halbrendt, S. J. Fleischer, Z. Smilowitz and W. Hock. *2001 Pennsylvania Commercial Vegetable Production Recommendations*. University Park, PA: Penn State Cooperative Extension, 2001.

Rowe, Randall. editor. *Potato Health Management*. St. Paul, MN: APS Press, 1993.

Sieczka, J. B. and R. E. Thornton. *Commercial Potato Production in North America*. Orono, ME: The Potato Association of America Handbook, 1992.

Weisz, R., Z. Smilowitz, M. Saunders, and B. Christ. *Integrated Pest Management for Potatoes*. University Park, PA: Penn State Cooperative Extension, 1995.

Associations

Pennsylvania Cooperative Potato Growers, Inc., 3107 North Front Street, Harrisburg, PA 17110-1310. (717) 232-5200.

Pennsylvania Vegetable Growers Association, RR1, Box 947, Richfield, PA 17086-9626. (717) 473-8468.

Web sites

Nebraska Potato Eyes: <http://www.panhandle.unl.edu/peyes.htm>

Potato Educational Guides: <http://www.panhandle.unl.edu/potato/>

Global Potato News: <http://www.potatonews.com>

International Potato Center: <http://www.cipotato.org>

Maine Potato Board: <http://www.mainepotatoes.com>

Michigan State University: <http://www.msue.msu.edu/msue/imp/modc4/51795003.html>

National Potato Council: <http://www.npcspud.com>

Oregon State University: <http://www.orst.edu/dept/botany/epp/guide/index/P.html>

Oregon State University, Potato Research and Extension: <http://www.css.orst.edu/coarc>

Potato Association of America: <http://www.potato.tamu.edu/variety/paa.htm>

Potato Engine: <http://www.potatoengine.com/thinkpotato.html>

Potato Information Exchange: <http://www.css.orst.edu/potatoes/main.htm>

Potato Research Online: <http://www.potatoresearch.com>

University of Idaho: <http://www.uidaho.edu/ag/plantdisease/plbstem.htm>

European Association for Potato Research (EAPR): <http://www.agro.wau.nl/eapr>

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Tablestock Potato Budget

Summary of estimated costs per acre, Pennsylvania 2001.

Item	Quantity	Unit	Price	Total	Your Estimate
Variable costs					
Custom					
Applying calcium lime	0.5	ton	\$25.00	\$12.50	_____
Fertilizer					
Nitrogen	200.0	pound	\$0.27	\$54.00	_____
Phosphorus	150.0	pound	\$0.28	\$42.00	_____
Potassium	150.0	pound	\$0.15	\$22.50	_____
Fungicides					
Bravo ZN	0.50	gal	\$37.95	\$18.98	_____
Manzate 200 DF	14.00	lb	\$2.75	\$38.50	_____
Tops Potato Dust	20.00	lb	\$1.70	\$34.00	_____
Herbicides					
Diquat	0.25	gal	\$86.90	\$21.73	_____
Lexone/Sencor 75DF	0.66	lb	\$18.50	\$12.21	_____
Matrix	1.00	oz	\$11.25	\$11.25	_____
Insecticides					
Admire 2F	0.13	gal	\$581.00	\$72.63	_____
Lannate LV	0.25	gal	\$49.00	\$12.25	_____
Monitor 4E	0.25	gal	\$79.70	\$19.92	_____
Sevin XLR	0.13	gal	\$26.95	\$3.37	_____
Other variable costs					
MH-30	2.00	gal	\$15.00	\$30.00	_____
Sticker/spreader	32.00	oz	\$0.25	\$8.00	_____
Surfactant	16.00	oz	\$0.15	\$2.40	_____
Potato seed	20.00	cwt	\$12.50	\$250.00	_____
Labor					
Machinery operation	5.85	hour	\$12.00	\$70.20	_____
Harvest	12.00	hour	\$10.00	\$120.00	_____
Seed cutting	2.00	hour	\$10.00	\$20.00	_____
Storing, grading, and packing	20.00	hour	\$10.00	\$200.00	_____
Fuel	19.56	gal	\$1.20	\$23.47	_____
Repair and maintenance					
Tractors	1.00	acre	\$10.78	\$10.78	_____
Implements	1.00	acre	\$64.22	\$64.22	_____
Interest charge	1.00	acre	8%	\$32.25	_____
<i>Total variable cost</i>				\$1,210.16	_____
Fixed costs					
Tractors	1.00	acre	\$23.79	\$23.79	_____
Implements	1.00	acre	\$106.11	\$106.11	_____
Land charge	1.00	acre	\$50.00	\$50.00	_____
Potato storage	1.00	acre	\$100.00	\$100.00	_____
Grader/washer	1.00	acre	\$110.00	\$110.00	_____
<i>Total fixed cost</i>				\$389.90	_____
Total cost				\$1,600.06	_____

Net returns for five different yields and prices.

Potato prices	Potato yield (cwt/A)				
	150	200	250	300	350
\$6	-\$700	-\$400	-\$100	\$200	\$500
\$8	-\$400	\$0	\$400	\$800	\$1,200
\$10	-\$100	\$400	\$900	\$1,400	\$1,900
\$12	\$200	\$800	\$1,400	\$2,000	\$2,600
\$14	\$500	\$1,200	\$1,900	\$2,600	\$3,300