Penn State **Extension**

AGRICULTURAL ALTERNATIVES

Pumpkin Production

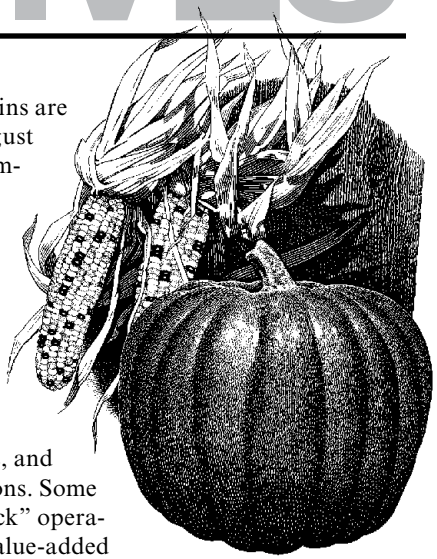
Pumpkins are a crop that lend themselves well to small-scale and part-time farming operations. Many marketing opportunities are available for small-scale growers.

Pumpkins are a member of the Cucurbitaceae family, which also includes squash, cantaloupes, cucumbers, watermelons, and gourds. The pumpkin is undoubtedly American in origin. Fragments of stems, seeds, and fruits of *C. pepo* and *C. moschata* have been identified and recovered from the cliff-dweller ruins of the southwestern United States. It is believed that *C. moschata* originated in the Mexican-Central American region and that *C. maxima* originated in northwestern South America. Cultivation of some of these pumpkins and squashes is almost as old as maize, and the presence in eastern Asia of distinct forms of squashes and pumpkins hints of distribution occurring in the sixteenth and seventeenth centuries.

Currently, production of pumpkin in the United States is more than 1 billion pounds annually, generating over $100 million in farm receipts from around 50,000 acres. Production in the northeastern United States is estimated at almost 25,000 acres.

Marketing

Pumpkins are grown throughout the northeastern United States, but production tends to be concentrated near population centers. Most pumpkins are sold in local markets or directly to consumers primarily for ornamental purposes, especially during the Halloween season. Depending on the cultivar grown, pumpkins are available from late August through October (recommended cultivars are listed in Table 1).



Five basic marketing alternatives are available to the pumpkin grower: wholesale markets, cooperatives, local retailers (grocery stores), roadside stands, and pick-your-own operations. Some farm stands and "U-Pick" operations have developed value-added activities such as hay rides and harvest festivals to boost sales. When pumpkins are shipped to the wholesale market, they are shipped in bulk bins or stacked loose in trailers.

In wholesale marketing, producers often contract with shippers to market and ship the pumpkins for a predetermined price. If you do not use a contractor and choose to ship your pumpkins to a wholesale market yourself, your product will be subject to the greatest price fluctuations. Produce auctions operate weekly; however, you must deliver the pumpkins to the auction. Marketing cooperatives generally use a 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 good-quality pumpkins when stores require them. For more information on marketing, consult *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers.*

Retail marketing options, including roadside stands (either your own or another grower's) and pick-your-own operations, provide opportunities for you to receive higher-than-wholesale prices for your pumpkins. You will have 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 have customers on your farm and accept some waste.

This publication was developed by the Small-scale and Part-time Farming Project at Penn State with support from the U.S. Department of Agriculture-Extension Service.

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Table 1. Recommended pumpkin cultivars.

Variety	Days to maturity	Fruit size (lb)
Apprentice* (hard-shell type)	90	<1
Munchkin	100	<1
Baby Boo (PVP, small, white fruit)	95	<1
Rockafellow*	95	2.5–3
Baby Pam (excellent for pies)	100	3–4
Snowball* (white)	90	1–2
Mystic Plus (PMT)	90	5–7
Hybrid Pam	95	5–7
Ironman (PMT, hard-shelled)	115	3–4
Magician* (PMR, ZYMV)	98	8–16
Magic Lantern*	100	16–24
Apollo* (PM)	100	18–32
Cotton Candy (white)	110	5–12
Sorcerer*	115	18–25
New Moon (white)	85	35–45
Hannibal*	95	18–25
Apogee* (PMR)	95	40–50
Gladiator* (PMT)	100	20–30
Aladdin* (PMT)	100	20–30
Solid Gold*	100	25–28
Growers Giant*	100	50–200
Monstar Smash	120	50–150
Prizewinner*	120	100–300
Ornamental types		
Bunch O' Warts	90	20–25
Rascal* (PMR, PR, WMV)	100	30–40
Knuckle Head*		

