AGRICULTURAL ALTERNATIVES
agalternatives.aers.psu.edu

Peach Production

Peaches may be grown in many of the more temperate climates of the United States and lend themselves well to part-time farming operations. The start-up costs for peaches can be high depending on the production method chosen, land preparation, and initial investment in the trees. The life of the orchard is expected to be at least 20 years, so this investment may be spread over a longer period of time than many crops. Depending on the amount of land devoted to the orchard, production method, and tree size, equipment costs may be held to a minimum. If the orchard is a part of an existing agricultural operation, you may already have much of the needed equipment.

Peach production will require many hours of labor, depending on the size of the orchard. Land preparation and planting will require at least two people. During the summer months, the orchard will require mowing, pesticide application, and fruit thinning. Depending on the mix of varieties and orchard size, additional labor may be required at harvest time. Although you may be able to accomplish these tasks with family members and local part-time labor, use of transient labor may be necessary.

According to the National Agricultural Statistics Service (NASS), Pennsylvania generally produces around 60 million pounds of peaches with an annual value of approximately $20 million. Pennsylvania currently has about 3,500 acres of land devoted to peach production, but this is a decrease of around 40 percent from the late 1990s due to the removal of trees because of plum pox virus (PPV), which was first discovered in Pennsylvania in 1999. Before planting any PPV-susceptible stone fruits (including peaches, nectarines, plums, and apricots), you must first determine that you reside outside the quarantined areas set up by the Pennsylvania Department of Agriculture (PDA). This can be determined by calling PDA at 717-787-4737. More information on PPV can be found on the PDA's Web site (http://www.agriculture.state.pa.us/) under "Animal and Plant Health."

Marketing

Depending on the peach varieties produced (commonly referred to as "cultivars"), peaches may be marketed from late July through early September. Peaches marketed wholesale are usually sold to a fruit packer. Fruit packers typically grade and pack peaches for the fresh market. Explore the marketing options prior to ordering the trees from the nursery so that you order the cultivars that best fit your marketing options.

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Peaches sold through a roadside stand need to be of the highest quality. This will ensure repeat customers from year to year. Roadside marketers need a wide variety of cultivars so the marketing season is not interrupted. Roadside marketing is time consuming, but it can also be very financially rewarding. For more on marketing, refer to *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers.*

Site Selection

The success of any orchard is directly related to planning and preparation. The ideal site for an orchard consists of rolling or sloping land to enhance air drainage during periods of spring frosts. The best site is south facing with a slope of between 4 and 8 percent because operating equipment on steeper slopes may be difficult. Sites with deep, well-drained soils are preferred because shallow, poorly drained soils will cause problems for root systems. Consult a county soil map prior to site selection. Soil maps may be obtained at your county extension office or the Farm Service Agency.

For the production of peaches, special attention must be given to minimum winter temperatures. Any area having temperatures of -10°F or below should not be considered for producing peaches. Because peaches traditionally bloom earlier than apples, special care should be given to the selection of the planting site. Any area subject to frosts after mid-April should not be used for peaches.

Another consideration when choosing a planting site is irrigation. Regardless of the type of irrigation system used, locating the orchard close to a water source will simplify setting up the system and reduce operating expenses. For more information on overhead and trickle irrigation for tree fruit production, consult *Agricultural Alternatives: Irrigation for Fruit and Vegetable Production.*

Land Preparation

The land should be prepared as if planting a traditional field crop. The soil should be plowed and leveled with a disk and harrow. Starting with an even orchard floor will reduce the possibility of standing water and make fruit harvesting and transportation easier. Establishing an orchard in well-prepared soil rather than established sod will also aid in keeping the tree rows and row middles free of broadleaf weeds. The elimination of any broadleaf weeds or plants is crucial prior to planting peaches. Broadleaf field crops such as soybeans or alfalfa should not be grown prior to planting peaches. These plants may harbor a virus responsible for prunus stem pitting, a serious disease in peaches.

