Organic Crop Production

Introduction
The term “organic farming” first came into use in the U.S. in the 1940s; however, organic crop production did not begin to really develop as an industry until the 1970s. In the early decades of the organic movement there were no uniform standards. At that time organic agriculture ran the gamut from “farming by neglect” to the minimal use of synthetic chemicals. This changed with the passage of the Organic Foods Production Act in 1990 and the implementation of mandatory certification requirements in 2002. The adoption of a uniform standard was intended to benefit both organic growers and consumers. Today organic crop production is one of the fastest growing segments of agriculture.

This profile presents a general overview of organic production methods and economics. It is one in a series of introductory information sheets concerning organic crop production in Kentucky. For a more complete discussion of allowable and excluded agricultural practices, refer to the National Organic Program (NOP) regulations.

Marketing
Despite the increased demand for organic products, identifying markets for organic produce generally requires more time and effort than for conventionally produced crops. Fresh market options 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. Internet sales are another option for some products.

A useful overview of the organic market may be found in the USDA publication, Marketing U.S. Organic Foods: Recent Trends from Farms to Consumers.

Market Outlook
USDA statistics report an increase in Kentucky certified organic acreages from 5,200 acres in 2002 to 6,768 acres in 2007. An additional 477 acres of cropland were listed as transitioning to organic production in 2007. This increase reflects a rapid, nationwide increase in consumer demand for organic products. U.S. sales of organic foods grew from $3.6 billion in 1997 to over $21 billion in 2008. Fresh produce constitutes the largest sector of the organic industry and accounts for a significant share of the organic market growth. Consumers purchase organic products for various reasons, including flavor, perceived health benefits, and environmental concerns. These consumers come from a wide variety of income levels, educational experiences, and ethnic backgrounds. USDA economists and industry trade groups expect the current rate of growth in the U.S. organic industry to continue.

Production Considerations
Certification requirement
All producers labeling or selling their products as “organic” must comply with NOP regulations. Growers with an annual gross
income of more than $5,000 from organic sales must be certified by a USDA-approved state or private certifying agency. The Kentucky Department of Agriculture (KDA) can serve as the certifying agent for Kentucky residents. While there are many benefits (e.g. cost) to using the KDA, growers may instead contract with a private certifying agency operating in the Commonwealth, if they prefer. Growers who complete the certification process may label and market their products as “organic,” “certified organic,” and/or use the USDA organic logo.

Small growers (less than $5,000 per year gross income) may be exempt from certification; however, they must still register with the KDA by completing the appropriate form. These growers may also be subject to an on-site farm inspection, at the discretion of the certifying agent, to verify that they qualify for exempt status. Exempt organic growers, who also must comply with all NOP regulations, may label their products “organic,” but they may not claim they are “certified organic” nor may they use the USDA organic logo.

Organic system plan and record keeping
Organic growers are required to develop an Organic System Plan (OSP), in which they outline the procedures that will be used to achieve, document, and comply with NOP standards. The OSP must contain details on current production, harvesting, and storage methods, including all materials (inputs) that will be used. Much of this information will be covered in the application form; however, it may be necessary to attach additional documentation to complete the OSP.

A detailed account of the field history, farm maps, crop rotations, and a comprehensive plan of operation for following organic protocols need to be incorporated into the plan. All fields, greenhouses, storage areas, warehouses, and processing facilities used in organic production must be discussed in the OSP. Growers with split operations (organic and conventional production on the same farm) need to include information on how they plan to prevent commingling of the two systems. They must also identify how equipment used in both organic and conventional production will be cleaned and managed prior to use on organic lands. The OSP should be implemented on all areas of the farm being transitioned to organic production. The certifying agency also conducts annual on-site inspections to make sure the farm is in compliance with NOP standards.

A thorough, well-thought-out plan that covers every possible contingency is essential, since any deviation from the plan must be approved in writing by the certifying agency before it can be implemented. For example, if there is any chance that an organically approved pesticide will be applied to the crop, the grower should include this information in the organic system plan. Valuable time can be lost in seeking approval for plan modifications while in the midst of a pest crisis. The initial OSP submitted with the certification application must be updated and approved annually.