*Hybrid variety, powdery.
PVP = plant variety protection; PMT = powdery mildew tolerant; PMR = powdery mildew resistant; ZYMV = zucchini yellow mosaic virus resistant; PR = *Phytophora* resistant; WMV = watermelon mosaic virus resistant

Farmers' markets are another retail option, but you should contact the markets well in advance of the marketing season to be sure space is available and to find out what requirements you must follow. For more information about roadside markets, see *Agricultural Alternatives: Developing a Roadside Farm Market*.

Production Considerations

Plants can be annual or perennial vines and grow best under warm and moist conditions similar to their native semi-tropical to tropical climates. Both male and female flowers are produced on each plant and fruit shape, size, and appearance are quite variable, ranging from smooth and small (under 3 pounds) to ribbed and quite large (more than 90 pounds).

Site Selection

Pumpkins should be grown on soils that have good water infiltration rates and good water-holding capacity. If pumpkins are going to be grown on sandy soils, access to irrigation is important to obtain optimum plant growth, uniform fruit set, and development. Soil pH should be in the 5.8–6.6 range with minimum soil compaction. Pumpkins are very sensitive to cold temperatures (below 50°F) and plants and fruit will exhibit injury from even a slight frost. The best average temperature range for pumpkin production during the growing season is between 65 and 95°F; temperatures above 95°F or below 50°F slow growth and maturity of the crop. Pumpkins require a constant supply of available moisture during the growing season. Water deficiency or stress, especially during the blossom and fruit set periods, may cause blossoms and fruits to drop, resulting in reduced yields and smaller-sized fruits.

Planting and Fertilization

Pumpkins are generally seeded in the field during the first couple weeks of July. Since they are a warm-season crop, they should not be seeded until the soil temperature reaches 60°F three inches beneath the soil surface. Pumpkins seeded in cool soils may suffer from seed corn maggot injury. No-till pumpkins can be seeded with a no-till planter or transplanted in a minimally prepared bed with only secondary tillage such as an s-tine cultivator or in a previously tilled field without any tillage treatment, saving both time and labor. Because pumpkin seed germinates and develops optimally when soil temperatures are at least 60°F, early pumpkin production using no-till is difficult because of the cold soil temperatures. However, by mid- to late June, soil temperatures in a no-till field are warm enough for rapid pumpkin seed germination and growth. In addition, no-till reduces soil moisture loss early in the season and has more water available for pumpkin plant growth later in the season. If considering no-till pumpkin production, the following factors must be considered to be successful: variety, planting date, soil fertility practices, insect pressure and control, planting equipment, cover crop type and stand, and weed species and population distribution in the field.

Because pumpkins are a warm-season crop, they can also be grown as transplants on raised beds with black or silver plastic mulch and drip irrigation for optimum plant growth and yields. The use of plasticulture in the production of pumpkins will:

1) Increase soil temperature 8–12 degrees warmer than bare soil
2) Maintain soil water availability
3) Reduce weeds
4) Improve soil tilth
5) Reduce fertilizer and pesticide leaching under the bed

Use of drip irrigation also allows for fertilizer application (injection) throughout the growing season. Growing pumpkins using plasticulture will double the yield of pumpkins grown on bare soil or in no-till production.

Pumpkins are generally planted as single rows with 30–40 inches between plants in the row and 8–12 feet between rows, depending on plant type. Plant populations at these spacing are approximately 1,600 (for pumpkins in excess of 30 pounds) to 2,800 plants per acre (for pumpkins less than 8 pounds).

Fertilizer recommendations are based on soil test results, and soil tests should be taken every year. In absence of soil test results, recommended N-P-K application rates are

80-150-150 broadcast or 40-75-75 banded at planting. Soil calcium levels should be checked; if soils are testing low or low to medium in calcium and have not received any calcitic (calcium-based) lime applications, apply gypsum to the field in bands where rows will be planted prior to planting pumpkins. Gypsum will supply calcium to the soil without changing soil pH.

Pollination

Honey bees are important for proper, complete pollination and fruit set. One hive per acre is the recommended population of honey bees for maximum fruit production. Populations of pollinating insects may be adversely affected by insecticides applied to flowers or weeds in bloom.