Prior to planting trees, a soil fertility test and nematode survey are recommended. These test kits may be obtained from your county extension office. The two tests can be taken at the same time, but the samples must be handled differently. Consult the instructions on both kits to ensure accurate results.

The results from the soil test provide recommendations for any soil amendments such as lime and/or fertilizer needed prior to orchard establishment. Soil amendments should be incorporated into the soil prior to planting trees. The nematode survey is critical prior to planting peaches and will determine if any treatments are needed for harmful nematodes. Left untreated, nematodes may damage the root system of the tree and can stunt or kill the tree prior to bearing fruit. This will result in uneven tree growth and delayed production.

Ordering Trees

Trees should be purchased from a reputable nursery to ensure trueness to variety and disease-free trees and because most provide a guarantee of survivability. Check for this guarantee when ordering trees. The nursery can also offer advice concerning tree and row spacing. Trees should be ordered at least one year prior to orchard establishment.

A problem in Pennsylvania orchards is the presence of a virus called prunus stem pitting, which causes early death in peach trees. In response to this problem, the PDA Bureau of Plant Industry has established a virus-free certification program in cooperation with Pennsylvania nurseries. The program seeks to provide and maintain virus-free sources of budwood for state nurseries and growers. Pennsylvania nurseries can therefore offer two grades of trees: Penn Standard and Penn Premium. Penn Standard trees are certified for virus-free budwood but not for virus-free rootstocks. Penn Premium trees are certified for both virus-free budwood and rootstocks. Surrounding states may also have certified virus-free trees. Growers are encouraged to take advantage of these programs. When ordering trees, ask the nursery if it belongs to such a program.

Tree caliper is another measure of nursery tree quality. Trees of a larger caliper—greater than 5/8 inch in diameter—often are not suited for today's orchards. The larger a tree's diameter, the less choice you will have in selecting scaffold limbs. Thicker trees tend to be taller, and forcing branches low to the ground may be difficult. In addition, after a larger-caliper tree is headed back, cytospora canker may infect the large wound area, eventually resulting in the tree's death. Small-caliper trees—less than 1/2 inch—are easier to train for certain production systems, such as the central leader, but they need extra care the year of planting to prevent competition.

Choosing cultivars for your orchard is largely dependent on when the fruit matures. Most consumers cannot distinguish between different peach cultivars as they can with apple and pears. The earliest-ripening cultivars tend to be clingstone types, while the later-maturing cultivars are called freestone. The difference between the two is that with the former the pit adheres to the flesh and in the latter the flesh of the peach easily separates from the pit. The clingstone cultivars also tend to produce smaller fruit than freestone cultivars and are most often used for processing.

Due to the lack of recognition between different peach cultivars by consumers, cultivars continuously change as

new ones are released to the nurseries. Often, the best information on which cultivars to plant can be obtained by visiting local growers and seeing what they have planted. The most popular peach cultivar currently planted in Pennsylvania is Redhaven. This high-quality freestone cultivar matures in late July to early August depending on location. Old standard cultivars grown in Pennsylvania include Autumnglo, Beekman, Bounty, Canadian Harmony, Cresthaven, Encore, Ernies Choice, Garnet Beauty, Jerseyqueen, Redkist, Sentry, and Topaz. Newer cultivars available are the FlaminFury and Star series developed in Michigan that have very good red color and increased firmness. Another recent trend has been the planting of white-fleshed peaches. Cultivars such as Lady Nancy, Scarlet Pearl, Sugar Lady, Summer Pearl, and White Lady are being evaluated. Peaches may be harvested from mid-July through early September depending on the cultivars selected. Planting several cultivars will help ensure an adequate supply throughout the season.

Nectarines are another popular option with growers and consumers. A nectarine is merely a fuzzless peach. Their one drawback is their susceptibility to brown rot. While peaches are also susceptible to this disease, nectarines are even more susceptible. If you are planting in the eastern part of Pennsylvania, you also need to consider a cultivar's susceptibility to bacterial spot—cultivars susceptible to this disease should not be planted. A wide range of nectarine cultivars are available that mature over the summer.

