Organic Tomatoes

Introduction
Tomatoes (*Solanum lycopersicum L.*) are one of the most popular fresh market vegetables grown commercially in Kentucky. With the rising consumer demand for organic products, organic tomatoes should be an excellent prospect for local fresh market sales.

Organic tomatoes are produced using pest management and fertilization methods that do not include synthetic compounds. Growers producing and selling tomatoes with an organic label must be certified by a USDA-approved state agency (e.g., the Kentucky Department of Agriculture) or private agency, plus follow production standards regulated by the National Organic Program (NOP).

Marketing
Tomatoes are grown in Kentucky primarily for fresh market sales. Planting for very early or for late fall markets often brings the most profit since prices tend to be higher. Fresh market options for organic tomatoes include roadside stands, farmers markets, local grocery stores, community supported agriculture (CSA) subscriptions, produce wholesalers, and produce auctions. Restaurants and health food stores may also be interested in locally produced organic products.

Offering educational materials for consumers at farmers markets about how the organic tomatoes were grown may be an effective way to attract new customers.

New producers should consider low-volume retail sales opportunities initially (such as farmers markets or roadside stands); large-scale production usually requires knowledge of wholesale marketing channels, which can handle larger volumes of produce.

Market Outlook
Tomatoes, lettuce, and carrots are the three most commonly grown certified organic vegetables in the United States. Organically grown tomatoes tend to not only be popular among those interested in the consumption of organic vegetables for health or ideological reasons, but also among farmers market consumers seeking unique varieties and flavors. Certified organic greenhouse tomato production has helped grow the organic tomato category.

Organically grown tomatoes can command premium prices, especially when offered for early- and late-
season availability. Even at wholesale price levels, certified organic tomatoes may command price premiums of 10 to 50 percent more than conventionally grown produce. However, these premiums may vary considerably between market areas.

Producers should develop a detailed marketing plan for certified organic produce and understand differences in pricing between organic and conventional produce in their region. Daily wholesale price reports for terminal markets around the country can be accessed on the Fruit and Vegetable Marketing News page of the USDA Agricultural Marketing Service Web site. Some archived price information and reports about organic produce prices are also available at the USDA Economic Research Service Web site.

Higher prices for certified organic produce are often critical for profitable organic production. Producers may choose to offer point-of-purchase information to new organic consumers about the costs of organic certification and potentially greater labor costs that may be incurred with organic tomato production. Some consumer education resources for producers may be available through the Organic Trade Association.

Production Considerations

Site selection and preparation

Only land that has been free of prohibited substances (e.g. synthetic pesticides and artificial fertilizers) for 3 years can be certified for organic production. Selecting a site that is well-suited to the crop is especially important in organic production. Healthy, fast growing plants can better tolerate or outgrow pest problems.

Choose a site for tomato production with well-drained soil that warms up quickly in the spring. Tomatoes are quite cold-sensitive, so low-lying fields that are subject to late frosts should be avoided. Locate tomato fields where plants will not be damaged by herbicide drift from neighboring conventional fields. Fields should be rotated out of tomatoes and related solanaceous crops (e.g. tobacco, pepper, and potatoes) for a period of 3 years to avoid pest problems common to this plant family. Tomatoes do well when transplanted to a field where fescue sod was plowed under the previous fall.

Healthy soil is the key to successful organic production. Soil fertility can be enhanced by properly aged animal manure, green manure (cover crops turned under prior to planting), and approved natural fertilizers. There are no restrictions regarding the source of manure; that is, it can come from conventional farming operations. However, the NOP does regulate the timing of the application of raw manure to minimize the risk of pathogens being transferred to the harvested portion of the crop. In addition, compost and composted manure must meet specific processing requirements.

While cover crops of grasses (e.g. rye) will increase organic matter, nitrogen-fixing legumes (e.g. hairy vetch) have the additional benefit of providing nitrogen. High levels of nitrogen can result in excess foliage at the cost of fruit production. Supplemental organic nutrient sources include bloodmeal, fishmeal, cottonseed meal, and soybean meal. Tomatoes require moderate to high levels of phosphorus, potassium, and calcium in balanced proportions.

Cultivar selection and transplant production

Cultivar selection is a critical decision for any commercial crop, but it is especially important in organic production. With fewer pest management options available, it is vital to identify selections with resistance and/or tolerance to as many prevailing diseases and insects as possible.

Tomato varietal selection is further complicated by the myriad of horticultural characteristics available. Fruit may differ in size (cherry-size to one pound or more in weight), color (pink, yellow, orange, red, red-black, striped), shape (pear, oval, blocky, globe), flavor, acid content, and intended use (canning, paste, salad, slicing, drying). Tomatoes may be open-pollinated or
a hybrid. Growth habit is classified as either
determinate (bush with a limited production
season) or indeterminate (vining with a longer
production season). Cultivars may also differ in
earliness (early-, mid-, and late-season). Other
factors that can dictate varietal selection for
fresh markets is consumer demand and regional
preferences, which can include heirloom
cultivars. Adaptability to local conditions and
suitability to intended production practices must
also be considered.