Pest Control

Control of weeds can be achieved with a good crop rotation system and herbicides. Pumpkins can be competitive with weeds once they develop their mature canopy, if they are planted at high plant populations, or if they are planted on plastic mulch. There are several pretransplant and postemergence herbicides labeled for pumpkins, depending on specific weed problems requiring control and stage of pumpkin growth. In addition, under mild infestation levels, early cultivation (if possible prior to vine running) can minimize weed problems.

Insects can be a major problem in pumpkin production. Cucumber beetles, aphids, squash vine borer, seed corn maggot, squash bug, and spider mites have the potential to cause a reduction or loss of the marketable crop in any given year. Monitoring insect populations through scouting will help growers determine when they should start and stop spraying pumpkins and the intervals between applications.

Several diseases of pumpkin can cause a reduction in crop yields, especially bacterial wilt, viruses (powdery mildew, downy mildew), and scab. Optimum crop yields and fruit color may only be possible if a scheduled fungicide program is used to prevent leaf loss from mildews. Crop rotation, good soil and air drainage, and use of resistant varieties (where possible) can help reduce problems from these diseases in the field.

Many of the pesticides required for pumpkin production are restricted-use pesticides and require a pesticide license to purchase. Pesticide applicator tests are usually administered at county extension offices, so you should contact your local office for dates and times of these examinations. When using any pesticides in your enterprise, remember to follow all label recommendations regarding application rates and personal protection equipment (PPE) requirements. Also remember that any Worker Protection Standards (WPS) apply to the owner as well as to employees.

Harvest and Storage

Pumpkins are hand-harvested at their mature stage, color (orange or white), and size. Because fruit are pollinated at different times, multiple harvests over the field are quite common. Grading pumpkins for size, maturity, and pest damage before marketing is necessary to ensure a high-quality product. Maintaining pumpkin fruit in a dry, cool environment (a barn, for example) will help extend the shelf life of the crop and help maintain a nonshrunken fruit appearance.

Placing pumpkins in a well-ventilated storage area, preferably protected from rain, maintains healthy fruit for processing (pumpkin pie mix) or late sales of Jack-O-Lantern types. Pumpkins will retain good quality for approximately 2–3 months if stored at the appropriate relative humidity (50–70 percent) and temperature (50–55°F).

Environmental Impacts

In the normal course of operations, farmers handle pesticides and other chemicals, may have manure to collect and spread, and use equipment to prepare fields and harvest crops. Any of these routine on-farm activities can be a potential source of surface or groundwater pollution. Because of this possibility, you must understand the regulations you must follow concerning the proper handling and application of chemicals and the disposal and transport of waste. Depending on the watershed where your farm is located, there may be additional environmental regulations regarding erosion control, pesticide leaching, and nutrient runoff. Contact your soil and water conservation district, extension office, zoning board, state departments of agriculture and environmental protection, and your local governing authorities to determine what regulations may pertain to your operation.

Good Agricultural Practices and Good Handling Practices

Good agricultural practices (GAPs) and good handling practices (GHPs) are voluntary programs that you may wish to consider for your operation. The idea behind these programs is to ensure a safer food system by reducing the chances for foodborne illnesses resulting from contaminated products reaching consumers. Also, several major food distribution chains are beginning to require GAP- and GHP-certified products from their producers. These programs set standards for worker hygiene, use of manure, and water supply quality.

These practices require an inspection from a designated third party and there are fees associated with the inspection. Prior to an inspection, you will need to develop and implement a food safety plan and designate someone in your operation to oversee this plan. You will need to have any water supply used by your workers or for crop irrigation and pesticide application checked at least twice each year. A checklist of the questions to be asked during the inspection can be found at **www.ams.usda.gov/fv/gapghp.htm**. For more information about GAPs and GHPs, contact your local extension office or your state's department of agriculture.

Risk Management

You should carefully consider how to manage risk on your farm. First, you should insure your facilities and equipment. This may be accomplished by consulting your insurance agent or broker. It is especially important to have adequate levels of property, vehicle, and liability insurance. You will also need workers' compensation insurance if you have any

employees. You may also want to consider the necessity for life and health insurance and whether you need coverage for business interruption or employee dishonesty. For more on agricultural business insurance, see *Agricultural Alternatives: Agricultural Business Insurance*.