Layout and Planting

Regardless of whether you are laying out an orchard on level or sloping land, care should be taken to make the rows as evenly spaced as possible. The distance between the rows should be the same throughout the orchard. Placing stakes in the rows prior to planting will help to ensure the distance between the rows is the same throughout. This should be strived for whether planting in straight rows or on a contour. One of the most common tree spacings in peach orchards is 14 feet by 22 feet or approximately 141 trees per acre. Some growers are experimenting with higher density and novel training systems. The number of trees required per acre for various tree spacings can be found in Table 1.

When planning the orchard, early blooming cultivars that are most susceptible to frost should be placed in areas with the best air drainage. Later-blooming cultivars can be placed lower on hillsides or in areas more prone to frost. When possible, orchard rows should be laid out so they run in a north–south orientation to increase light reception for better color and ripening. If this is not possible due to slope consideration, position the rows on the contour to facilitate safe spraying and machinery operation.

Table 1. Number of trees per acre at various tree spacings.

Spacing (in feet) between rows	Spacing (in feet) between trees															
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
8	1,089	908	778	681												
9	968	807	691	605	538											
10	871	726	622	545	484	436										
11	792	660	566	495	440	396	360									
12	726	605	519	454	403	363	330	303								
13	670	558	479	419	372	335	305	279	258							
14	622	519	444	389	346	311	283	259	239	222						
15	581	484	415	363	323	290	264	242	223	207	194					
16	545	454	389	340	303	272	248	227	209	194	182	170				
17	512	427	366	320	285	256	233	214	197	183	171	160	151			
18	484	403	346	303	269	242	220	202	186	173	161	151	142	134		
19	459	382	328	287	255	229	208	191	176	164	153	143	135	127	121	
20	436	363	311	272	242	218	198	182	168	156	145	136	128	121	115	109
21	415	346	296	259	230	207	189	173	160	148	138	130	122	115	109	104
22	396	330	283	248	220	198	180	165	152	141	132	124	116	110	104	99
23	379	316	271	237	210	189	172	158	146	135	126	118	111	105	100	95
24	363	303	259	227	202	182	165	151	140	130	121	113	107	101	96	91
25	348	290	249	218	194	174	158	145	134	124	116	109	102	97	92	87

Production Considerations

In the United States, anyone desiring to purchase restricted-use pesticides is required to have a pesticide applicators license. Even some materials used in organic production now require a license. In Pennsylvania, the licensing procedure is handled by the PDA. Please check with your state regarding these requirements.

Because of the complexity of fruit production and the large number of pests affecting peaches and nectarines, this publication cannot cover all necessary production practices and procedures. For more information on the diseases and conditions affecting peaches, please consult the *Pennsylvania Tree Fruit Production Guide*, which may be purchased at your local extension office in Pennsylvania and accessed online at http://tfpg.cas.psu.edu/. This valuable guide describes appropriate cultural and chemical treatments for the control of insects, diseases, and weeds.

Pollination

Peaches are self-pollinating, so trees or cultivars used specifically for pollinating other cultivars are not required. This allows cultivars to be planted together to make harvesting easier. Honey bee hives should be brought into the orchard to ensure good pollination.

Thinning

To produce large peaches and nectarines with good color, thinning of the fruit is necessary. Because of a lack of good chemical thinners, peaches must be hand thinned. Other methods for thinning peaches are available, but hand thinning is the surest method of thinning used today. Thinning begins in early June and continues until the process is finished. Peaches and nectarines should be thinned to approximately 6 inches between each fruit. This spacing should be increased if larger fruit are desired or when the crop is drought stressed.

Fertilization

Nutritional requirements for peach trees vary through their lifetimes and are influenced by such factors as rootstock, crop load, soil type, and weather conditions. In addition to nitrogen, phosphorus, and potassium, peach trees need adequate levels of calcium, boron, copper, and zinc to maintain the health of the tree and produce quality fruit. After planting, soil tests and leaf analyses are recommended at least once every 3 years. A leaf analysis is the most accurate way to determine if applied soil amendments are being used by the tree. Leaf analysis test kits can be purchased at your county extension office.

