
AGRICULTURAL ALTERNATIVES

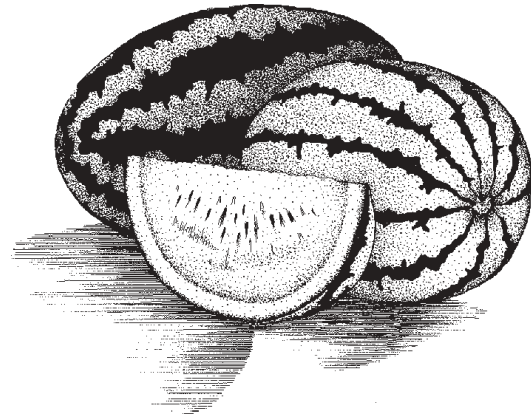
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Watermelon Production

Watermelons are a crop that lend themselves well to small-scale and part-time farming operations. There are multiple markets for growers with 5 acres or less, and many field operations, such as land preparation, planting, and harvesting, can be custom hired.

Watermelons are a member of the cucurbitaceae family, which includes squash, pumpkins, cucumbers, muskmelons, and gourds. Individual plants produce both male and female flowers, and fruit size varies from 5 to 40 pounds, depending on variety. Fruit shape and appearance are quite varied, ranging from round to cylindrical and a single color to various striped patterns on the fruit surface.

The culture of watermelons goes back to prehistoric times. The watermelon was cultivated in ancient Egypt and was verified by David Livingstone (the noted missionary-explorer) in the 1850s. He found great tracts of watermelon (called kengwe) growing wild in the Kalahari desert and semi-tropical regions of Africa. In semi-desert regions of Africa watermelons are still cultivated as an important source of water during dry periods. Watermelons were widely distributed throughout the remainder of the world by African slaves and European colonists. It was carried to Brazil, the West Indies, eastern North America, islands of the Pacific, New Zealand, and Australia. Written records indicate that watermelons were cultivated in Massachusetts as early as 1629, before 1664 by the Florida Indians, in 1747 in Connecticut from seeds that originated in Russia, in 1799 by Indian tribes along the Colorado River, and in 1822 in Illinois. Watermelons are currently grown on all continents throughout the warm regions of the globe.



Most of the watermelons harvested in the U.S. are sold as fresh produce. In 2002, the U.S. produced 150,000 acres of watermelons with a value of \$328 million. (USDA's National Agricultural Statistical Service bases value of production on total acres harvested times average price.) Pennsylvania produces around 400 acres of watermelons, valued at approximately \$1.2 million annually.

Marketing

Fresh market watermelons are produced in Pennsylvania from the end of July to the end of September. Watermelon cultivars recommended for Pennsylvania are listed in Table 1. Fresh market watermelons usually are sold loose in bulk containers or in 800-pound cardboard bins.

Five basic marketing alternatives are available to the watermelon grower: wholesale markets, cooperatives, local retailers (grocery stores), roadside stands, and pick-your-own operations. In wholesale marketing, producers often contract with shippers to market and ship their watermelons for a

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predetermined price. If you do not use a contractor and ship your crop to the wholesale market yourself, your product will be subject to the greatest price fluctuations. Marketing cooperatives generally use a daily pooled cost and price, which spreads price fluctuations over all participating producers. Local retailers are another possible market, but you must take the time to contact produce managers and provide high-quality watermelons when stores require them. Roadside stands (either your own or another grower's) and pick-your-own operations provide opportunities to receive higher than wholesale prices for your watermelons, but you may have some additional expenses for advertising, building and maintaining a facility, and providing service to your customers. With pick-your-own operations you save on harvest costs, but you must be willing to accept some waste. For more information on marketing, consult *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers*.

Table 1. Recommended watermelon varieties for Pennsylvania.

VARIETY	AVERAGE DAYS TO MATURITY	AVERAGE FRUIT SIZE—LBS
SEEDED		
Baby Doll® (yellow icebox)	70	10 to 15
Mickylee (icebox)	82	8 to 10
Regency® (FR)	82	18 to 22
Crimson Sweet (AFR, OS)	85	15 to 25
Sangria®	87	22 to 26
Royal Majesty® (FR)	90	up to 30
SEEDLESS		
Millennium® (FR, AR, OT)	78	16 to 20
Freedom® (oblong; OT)	80	16 to 22
Genesis® (FR)	82	up to 15
Tri-X 313® (OT)	85	15 to 18
Triple Crown®	85	15 to 18
Orange Sunshine (deep orange)	85	16 to 20
Millionaire® (OT)	92	18 to 22

FR = Fusarium resistant.
 AR = Anthracnose resistant.
 OS = ozone sensitive.
 OT = ozone tolerant.

Note: Seedless (triploid) watermelons produce fruits having few if any true seeds. Immature, white seed coats and, under certain conditions, a few dark seeds may be present in the fruit.