Second, check to see if there are multiperil crop insurance programs available for your crop or livestock enterprises. There are crop insurance programs designed to help farmers manage both yield risk and revenue shortfalls. However, individual crop insurance coverage is not available for all crops. If individual coverage is not available for what you grow, you may be able to use the AGR/AGR-Lite program to insure the revenue of your entire farm operation. To use AGR-Lite you must have 5 years of Internal Revenue Service (IRS) Schedule F forms. For more information concerning crop insurance, contact a crop insurance agent or check the Pennsylvania crop insurance education website at extension.psu.edu/crop-insurance.

Finally, the USDA Farm Service Agency has a program called the Non-insured Assistance Program (NAP), which is designed to provide a minimal level of yield risk protection for producers of commercial agricultural products that don't have multiperil crop insurance coverage. NAP is designed to reduce financial losses when natural disasters cause catastrophic reduction in production. NAP coverage is available through your local USDA Farm Service Agency office. The application fee for this program may be waived for eligible limited-resource farmers.

Sample Budget

Included in this publication are two production budgets for irrigated pumpkins, one using no-till and the other using plasticulture. These budgets utilize custom hire for most of the fieldwork, which could be more economical for small-acreage growers. Producers who own equipment should substitute equipment costs for custom-hire costs. These budgets summarize the receipts, costs, and net returns of a pumpkin enterprise. The 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" columns 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*.

For More Information

Publications

American Vegetable Grower, Centennial Edition. Willoughby, Ohio: Meister Publishing, 2007.

Dunn, J., J. K. Harper, and L. F. Kime. *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers.* University Park: Penn State Cooperative Extension, 2009.

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Hardenburg, R. E., A. E. Watada, and C. Y. Wang. "The Commercial Storage of Fruits and Nursery Stocks." Agricultural Handbook Number 66 (USDA-ARS). Washington, D.C.: Superintendent of Documents, Government Printing Office, 1986.

Jarrett, A. R., B. L. Goulart, G. L. Greaser, and J. K. Harper. *Agricultural Alternatives: Irrigation for Fruit and Vegetable Production.* University Park: Penn State Cooperative Extension, 1995.

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MacNab, A. A., A. E. Sherf, and J. K. Springer. *Identifying Diseases of Vegetables.* University Park: Penn State College of Agricultural Sciences, 1994.

Maynard, D. M., and G.L. Hochmuth. *Knott's Handbook for Vegetable Growers.* 5th ed. New York: John Wiley and Sons, 2007.

Pennsylvania Commercial Vegetable Production Guide. University Park: Penn State College of Agricultural Sciences, 2012.

Association

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

Initial resource requirements: **No-till Production**

- Land: 1 acre
- Total labor: 20–30 hours per year
- Capital
  Annual production and harvest costs: $4,800–5,250
  Existing equipment and capital: $2,000–3,500
- Equipment needs: tractor (40–60 hp) with loader, no-till planter, and boom sprayer

Initial resource requirements: **Plasticulture Production**

- Land: 1 acre
- Total labor: 20–30 hours
- Capital
  Annual production and harvest costs: $4,500–5,000
  Existing equipment and capital: $2,000–3,500
- Equipment needs: tractor (40–60 hp), mulch layer, transplanter, boom sprayer, and wagon

Sample Budget Using No-till Planting

Summary of estimated costs per acre and selling wholesale.

Item	Number of operations	Unit	Price	Total	Your estimate
Variable costs					
Custom					
Soil Test	1	kit	$10.00	$10.00	
Applying calcium lime	0.5	ton	$12.20	$12.20	
Pest scouting	1	acre	$35.00	$35.00	
Fertilizer spreading	1	acre	$ 9.85	$ 9.85	
Bee rental	1	acre	$75.00	$75.00	
No-till planting	1	acre	$20.50	$20.50	
Fertilizer/lime	1	acre	$112.50	$112.50	
Herbicide	1	acre	$156.50	$156.50	
Fungicides	1	acre	$344.25	$344.25	
Insecticide	1	acre	$94.12	$94.12	
Drip tape	7,260	feet	$0.03	$217.80	
Trickle operating	15	inches	$20.00	$300.00	
Pumpkin seed	1.362	thsd.	$59.93	$81.62	
Operator labor					
Tractors	4.75	hour	$15.00	$71.25	
Harvest labor	100	hour	$12.00	$1,200.00	
Bulk containers	34	containers	$24.98	$849.32	
Diesel fuel	40.76	gallon	$4.00	$163.04	
Repairs and maintenance					
Tractors	1	acre	$31.10	$31.10	
Implements	1	acre	$66.27	$66.27	
Interest on operating capital	1	acre	$67.89	$67.89	
Marketing	10%	sales	$3,780.00	$378.00	
Total variable costs				$4,286.21	
Fixed costs					
Tractors	1	acre	$65.06	$65.06	
Implements	1	acre	$165.08	$165.08	
Land charge	1	acre	$200.00	$200.00	
Total fixed costs				$430.14	
Total costs				**$4,716.35**	

Pumpkins sold wholesale in containers.

