

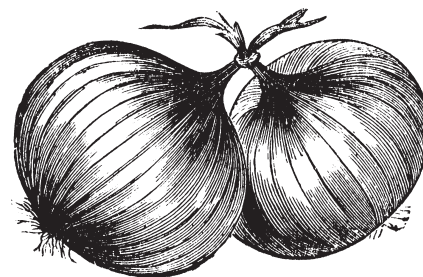
AGRICULTURAL ALTERNATIVES

Onion Production

Dry onions are a crop that lends itself well to small-scale and part-time farming operations. Multiple markets exist for growers with small acreages and the various colors and types of mature bulbs (red, yellow, and white) allow growers to find their market niche. The term “dry onion” is used to distinguish them from green onions, which are pulled while the tops are still green and usually before a large bulb has formed. Many field operations, such as land preparation, planting, and harvesting, can be custom hired, and most of the equipment for planting and harvest can be used for other crops.

The common dry onion (*Allium cepa*), a member of the Amaryllidaceae family, originated in mid-Asia in what is now northwestern India, Afghanistan, Tajikistan, and Uzbekistan. It was reported in the sixteenth century that onions were among the most common vegetables used at that time. They occurred in red and white varieties and were sweet, strong, or intermediate in flavor. The onion was introduced by the Spanish into the West Indies soon after their discovery. From there, onions were spread to all parts of the Americas and were grown by the earliest colonists and soon afterward by Native

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Americans. Relatives of onions include garlic, leek, chives, Welsh onion, and shallots. Most of the onions harvested in the United States are sold as fresh produce. In 2010, the United States produced more than 150,000 acres of onions with a value of almost \$900 million.

Marketing

Fresh-market onions are available in the northeastern United States from the first of July to the end of October. They are traditionally sold loose in bulk containers. Four basic marketing alternatives are available to the onion grower: wholesale markets, cooperatives, local retailers, and roadside stands.

In wholesale marketing, producers often contract with shippers to market and ship the onions for a predetermined price. If you do not use a contractor and ship your onions to a 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 good-quality onions when stores require them. Roadside stands (either your own or another grower's), consumer-supported agriculture (CSA), and

pick-your-own operations (to a very limited extent) may provide opportunities to receive higher-than-wholesale prices for your onions, 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. Depending on your location, processors may or may not be a marketing option. Processors are less likely to contract with small-acreage growers (those with less than 5 acres). For more information on marketing, consult *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers*.

Site Selection

Onions should be grown on friable soils, which contain high amounts of organic matter and have good water-infiltration rates and good moisture-holding capacity. The soil should not be compacted, and the pH should be 5.8 to 6.6. Sandy loams and muck soils are often used for onion production. For sweet Spanish onion production, soils with low sulfur levels (below 40 ppm) are recommended.

Variety Selection

Bulbing of onions is primarily induced by photoperiod or day-length. Both long day and intermediate day onion varieties are recommended for in the northeastern United States (Table 1). In addition, onions are classified by skin color (red, white, brown, or yellow), taste (sweet or pungent), and shape of the bulb (round, flat, or globe).

Planting and Fertilization

Onions can be started as transplants or sets. Transplants are seeded in the greenhouse 10 to 12 weeks prior to planting in the field. Because onions are a cool-season crop, they can be transplanted as early as mid-March. When producing transplants in the greenhouse, the plant tops should be trimmed to a 4-inch height to produce a stout, sturdy transplant. Sets are small dry onion bulbs produced the previous year. They can be planted later in the year than transplants and still produce a marketable crop.

Growers generally plant 75,000 to 120,000 onions per acre in single rows with 2 inches between plants in the row and 24 inches between rows. For large sweet or Spanish onions, the in-row spacing would be 4 to 6 inches between plants. If you are not limited by equipment space restrictions, multiple rows of onions (up to four) can be planted on raised beds covered with black plastic mulch. In this case, two drip tapes are placed 2 inches beneath the soil to facilitate production and harvest operations.

Table 1. Recommended onion varieties for growers in the northeastern United States.