Organic production requires the use of certified
organic seed and organic transplant production
methods. Individual organic certifiers may
permit the use of untreated conventional seed if
suitable organic seed is unavailable; however,
growers must be able to document their effort to
obtain certified organic seed from at least three
different sources. Neither seed nor transplants
can be treated with any prohibited substances,
such as synthetic fungicides.

Stocky, container-grown transplants are most
desirable for transplanting as they will result in
higher early yields than bare-root plants. The
higher prices generally commanded by early
tomatoes usually more than offsets the higher
cost of good quality container-grown plants.
Many growers produce transplants in 72 or 128
cell trays, although some grow transplants for
their earliest crops in larger cells. Tomatoes will
tend to get “leggy” if produced in smaller cell
trays where plants are tightly spaced.

*Planting and crop management*
Transplanting is done after the last killing frost
for a spring crop and in July for a fall crop. The
earliest and latest safe planting dates for tomatoes
vary according to the region of Kentucky. Most
growers use approximately 4,200 to 5,000 plants
per acre.

The use of mulch will help preserve soil moisture,
moderate soil temperatures, and prevent weed
germination near plants. In addition, mulches
can reduce the incidence of soil borne diseases
that occur when soil is splashed on fruit and
foliage, as well as reduce fruit contact with the
soil. Mulching materials can include natural
materials (e.g. straw or wood chips) or allowable
synthetic materials (e.g. newspaper). Plastic
mulch is permitted in organic production if it is
removed at the end of the harvest season.

University of Kentucky on-farm demonstrations
have shown that the highest profits can be
obtained with raised beds covered with black
plastic and using drip irrigation. Black plastic
may also enhance earliness by warming soils in
the spring. The moisture levels under the plastic
must be carefully monitored with tensiometers
so that the moisture remains relatively constant
during the growing season. Allowing soils to dry
and then rapidly applying large volumes of water
can result in fruit cracking; fluctuations in soil
moisture can also lead to blossom end rot.

The use of organic mulch has the further
advantage of improving the soil by adding
organic matter back into the soil as it decays.
Organic mulches also tend to keep soils cooler
in the heat of summer. However, organic mulch
will also keep soils cooler in the spring, which
could delay early season growth.

Sucker removal (pruning) should be done as
needed to reduce vegetative growth and encourage
fruit development. It is important to strike a good
balance between fruit and foliage, as excessive
pruning can reduce yields and fruit quality.

Tomato plants grown organically should be
supported and trained using cages, stakes,
or a trellis system. While support systems
require additional material and labor, the
benefits generally outweigh the costs in organic
production. Supporting plants results in
improved fruit quality, less post-harvest fruit
decay, and increased yields when compared to
unsupported plants (sprawl culture). Support
systems, along with pruning, result in improved
air circulation through plants, thus fewer foliar
disease problems. Additionally, supported plants
are easier to harvest. The support system should be in place 2 to 3 weeks after transplanting. Stakes or posts can be made of metal or wood; however, wooden stakes cannot be treated with arsenate or other prohibited materials.

Organic crops must be protected from potential contamination by adjoining conventional farms, as well as from non-organic fields in split operations. The drift and run-off of prohibited substances can compromise the farm’s organic certification status. Preventative strategies include the use of buffer zones and barriers, altering drainage patterns, posting “no spray” signs, and cooperating with neighboring conventional farmers. Growers with split operations must take steps to prevent the commingling of their two systems.

Pest management

Organic tomato production can be very challenging in Kentucky due to the number of diseases that can reduce harvest quality and yields. Pest management in organic systems emphasizes prevention through good production and cultural methods. The goal is not necessarily the complete elimination of pest problems, but rather to manage insects and diseases to keep crop damage within acceptable economic levels.

Effective and economically efficient pest management in organic farming requires multiple strategies and an integrated systems approach. Following good cultural practices, such as maximizing air circulation (e.g., with plant spacing, pruning, and trellising), rotating crops, maintaining well-balanced fertility, managing soil moisture, and practicing sanitation, can go a long way in preventing problems that would reduce yields. Frequent scouting is essential to keeping ahead of potential problems; monitoring diseases and pests requires accurate identification.

Tomatoes are subject to a large number of diseases, which includes anthracnose, bacterial canker, bacterial spot, early blight, Fusarium wilt, root knot nematode, Septoria leaf spot, southern blight, and Verticillium wilt. Late blight can be a problem during cooler growing seasons. Growing varieties with multiple resistances to locally prevalent diseases is essential to effective disease management in organic systems. While there are some organically approved fungicides available (such as copper and sulfur products) they should not be applied routinely. Excessive copper can be damaging to certain beneficial soil organisms, and sulfur will injure plant foliage at high temperatures. A list of approved products can be found on the Organic Materials Review Institute (OMRI) Web site.

Potential insect pests include aphids, cutworms, flea beetles, fruitworms, mites, and stinkbugs. Trap crops, approved insecticides (such as insecticidal soap and Bt), and beneficial insects can help organic growers manage insect pests.