Returns above total costs for various price and yield combinations for retail wholesale production.

Price Received ($/lb)	Yield (lb/A) 24,000	25,000	26,000	27,000	28,000	29,000	30,000
$0.15	$(1,419.77)	$(786.55)	$(726.45)	$(666.35)	$(606.26)	$(546.16)	$(486.06)
$0.17	$(939.77)	$(286.55)	$(206.45)	$(126.35)	$(46.26)	$33.84	$113.94
$0.19	$(459.77)	$213.45	$313.55	$413.65	$513.74	$613.84	$713.94
$0.21	$20.23	$713.45	$833.55	$953.65	$1,073.74	$1,193.84	$1,313.94
$0.23	$500.23	$1,213.45	$1,353.55	$1,493.65	$1,633.74	$1,773.84	$1,913.94
$0.25	$980.23	$1,713.45	$1,873.55	$2,033.65	$2,193.74	$2,353.84	$2,513.94

Returns above total costs for various price and yield combinations for retail market production.

Price Received ($/lb)	Yield (lb/A) 24,000	25,000	26,000	27,000	28,000	29,000	30,000
$0.15	$(1,009.81)	$(952.37)	$(894.92)	$(837.48)	$(780.04)	$(722.59)	$(665.15)
$0.20	$190	$298	$405	$513	$619.96	$727.41	$834.85
$0.25	$1,390	$1,548	$1,705	$1,863	$2,019.96	$2,177.41	$2,334.85
$0.30	$2,590	$2,798	$3,005	$3,213	$3,419.96	$3,627.41	$3,834.85
$0.35	$3,790	$4,048	$4,305	$4,563	$4,819.96	$5,077.41	$5,334.85
$0.40	$4,990	$5,298	$5,605	$5,913	$6,219.96	$6,527.41	$6,834.85

Sample Budget Using Plasticulture

Summary of estimated costs per acre and selling retail.

Item	Number of operations	Unit	Price	Total	Your estimate
Variable costs					
Custom					
Soil test	1	kit	$10.00	10.00	
Applying calcium lime	0.5	ton	$12.20	$12.20	
Pest scouting	1	acre	$35.00	$35.00	
Fertilizer spreading	1	acre	$ 7.00	$ 7.00	
Bee rental	1	acre	$75.00	$75.00	
Moldboard plowing	1	acre	$22.00	$22.00	
Disking	2	acre	$17.90	$35.80	
Harrowing	1	acre	$14.00	$14.00	
Fertilizer/lime	1	acre	$132.25	$132.25	
Herbicide	1	acre	$9.03	$9.03	
Fungicides	1	acre	$412.94	$412.94	
Insecticide	1	acre	$81.60	$81.60	
Plastic mulch	7,260	feet	$0.03	$217.80	
Drip tape	7,260	feet	$0.03	$217.80	
Pumpkin seed	1.362	thsd.	$59.93	$81.62	
Operator labor					
Implements	1.572	hour	$15.00	$23.58	
Tractors	7.811	hour	$15.00	$117.17	
Hand labor	3.375	hour	$12.00	$40.50	
Harvest labor	80	hour	$12.00	$960.00	
Diesel fuel	52.49	gallon	$4.00	$209.96	
Repairs and maintenance					
Tractors	1	acre	$42.10	$42.10	
Implements	1	acre	$68.92	$68.92	
Interest on operating capital	1	acre	$58.99	$58.99	
Marketing	15%	sales	$10,260.00	$1,539.00	
Total variable costs				$4,424.26	
Fixed costs					
Tractors	1	acre	$87.10	$87.10	
Implements	1	acre	$176.12	$176.12	
Land charge	1	acre	$200.00	$200.00	
Total fixed costs				$463.22	
Total costs				**$4,887.48**	

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