VARIETY	DAYS TO MATURITY
Sets	
Early Yellow Globe	90
Ebenezer	90
Southport Red Globe	90
Seeds/Transplants	
<i>Storage Types</i>	
Trailblazer*	103
Hendrix*	107
Fortress	110
Spartan Banner 80*	115
Vega*	125
<i>Sweet Spanish Types</i>	
Alisa Craig	95
Candy*	105
Exspression	105
Spanish Medallion	110
Exacta*	110
Red Sky* (red bulb)	103
Redwing* (red bulb)	115
Mercury* (red bulb)	115

*Indicates hybrid variety.

Fertilizer application rates should be based on an annual soil test. If you are unable to conduct a test (including a test for calcium), the recommended N-P-K application rates are 60-80-80 pounds per acre banded at planting or 120-160-160 pounds per acre broadcast prior to planting. For sweet onions, a spring application (early May) of calcium or potassium nitrate should be sidedressed at 100 pounds per acre.

Pest Control

Weed control can be achieved with herbicides, cultivation, and a good crop-rotation system. Several preplant and postemergence herbicides are available for onions, depending on the specific weed problem and the stage of onion growth. If infestation levels are mild, early cultivation can minimize weed problems.

Insects can be a major problem in onion production. Onion maggots and thrips have the potential to reduce or destroy crops in any given year. Monitoring insect populations will help you determine when you should use pesticides and how often you should spray.

Several onion diseases can cause crop losses, especially downy mildew, purple blotch, and white rot. Many of these diseases can be prevented by using a good crop-rotation system, high-quality soil with good air drainage, and disease-resistant onion varieties.

Many of the pesticides required for onion production are restricted-use pesticides and require a pesticide license to purchase. Pesticide applicator tests are usually administered at 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 requirements. Also remember that any worker protection standards apply to the owner as well as to employees.

Harvest and Storage

Most dry onions are usually harvested when one-third to one-half of the tops have fallen over. Bulbs are generally pulled from the soil after being loosened with a disk. They are then topped approximately 1 inch above the bulb. To prevent rot organisms from entering the bulb, onions must be adequately cured (drying of the cut top or neck area) in the field, in open shade, or by artificial means before being placed in storage. Curing may require two to four weeks, depending on weather conditions. In high humidity and wet regions, onions are usually removed from the field for curing. To ensure that you are marketing a high-quality product, grade onions by size and color and check them for insect damage. Onions that are maintained at 32°F and 65 to 70 percent relative humidity can be stored for approximately one to eight months, depending on variety.

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 water or groundwater pollution. Because of this possibility, you must understand the regulations to 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 (GAP) and Good Handling Practices (GHP) 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 GAP and GHP, 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 your needs for life and health insurance and if 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 multi-peril 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 five 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 Noninsured 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 multi-peril 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 is a sample fresh-market onion production budget. This budget utilizes custom hire for most of the field work, which could be more economical for a smaller acreage. If farmers have their own equipment, they should substitute their costs for the custom hire. The budget summarizes the receipts, costs, and net returns of an onion 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. These budgets are developed for one acre; however, your scale of production should be based on market considerations. More information on the use of crop budgets can be found in *Agricultural Alternatives: Enterprise Budget Analysis*.

For More Information

- Hardenburg, R. E., A. E. Watada, and C. Y. Wang. *The Commercial Storage of Fruits and Nursery Stocks* (USDA-ARS Agricultural Handbook Number 66). Washington, D.C.: Superintendent of Documents, Government Printing Office, 1986.
- Jeavons, J. *How to Grow More Vegetables*. 8th ed. New York: Ten Speed Press, 2012.
- MacNab, A. A., A. E. Sherf, and J. K. Springer. *Identifying Diseases of Vegetables*. University Park: Penn State Extension, 1983.
- Maynard, D. M., and G. J. Hochmuth. *Knott's Handbook for Vegetable Growers*. 5th ed. New York: John Wiley and Sons, 2006.
- Pennsylvania Commercial Vegetable Production Recommendations*. University Park: Penn State Extension, 2012.
- Swaidner, J. M., and G. W. Ware. *Producing Vegetable Crops*. 5th ed. Upper Saddle River, N.J.: Prentice Hall, 2001.