Since herbicides cannot be used, organic growers will need to implement alternative measures for weed control. Weed management begins with careful site selection; thus, sites with perennial noxious weeds that have historically been difficult to control should be avoided. The planned crop rotation program, as well as site preparation, should be directed at making sure existing weeds are under control prior to planting.

Maintaining a “weed-free” planting is most critical during the first 4 to 5 weeks after transplanting. Once plants have reached a height of 12 to 15 inches they are better able to compete with weedy vegetation. However, if left unchecked, weeds compete with plants for water and nutrients, harbor insect and disease pests, and reduce air circulation. Weeds should not be allowed to go to seed. Plastic or organic mulches can be used to suppress weed development within rows, while mowing, shallow tillage, and living mulches are techniques for managing weeds between rows.

Harvest and storage

Products grown organically but harvested during the transition period cannot be marketed as
organic. Only those crops that have met NOP production and certification standards, including the 3-year minimum transition period, can be marketed and sold as certified organic or organic.

Harvesting operations, storage areas, and packaging materials must comply with NOP standards. Growers with split operations must either use separate equipment and facilities for these operations or decontamination protocol must be followed before use in the organic end of the enterprise. Packaging materials must be protected against potential contamination from prohibited substances.

Tomato fruit is easily damaged and should be handled as carefully as possible in all picking, grading, packing, and hauling operations. Fruit is harvested at the maturity stage preferred by the intended market. Vine-ripe tomatoes must be harvested as often as twice a week, whereas mature-green tomatoes are only harvested three or four times during the season. Pack tomatoes in the type and size container the market requires.

**Labor requirements**

Organic systems can be more labor intensive than conventional systems. This higher labor requirement is most often attributed to the increased time in weed control and monitoring and managing pests. Conventional tomato production per acre involves approximately 60 hours for production, 600 hours for harvest, and 100 hours for grading and packing. Plasticulture will add 8 to 10 hours more labor per acre, mainly for the removal and disposal of the plastic.

Labor times for small-scale organic tomato production, such as that for sale at farmers markets, can also vary according to specific production systems and practices. For tomato production in a 100-foot x 4-foot bed, Iowa State University has estimated about 5 hours for production and 6 to 7 hours for harvest and postharvest activities.

**Economic Considerations**

Initial investments include land preparation, the purchase of seed or transplants, and the purchase of stakes or other training system. Additional start-up costs can include the installation of an irrigation system and black plastic mulch. Organic certification costs will also be incurred in certified organic tomato production.

For small-scale organic tomato production, total production costs (including fixed costs of land and organic certification) are estimated at $220 for a 100-foot by 4-foot bed. Returns will vary based on yield and price. Assuming yields of 400 pounds sold at $2 per pound, this bed could return as much as $680 above total costs.

Production costs for staked, trickle irrigated tomatoes are estimated at $2,630 per acre, with harvest and marketing costs for 1,200 boxes at $6,705 per acre. Total costs are estimated at approximately $10,200 per acre.

Since returns vary depending on actual yields and market prices, the following per acre returns to land and management estimates are based on three different scenarios. These estimates are the returns above a $3,300 cost attributed for 220 hours of operator labor at $15 per hour. Conservative estimates represent average cost and return estimates in 2011.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Pessimistic</th>
<th>Conservative</th>
<th>Optimistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(2,210) *</td>
<td>$850</td>
<td>$5,450</td>
<td></td>
</tr>
</tbody>
</table>

* Parentheses indicate a negative number, i.e. a net loss

**Selected Resources**

**Publications**

- Vegetable Production Guide for Commercial Growers, ID-36; includes Organic Manures and Fertilizers: Appendix G (pp. 132-133) (University of Kentucky)

[http://www.ca.uky.edu/agc/pubs/id/id36/id36.htm](http://www.ca.uky.edu/agc/pubs/id/id36/id36.htm)
• Field Production of Organic Tomatoes (eXtension, 2011)
  http://www.extension.org/article/18653
• Organic Tomato Production (ATTRA, 2012)
• Organic Weed Control Toolbox (eXtension, 2010)
  http://www.extension.org/article/18532
• Resource Guide to Organic and Sustainable Vegetable Production (ATTRA, 2012)
• Tomatoes: Organic Production in Virginia (Virginia Association for Biological Farming, 2006)
  http://vabf.files.wordpress.com/2012/03/tomatoes.pdf
• Training Systems and Pruning in Organic Tomato Production (eXtension, 2012)
  http://www.extension.org/article/18647

Organizations/Web sites
• Organic Marketing (Kentucky Department of Agriculture)
• Economic Research Service (USDA)
  http://www.ers.usda.gov/Briefing/Organic/
• Fruit and Vegetable Marketing News-Terminal Market Prices (USDA Agricultural Marketing Service)
• National Organic Program (USDA-AMS)
  http://www.ams.usda.gov/nop
• Organic Materials Review Institute (OMRI)
  http://www.omri.org/

Reviewed by Mark Williams, Associate Professor (Issued 2011)
Photo by Gerald Holmes, Valent USA Corp., courtesy of Bugwood.org

For additional information, contact your local County Extension agent

July 2011