Record-keeping is an essential aspect of organic production, and documents must be maintained for a minimum of 5 years after they are created. The NOP requires that records fully disclose every activity and transaction conducted in the operation of the organic farm. This includes accurate maps with the complete histories of all fields, greenhouses, and plant beds used in organic production; farm-related correspondence; labels and receipts for purchases; production, harvest, and storage logs; and any soil/water test results.

Transitioning to organic production
Only land that has been free of prohibited substances (e.g. synthetic pesticides and artificial fertilizers) for three years can be certified for organic production. The actual conversion from conventional agriculture to full organic production, however, can take from three to five years, depending on the crop(s), soil fertility, and the transitioning approach. A well-designed organic system will require progressively fewer and fewer off-farm inputs each year. Agricultural practices outlined in the grower’s OSP are employed during the transition period; however, produce may not be marketed as organic until after all certification requirements have been met.
Site selection and planting
Selecting a site that is well-suited to the crop being produced is especially important in organic production. Healthy, fast-growing plants can better tolerate or outgrow pest problems. Choosing appropriate varieties, plant densities, and planting dates are also critical to enhancing plant health.

Cultivar selection and planting stock
All seeds (including cover crop seed) and other planting stock (rhizomes, shoots, cuttings, tubers, and transplants) must be certified organic and either purchased from a reputable dealer or produced organically on the farm. 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. This generally means reporting attempts to find certified organic seed of the specified variety from a minimum of three sources. Seed or other planting materials cannot be treated with any prohibited substances. Transgenic or genetically modified (GMO) hybrids not permitted in organic production.

Plants for perennial crops, such as fruit trees, can be purchased from conventional sources if the desired cultivars are unavailable as organic stock. However, after these crops are transplanted, they must be grown organically for 12 months before the produce can be sold as organic.

Growers should select only locally adapted cultivars that have the qualities in demand for the intended market. It is especially important in organic production to choose varieties with resistance or tolerance to commonly occurring diseases and insects. Other key desirable features will depend upon the crop being grown. Refer to University of Kentucky variety trial data for recommendations. When crops are grown under contract, the processor generally specifies the cultivars to be planted.

Production methods
The emphasis of organic production is on biodiversity and the use of natural means of plant fertilization, soil-building, and pest management. The National Organic Standards Board has defined organic production as “an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony.”

Many of the traditionally sound cultural practices recommended for conventional agriculture are also employed in organic production. In fact, organic agriculture has been referred to as “good farming practice without using synthetic chemicals.” For example, planned crop rotations, which have multiple benefits in terms of soil building, plant health, pest management, and enhancing biodiversity, are required in annual organic cropping systems. Perennial cropping systems rely on alternative methods (such as intercropping, alley cropping, and hedgerows) to gain some of these benefits.

Growing cover crops, cultivating, composting, irrigating, and using animal and green manures are also employed in organic systems. Mulching materials can include natural materials (e.g., 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.

Healthy soil is the key to successful organic production. Depending on the condition of the soil, it can take several years to build up organic matter and improve soil quality. Soil fertility is enhanced through cover crops, nitrogen-fixing legumes, green manure, animal manure, 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. The use of raw or composted sewage sludge is prohibited because of the presence of heavy metals. 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, as well as the pollen drift from GMO varieties, can compromise the farm’s organic certification status. The certifying agency can require water, soil, and plant testing in cases where contamination is suspected. 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 additional steps to prevent the commingling of their two systems during all stages of production, harvest, storage, and transportation. For example, shared equipment and storage facilities must be decontaminated before use with organic crops.

It is important to note that not all non-synthetic materials (natural) are allowable, nor are all synthetic materials excluded from use in organic production. Notable exceptions include insecticidal soap, a synthetic compound that can be used in pest control, and tobacco dust, a natural product that is not permitted. The Organic Materials Review Institute (OMRI) evaluates materials for use in organic agriculture and publishes their findings in the form of lists of allowable and prohibited inputs. The certifying agency, however, makes the final decision regarding what products can or cannot be used on the organic farm.