Production Considerations

Watermelons grow best on soils that hold water well and have good air and water infiltration rates. Soil should have a pH of 5.8 to 6.6. Watermelons are sensitive to cold temperatures, and even a mild frost can severely injure the crop. The best average temperature range for watermelon production during the growing season is between 65° and 95°F. Temperatures above 95°F or below 50°F will slow the growth and maturation of the crop. Watermelons require a constant supply of moisture during the growing season. However, excess water at any time during crop growth, especially as fruit reaches maturity, can cause the fruit to crack, which will reduce crop yields and fruit quality.

Planting and Fertilization

Growers generally transplant approximately 2,800 to 4,400 plants per acre in single rows 5 to 8 feet apart on plastic-mulched beds with 24 to 36 inches between plants in the row. Fertilizer rates should be based on annual soil test results. If you are unable to conduct a test, the recommended N-P-K application rates are 40-50-50 pounds per acre banded at planting and 30-50-50 pounds per acre injected during irrigation, applying no more than 5 to 7 lbs nitrogen per application.

In recent years, the production of seedless (triploid) watermelons has equaled or surpassed the production of seeded (diploid) watermelons in Pennsylvania. Commercially produced watermelons (seeded and seedless) generally are started as transplants in the greenhouse 18 to 24 days prior to planting in the field. However, growing seedless watermelon transplants is more difficult than seeded varieties because of difficulties in germinating the seed. The key to success in germinating seedless watermelons is warm soil and limited watering. Water the planting media thoroughly the afternoon before planting, then do not water again until plants emerge. Soil temperature in the transplant containers should be maintained at 75° to 90°F from seeding through early seedling growth. Because watermelons are a warm-season crop, they should not be transplanted until the soil temperature 3 inches beneath the soil surface reaches 60°F. Watermelons grow best on raised beds covered with black, green IRT, or silver plastic mulch, with drip tape buried 2 to 3 inches below the soil surface. Watering the plants with drip irrigation ensures optimum plant growth and yields and allows growers to apply fertilizer during the growing season. For more information on crop irrigation, consult *Agricultural Alternatives: Irrigation for Fruit and Vegetable Production* and *Agricultural Alternatives: Drip Irrigation for Vegetable Production*.

Pollination

For seedless watermelon production, a pollinator variety is required. Using a seeded watermelon variety with a distinctly different shape or appearance from the seedless variety allows for easy sorting at harvest. Pollinators can be planted in rows with every third and outside row being the seeded variety. The pollinator can also be intermingled in the row with every third or fourth plant being the seeded variety. A large honeybee population is essential for pollination and fruit set. One hive per acre is recommended for maximum fruit production. Avoid applying insecticides when pollinating insect populations, especially honeybees, are active in the field.

Pest Management

Weed control can be achieved with herbicides, plastic mulch, and a good crop-rotation system. Several preplant and postemergence herbicides are available for watermelons, depending on the specific weed problem and the growth stage of the watermelons. If weed infestation levels are low, early cultivation (prior to vine running) can help reduce weed problems. Insects are a major problem in watermelon production. Cucumber beetle, aphids, seed corn maggot, leafminers, and rindworms (cucumber beetle larvae) all can cause crop losses. Monitoring insect populations with traps and scouting will help you determine when to apply pesticides and how often to spray. Several watermelon diseases can cause crop losses, including bacterial fruit blotch, fusarium wilt, powdery mildew, downy mildew, and gummy stem blight. Viruses such as cucumber mosaic (CMV), squash mosaic (SqMV), and watermelon mosaic (WMV-1,2) also present a problem for the grower. Using disease-resistant varieties, fungicides, and crop rotation are options for managing disease and virus problems in watermelons.

Harvest and Storage

Watermelons are hand harvested at full maturity for best taste and texture. Indicators of watermelon fruit maturity include a yellow spot on the fruit surface in contact with soil or plastic mulch, a brown, dried tendril where the fruit stem is joined to the watermelon vine and a dull surface on top of the fruit. Because individual fruits are pollinated at different times, multiple harvests are usually necessary. After harvest, growers should sort watermelons by size and check for maturity and pest damage to ensure marketing of a high-quality product. Cooling the watermelons after harvest to 45° to 50°F removes field heat, which improves shelf life and taste. Watermelons will retain good quality for approximately 21 to 28 days if stored at 85 to 90 percent humidity and 47° to 55°F.

Budgeting

Included in this publication is an annual fresh market watermelon production budget. This budget utilizes custom hire for most of the field work, which could be more economical for small-acreage growers. Farmers who own equipment should substitute their equipment costs for custom hire costs. The budget summarizes the receipts, costs, and net returns of a watermelon enterprise. This sample budget should help ensure that all costs and receipts are included in your calculations. Costs and returns are often difficult to estimate in budget preparation because they are numerous and variable. Therefore, you should think of these budgets as an approximation and make appropriate adjustments in the “Your Estimate” column to reflect your specific production and resource situation. More information on the use of crop budgets can be found in *Agricultural Alternatives: Enterprise Budget Analysis*.