Pruning and Training

Peaches must be pruned each year. The best time to prune peaches in Pennsylvania is from late March to early May. Pruning earlier may expose the trees to winter cold injury; pruning too late may reduce fruit size. Some cultivars benefit from summer pruning done two to three weeks before harvest. Summer pruning consists of removing the dense rank growth in the center of the tree to allow more light into the tree and improves final fruit color.

Most peaches in Pennsylvania and the eastern United States are pruned with the open center system. This system consists of establishing three to five major scaffold limbs close to the ground. A bowl-like tree shape is desired, where the limbs are pruned to force growth to the outside of the tree while the middle of the tree is maintained more open. Tree height is normally kept low by pruning so the trees can be harvested from the ground or with very short ladders. Other tree training systems include the central leader system and the perpendicular V. The central leader system consists of the development of a single central trunk with up to three layers of smaller horizontal limbs coming off of the main trunk, with each layer maintained around 3 feet apart. The V system is a higher-density system in which only two major limbs oriented perpendicular to the tree row are allowed to develop. The advantage is that trees can be planted closer in the row to increase tree density. The disadvantage to this system is that tree height is greater than either of the other two training systems and has an increased potential for limb breakage.

Harvest and Storage

Peaches do not mature all at once, and normally it will be necessary to harvest a tree two to four times. Length between harvests is dictated by the weather as well as location of the fruit within the tree. Most peaches are harvested based on firmness and color. Harvest will vary depending on how you will be marketing your fruit. Fruit destined for the wholesale market is picked at a less mature stage so the fruit can better withstand the rigors of shipping. Fruit that you intend to sell locally can be left on the tree slightly longer to mature and soften. These “tree-ripe” peaches usually command a somewhat higher market price.

Extreme care must be taken not to bruise or damage peaches and nectarines during the harvest process. Bruising and any damage to peaches will lead to early spoilage and a large reduction in the returns realized from the sale of the fruit. Traditionally, peaches destined for the wholesale market are shipped to the packer as soon as they are harvested. If you are selling directly to the consumer, they can be stored for a short time. At a temperature of 31 to 32°F and humidity of 90 to 95 percent, peaches may be stored up to 2 to 4 weeks.

Even if some family labor is used for harvest, outside labor may be necessary to harvest the crop in a timely manner. If you use hired labor, you are required to follow all laws and regulations concerning hired labor. More information concerning hired labor can be found in the *Pennsylvania Tree Fruit Production Guide*, *Agricultural Alternatives: Starting or Diversifying an Agricultural Business*, and *Agricultural Alternatives: Agricultural Business Insurance*.

Sample Budget

Included in this publication are sample fresh-market peach land preparation and planting and mature production budgets. The budgets summarize the receipts, costs, and net returns of a small-scale peach 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 this budget 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.*

Sample Peach Budget—Land Preparation and Planting

Per-acre costs for land preparation and establishment based on 141 trees per acre.

Items	Land Preparation	Your Estimate	Planting	Your Estimate
Variable Costs				
Lime	$75.00	_____		_____
Fertilizer	$64.25	_____	$14.50	_____
Custom machinery	$42.10	_____	$5.00	_____
Grass seed	$45.00	_____		_____
Trees*		_____	$860.10	_____
Herbicides		_____	$55.63	_____
Insecticides		_____	$30.60	_____
Fungicides		_____	$54.02	_____
Bar soap		_____	$ 27.20	_____
Tree guards		_____	$54.40	_____
Rodenticide		_____	$10.00	_____
Labor	$276.69	_____	$230.76	_____
Diesel fuel	$6.00	_____	$25.81	_____
Repairs and maintenance				
Tractors	$3.25	_____	$8.20	_____
Equipment	$6.33	_____	$4.55	_____
Interest on capital	$18.20	_____	$65.84	_____
Total Variable Costs	$536.82	_____	$1,446.61	_____
Fixed Costs				
Tractors	$7.11	_____	$16.95	_____
Implements	$11.14	_____	$8.13	_____
Land charge	$150.00	_____	$150.00	_____
Total Fixed Costs	$168.25	_____	$175.08	_____
Total Costs	**$705.07**		**$1,621.69**	

*Tree cost based on standard cultivars for quantities over 100 trees.
Royalties are charged on many of the newer cultivars of up to $2.25 per tree.