**Pest management**

Organic farmers state that managing insect pests, plant diseases, and weeds are the greatest challenges in organic farming. Pest management in organic fields emphasizes prevention through good production and cultural methods. The goal is not necessarily the complete elimination of a pest, but rather to manage pests 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. Simply substituting conventional pesticides with organically approved chemicals is expensive and less efficacious than using cultural management strategies that minimize pest pressure in concert with organically approved controls.

Some organic pest management strategies include using crop rotations that disrupt the pest life cycle, improving soil quality, practicing good sanitation, using optimum planting densities, timing planting and transplanting operations to avoid high pest populations, employing biological control, and growing resistant varieties. Approved pesticides that have been listed in the grower’s OSP can be used in organic production, but should be used as judiciously and as specific to the pest organism as possible. Monitoring pests through frequent crop inspections and accurate identification are essential to keeping ahead of potential problems.

**Harvest and storage**

Products grown organically and harvested during the transition period cannot be marketed as organic; although as the organic market grows and consumers are informed about what “transitional” products are, this market is emerging as well. However, only those crops that have met NOP production and certification standards, including the three-year minimum transition period, can be marketed and sold as certified organic or organic. Many growers have found that yields can decline during the conversion to organic production; however, crop yields often improve following this transition period.

Harvest equipment, 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.

**Labor requirements**

Organic systems are more labor intensive than conventional systems. This higher labor requirement is most often attributed to the increased time monitoring and managing pests. Washington State research statistics indicate that labor hours per acre can be as much as 11% higher for agronomic crops. The increase can be much greater for horticultural crops.
Economic Considerations

Organic crops can receive price premiums of anywhere from 10% to 200% (or more) over conventionally grown products, according to the USDA Economic Research Service. Although production costs for organic crops can be higher, organic growers typically obtain higher net profits due to these price premiums.

Organic price premiums partially result from an increasing demand for organic products, coupled with a limited supply. In addition, some organic crops can be more expensive to grow, to market, and to transport than their conventional counterparts, thus resulting in higher prices. More intensive labor requirements, the higher cost of organic planting material, the purchase of specialized equipment, and the cost of organic inputs are some of the reasons for greater production costs. Further expenses can be incurred when organic products must be segregated from conventional products during transportation, processing, and storage.

Although production costs of organic specialty crops can be higher than conventional production, some organic commodity crops have lower costs of production than the same conventional crops. A recent study of corn and soybean production in Iowa found that organic farms had lower fertilizer and pesticide costs, but higher seed and machinery costs. On the average, the total cost of organic production was slightly lower than that of conventional production. A SARE-funded study of organic potatoes in Idaho found no overall difference in fixed and variable costs when compared to traditional production.

A number of studies comparing organic and conventional cropping systems have found that yields of crops in full organic production may be somewhat lower than that of conventional production. Most often cited are yield reductions of approximately 5% to 10%; however, in some studies these reductions were higher. At least one research study has indicated that organic crop yields were much higher than conventional during drought years. Yields can vary depending on the crop, variety, weather conditions, production methods, and grower expertise. In general, the longer the land is in active organic production, the smaller the observed yield reduction. This is due to the increases in soil organic matter, increases in insect diversity (including beneficial insects), and farmer experience. However, even with somewhat lower yields, higher price premiums can make economic returns for organic production equal to or higher than conventional production.

Organic production, however, does not necessarily guarantee higher wholesale or retail prices. A 2004 Organic Research Foundation survey of organic farmers found that only 41% of the respondents received a price premium for all of their organic products. Another 86% reported receiving a price premium on some portion of their organically grown products.3 Price competition with conventional products and limited local demand (e.g. in rural areas) are some of the reasons mentioned for failure to receive price premiums. The greatest price premiums and market demands are typically captured in urban markets.