Initial Resource Requirements

- Land: 1 acre
- Labor: 10 hours
- Harvest labor: 200 hours
- Production costs: \$9,000–10,000
- Capital: \$400–500
- Equipment: Tractor, mulch layer, irrigation system, and boom sprayer

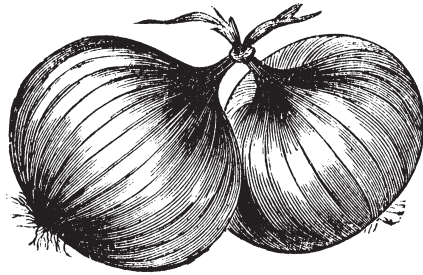
Onion Budget: Summary of Estimated Costs and Returns per Acre

Item	Quantity or Number of Operations	Unit	Price	Total	Your Estimate
Variable Costs					
Custom					
Soil test	1	kit	\$10.00	\$10.50	_____
Applying calcium lime	1	acre	\$13.60	\$13.60	_____
Fertilizer spreading	1	acre	\$20.00	\$20.00	_____
Moldboard plowing	1	acre	\$19.60	\$19.60	_____
Disking and harrowing	1	acre	\$37.20	\$37.20	_____
Fertilizer					
Lime	0.5	ton	\$20.00	\$10.00	_____
Nitrogen (N)	120	lb	\$0.85	\$102.00	_____
Phosphorus (P)	160	lb	\$0.62	\$99.20	_____
Potassium (K)	160	lb	\$0.55	\$88.00	_____
Herbicide	1	acre	\$33.78	\$33.78	_____
Fungicides	1	acre	\$144.29	\$144.29	_____
Insecticide	1	acre	\$121.01	\$121.01	_____
Plastic mulch	10,890	feet	\$0.03	\$326.70	_____
Drip tape	21,780	feet	\$0.02	\$435.60	_____
Onion sets	50,000	sets	\$0.05	\$2,500.00	_____
Packaging					
Mesh onion bags	1,500	each	\$0.95	\$1,425.00	_____
Operator labor					
Tractors and implements	6.3	hour	\$15.00	\$94.50	_____
Seasonal labor	3.375	hour	\$12.00	\$40.50	_____
Harvest labor	200	hour	\$12.00	\$2,400.00	_____
Diesel fuel	46.46	gallon	\$3.50	\$162.61	_____
Repair and maintenance					
Tractors and implements	1	acre	\$100.33	\$100.33	_____
Interest on operating capital	1	acre	\$175.13	\$175.13	_____
Marketing	10%	sales	\$10,500.00	\$1,050.00	_____
<i>Total variable cost</i>				\$9,409.05	_____
Fixed Costs					
Implements*	1	acre	\$167.57	\$167.57	_____
Tractors	1	acre	\$74.60	\$74.60	_____
Land charge	1	acre	\$200.00	\$200.00	_____
<i>Total fixed cost</i>				\$442.17	_____
Total Cost				\$9,851.22	_____

*Includes irrigation system.

Net returns for five different yields and prices.

Price	Yield (50-lb bags)				
	1,100	1,300	1,500	1,700	1,900
\$5.00	\$(3,051.22)	\$(2,701.22)	\$(2,351.22)	\$(2,001.22)	\$(1,651.22)
\$6.00	\$(1,951.22)	\$(1,401.22)	\$(851.22)	\$(301.22)	\$248.78
\$7.00	\$(851.22)	\$(101.22)	\$648.78	\$1,398.78	\$2,148.78
\$8.00	\$248.78	\$1,198.78	\$2,148.78	\$3,098.78	\$4,048.78
\$9.00	\$1,348.78	\$2,489.78	\$3,648.78	\$4,798.78	\$5,948.78



Prepared by Michael D. Orzolek, professor of horticulture; Lynn F. Kime, senior extension associate in agricultural economics; R. Matthew Harsh, Chesley Farms; and Jayson K. Harper, professor of agricultural economics.

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