Sample Peach Budget—Mature Production

Per-acre costs for 1 year of production based on 141 trees per acre.

Items	Costs	Your Estimate
Variable Costs		
Lime	$12.50	
Fertilizer	$20.10	
Herbicides	$24.85	
Fungicides	$116.76	
Insecticides	$146.32	
Labor		
Scouting	$8.67	
Thinning	$300.00	
Operator	$52.97	
Pruning	$211.50	
Harvesting	$550.00	
Diesel fuel	$10.54	
Repairs and maintenance		
Tractors	$5.14	
Equipment	$7.38	
Other		
Insect traps	$5.00	
Mating disruption	$45.00	
Interest on operating capital	$17.48	
Total Variable Costs	*$1,534.21*	
Fixed Costs		
Tractors	$9.80	
Implements	$12.35	
Land charge	$150.00	
Total Fixed Costs	*$172.15*	
Total Specified Costs	**$1,706.36**	

Initial Resource Requirements

- Land: 1 acre
- Labor
  - Land preparation: 27 hours
  - Planting: 22 hours
  - Production labor (scouting, thinning, pruning, spraying, and mowing harvest labor): 48 hours
- Capital
  - Equipment: $20,000 to $30,000
  - Land preparation and planting: $2,300 to 2,500/A
  - Production years: $1,700 to $2,000/A
- Equipment
  - Tractor (45 horsepower minimum)
  - Airblast orchard sprayer
  - Herbicide sprayer
  - Rotary mower
  - Tillage equipment
  - Containers (bulk bins, bushel crates, boxes)
  - Pruning equipment

Profitability Table for Peaches

Returns above annual specified growing and harvesting costs under various price and yield combinations.

Orchard block price* ($/bu)	Yield (bu/A) 100	200	300	400	500	600
$6.00	-$756	-$356	$44	$444	$844	$1,244
$8.00	-$556	$44	$644	$1,244	$1,844	$2,444
$10.00	-$356	$444	$1,244	$2,044	$2,844	$3,644
$12.00	-$156	$844	$1,844	$2,844	$3,844	$4,844
$14.00	$44	$1,244	$2,444	$3,644	$4,844	$6,044
$16.00	$244	$1,644	$3,044	$4,444	$5,844	$7,244
$18.00	$444	$2,044	$3,644	$5,244	$6,844	$8,444
$20.00	$644	$2,444	$4,244	$6,044	$7,844	$9,644

*Picked in bins in orchard. Average price received for all peaches.

For More Information

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Van Atta, M., and S. L. Wagner (1998). *Growing Family Fruit and Nut Trees.* Sarasota, Fla.: Pineapple Press.

Associations

Many states have horticultural societies or fruit growers associations. Many of these may be found through the following sources.

American Horticultural Society
7931 East Boulevard Drive
Alexandria, VA 22308
http://www.ahs.org/

North American Fruit Explorers
1716 Apples Road
Chapin, IL 62628
http://www.nafex.org/

State Horticultural Association of Pennsylvania
697 Mountain Road
Orrtanna, PA 17353
http://www.shaponline.org/index.html

Web Sites

Growing Peaches in North Carolina
http://www.ces.ncsu.edu/depts/hort/hil/ag30.html

Organic and Low-Spray Peach Production
http://attra.ncat.org/attra-pub/peach.html

Ohio State University Organic Apple Disease Spray Guide
http://www.caf.wvu.edu/kearneysville/organic-apple.html

The Penn State Small-Scale Fruit Production Guide
http://ssfruit.cas.psu.edu/

Pennsylvania Tree Fruit Production Guide
http://tfpg.cas.psu.edu/

Virginia Stone Fruits
http://www.ento.vt.edu/Fruitfiles/VirginiaPeachSite.html

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