In summary, organic crops are in increasing demand and often receive price premiums. While the learning curve to grow crops organically, along with the three-year transition period, are challenging, there should be market opportunities for Kentucky growers in both direct and wholesale markets. For an excellent description of the market for organic produce and the current price premiums received, see “Price Premiums Hold on as U.S. Organic Produce Market Expands.”

1 Definition passed by the National Organic Standards Board, April 1995 meeting.
2 “Organic Crop Production Overview” by George Kuepper and Lance Gegner, ATTRA, August 2004
3 “National Organic Farmers’ Survey” by the Organic Farming Research Foundation, 2004

Selected Resources

Web sites and organizations
- KDA Division of Value-added Plant Production: Organic Program (Kentucky Department of Agriculture)
- Organic Association of Kentucky (OAK)
  http://oak-ky.org/
- ATTRA: National Sustainable Agricultural Information Service
  https://attra.ncat.org/
- National Organic Program (USDA-NOP)
  http://www.ams.usda.gov/nop
• Organic Materials Review Institute (OMRI)  
  http://www.omri.org  
  • Southern Sustainable Agriculture Working Group (SSAWG)  
  http://www.ssawg.org  

Publications and tools  
• Organic Manures and Fertilizers, Appendix G in Vegetable Production Guide for Commercial Growers, ID-36 (University of Kentucky)  
  http://www.ca.uky.edu/age/pubs/id/id36/id36.htm  
• Agricultural Alternatives: Organic Vegetable Production (Pennsylvania State University, 2003)  
  http://extension.psu.edu/business/ag-alternatives/horticultural-production-options/organic-vegetable-production  
• Crop Conversion Calculator (Rodale Institute)  
  http://rodaleinstitute.org/farm/online-tools/crop-conversion-calculator/  
• Driftwatch: Watch Out for Pesticide Drift and Organic Production (Purdue University, 2012)  
  http://www.extension.purdue.edu/extmedia/JO/DW-1-W.pdf  
• GMO Contamination Prevention: What Does it Take? (University of Minnesota, 2012)  
  http://swroc.cfans.umn.edu/prod/groups/cfans/@pub/@cfans/@swroc/documents/article/cfans_article_390283.pdf  
• Guide for Organic Crop Producers (ATTRA, 2012)  
• How to Go Organic (Organic Trade Association)  
  http://www.howtogoorganic.com/index.php  
• Marketing U.S. Organic Foods: Recent Trends from Farms to Consumers (USDA-ERS, 2009)  
  http://www.ers.usda.gov/Publications/EIB58/  
• Organic Crop Production Overview (ATTRA, 2004)  
• Organic Crops Workbook (NCAT, 2003)  
  http://www.agrisk.umn.edu/cache/ARL04288.pdf  
  http://www.nal.usda.gov/afsic/opf/  
• Organic Production Handbook (Carolina Farm Stewardship Association, 2012)  
  http://www.carolinafarmstewards.org/organic-production-handbook/  
• Organic Seed Finder (AOSCA)  
  http://www.organicseedfinder.org/  
• Organic Weed Control Toolbox (eXtension, 2010)  
  http://www.extension.org/article/18532  
• Pressure-Treated Wood: Organic and Natural Alternatives (ATTRA, 2011)  
• Price Premiums Hold on as US Organic Produce Market Expands, VGS-308-01 (USDA-ERS, 2005)  
• Production Guide for Storage of Organic Fruits and Vegetables (Cornell University, 2012)  
  1.6 MB  
• Resource Guide to Organic and Sustainable Vegetable Production (ATTRA, 2012)  
• Southern Organic Resource Guide (ATTRA, 2005)  
  http://attra.ncat.org/sorg/  
• Sustainable Agriculture and Research Education Learning Center (Sustainable Agriculture Network)  
  http://www.sare.org/publications/index.htm  
• Whole-Farm Profitability Analysis of Organic and Conventional Cropping Systems (University of Minnesota, 2011)  
  http://ageconsearch.umn.edu/bitstream/103790/2/Delbridge%20AAEA%202011%20v2.pdf  

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For additional information, contact your local County Extension agent.