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For more information

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Pennsylvania Commercial Vegetable Production Guide (AGRS-28). Penn State College of Agricultural Sciences, 2002.

Sackett, C. "Watermelons." *Fruit & Vegetable Facts & Pointers*. Alexandria, Va.: United Fresh Fruit and Vegetable Association, 1975, 4th revision. 20 pp.

Associations

Pennsylvania Vegetable Growers Association, RR 1,
Box 392, Northumberland, PA 17857-9723

Web sites

University of Delaware, Watermelon Production Guide for Delaware and Maryland

<http://www.rec.udel.edu/veggie/watermelon/watermelonproductionguide.htm>

Purdue University, Diseases and Pests of Muskmelons and Watermelons

<http://www.agcom.purdue.edu/AgCom/Pubs/BP/BP-44.html>

Purdue University, Watermelon: Marketing and Production Opportunities for Indiana

<http://www.agcom.purdue.edu/AgCom/Pubs/HO/HO-210.html>

Mississippi State University, Crops: Vine Crops

<http://msucares.com/crops/comhort/vine.html>

Watermelon Budget (15 lb. average weight)

Summary of Estimated Costs and Returns per Acre

Item	Quantity or number of operations	Unit	Price	Total	Your Farm
Variable costs					
Custom					
Applying calcium lime	0.5	ton	\$20.00	\$10.00	_____
Scouting for pests	6	times over/acre	\$10.00	\$60.00	_____
Pest control including labor	6	times over/acre	\$7.20	\$43.20	_____
Bee rental	1	acre	\$25.00	\$25.00	_____
Fertilizer					
Nitrogen	70	pound	\$0.22	\$15.40	_____
Phosphorus	100	pound	\$0.28	\$28.00	_____
Potassium	100	pound	\$0.15	\$15.00	_____
Herbicide					
Gramoxone extra	0.1875	gallon	\$29.30	\$5.49	_____
Curbit	0.1875	gallon	\$44.00	\$8.25	_____
Fungicides					
Ridomil Gold	2	pound	\$12.34	\$24.68	_____
Fixed Copper	1.5	pound	\$2.59	\$3.89	_____
Bravo Ultrex	2	pound	\$8.58	\$17.16	_____
Benlate SP	1	pound	\$16.99	\$16.99	_____
Insecticide					
Asana XL	0.069	gallon	\$111.00	\$7.66	_____
Agri-Mek	0.125	gallon	\$706.00	\$88.25	_____
Admire	0.18	gallon	\$561.00	\$100.98	_____
Other variable costs					
Plowing	1	times over/acre	\$11.80	\$11.80	_____
Disking and harrowing	1	times over/acre	\$11.40	\$11.40	_____
Cultivating	3	times over/acre	\$8.30	\$24.90	_____
Black, embossed, or silver mulch	1	acre	\$250.00	\$250.00	_____
Drip irrigation (tape and labor)	1	acre	\$150.00	\$150.00	_____
Watermelon transplants	3.6	thsd	\$50.00	\$180.00	_____
Labor	15	hour	\$10.00	\$150.00	_____
Marketing and advertising	1	acre	\$50.00	\$50.00	_____
Hand harvesting	1	acre	\$450.00	\$450.00	_____
Packing, grading	1	acre	\$135.00	\$135.00	_____
Cardboard bins (800 lb.)	65	cartons	\$4.00	\$260.00	_____
Fuel	10.21	gallon	\$1.10	\$11.23	_____
Repair and maintenance					
Tractors and implements	1.0	acre	\$15.00	\$15.00	_____
Interest charge	1.0	acre	9.5%	\$103.04	_____
<i>Total variable cost</i>				\$2,272.32	_____
Fixed costs					
Tractors	1.0	acre	\$15.86	\$15.86	_____
Implements	1.0	acre	\$12.32	\$12.32	_____
Drip irrigation	1.0	acre	\$500.00	\$500.00	_____
<i>Total fixed cost</i>				\$528.18	_____
Total costs				\$2,800.50	_____

Net returns for five different yields and prices

Price/melon	Yield (based on number of melons)				
	3,000	4,000	5,000	6,000	7,000
\$0.10	-\$2,500	-\$2,400	-\$2,300	-\$2,200	-\$2,100
\$0.30	-\$1,900	-\$1,600	-\$1,300	-\$1,000	-\$700
\$0.75	-\$550	\$200	\$950	\$1,700	\$2,450
\$1.00	\$200	\$1,200	\$2,200	\$3,200	\$4,200
\$1.25	\$950	\$2,200	\$3,450	\$4,700	\$5,950

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