Converting to an Organic Farming System

Prepared by:
Melissa VanTine, *Graduate Assistant in Horticulture*
and Sven Verlinden, *Assistant Professor of Horticulture*
Work supported by: WVU Extension Service
Tom McConnell, *Extension Farm Management Specialist and Program Leader*
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Introduction to Organic Farming

Before 1940, when the population was smaller than it is today, it was common for farmers throughout the world to grow food organically, and yields were similar to those of medieval times. However, as the world's population increased, growing organically was no longer a feasible way to feed society. A more efficient way to feed a population that had almost doubled in size became necessary. This led to the introduction of intensive technologies, including fertilizers, mechanized cultivation, and biocides such as fungicides and herbicides, which helped produce greater yields for the larger population. These farming practices became integral parts of what we know as conventional farming.

Today, the intensive demands of conventional agriculture and the subsequent environmental impact are leading many people to demand production systems that are less detrimental to their health and the environment. Some of these detrimental effects are soil erosion and degradation, nonpoint source water pollution, groundwater contamination, reliance on nonrenewable energy sources, salinization, aquifer depletion, and loss of biological diversity. The trend toward organic production is also a result of consumers' concerns about possible negative impacts on their health when they are exposed to foods that contain chemicals. For these reasons, organic production is making a comeback.

The amount of organic farmland in the United States has been increasing since the 1990s, and organic production is estimated to be one of the fastest-growing segments of agriculture in the United States. The U.S. Department of Agriculture (USDA) has observed that the amount of certified organic land more than doubled between 1992 and 1997 in the United States. (Greene and Kremen 2003). Strong market signals are causing farmers to turn their attention toward organic production practices to meet the rising demand from consumers concerned about their health and the environmental risks of conventional farming.

The USDA implemented national organic standards in October of 2002, in response to the increased demand for organic products. These standards, known as the Final Rule, help define organic production. Organic farming excludes the use of synthetic fertilizers, pesticides, growth regulators, and livestock feed additives. Farmers rely on crop rotations, crop residues, animal and green manures, mechanical cultivation, and biological pest control. Each organic farm is considered unique, with practices carried out in a manner specific to its geographical location.

Converting to Organic Farming

When a conventional farmer wishes to switch to an organic production system the USDA requires a three-year transition period before produce may be certified as organically grown. During the transition phase, growers must use cultural, chemical, and biological practices that are approved under the Final Rule. These three years pose many difficulties to the transitional farmer while the changes in the chemical, physical, and biological properties of the soil take time to reach an ecological balance. In addition, many transitional farmers experience a loss in profits since it has been found that crop yields and profits decrease while input costs increase. It is recommended that farmers who are serious about converting to an organic production system start a pre-transition period, by slowly eliminating conventional practices such as using pesticides and beginning organic practices such as using biological control (Ngouajio et al. 2003).

A study about the relative costs associated with a transition to organic vegetable production found that average organic yields were significantly lower and input costs were higher for the organic system. It is important to realize that during the three-year transition period, organic growers cannot demand the price premiums they will receive after the product is certified and labeled organic (Sellen et al. 1995).

However, this study fails to consider the hidden costs of detrimental impacts to the environment and to human health associated with conventional practices. Nor does it account for the beneficial changes observed in the soils, including better soil aeration and rooting depth, better ability of the soil to hold water, and less potential for soil erosion and compaction (Sellen et al. 1995).

Although crop profits and yields are generally lower during the transitional phase, farmers convert to organic production to capture the price premiums organic products are likely to command and to enjoy the potential health and environmental benefits. Organic production is becoming possible for many farmers.

The following is an introduction to some key areas the organic producer may want to give extra attention. Please refer to upcoming papers covering each of these points in more detail.

Organic Production: The Basics

1. Soil Fertility

The foundation of organic farming lies in the health of the soil. A fertile soil provides essential nutrients to a growing crop plant, and helps support a diverse and active biotic community. Strategies the transitional farmer will employ to build the soil are crop rotations, animal and green manures, and cover cropping.

- Crop rotations

Many farmers find that rotating crops improves the tilth or aggregation of the soil. Planning a crop rotation requires a farmer to plant crops during different times and locations on the same field. Usually the succeeding crop will be of a different variety and species than the previous crops. Crop rotations can also be used to promote the soil's fertility, reduce erosion, reduce the buildup of pests, and spread out financial risk in case a crop fails. Farmers who include a legume in the rotation can increase the availability of nitrogen in the soil. Rhizobia that form on the nodules of legume roots convert nitrogen from the atmosphere into organic nitrogen, which then becomes available to plants.

- Cover cropping

A cover crop provides soil cover and can help loosen compacted soil through the root growth and improved water filtration. Cover crops also help prevent soil erosion by both water and wind, suppress weeds by keeping the sun from reaching weed seeds, and reduce insect pests and diseases. If a legume is used as a cover crop, it can provide nitrogen to the soil. Nonlegume cover crops can take up excess nitrogen, phosphorus, and potassium from previous crops and recycle them to the following crop.

- Green manures

A cover crop that is tilled into the soil while it is still green is referred to as a green manure. Green manures are important under an organic farming system because they help to add organic matter and nutrition to the soil. When a green plant is incorporated into the soil, it contains high amounts of nitrogen and moisture and becomes a food source for soil microorganisms and earthworms. During the process of decomposition by the organisms in the soil, organic matter and nutrients become available to the crop plants. Additional benefits from using green manures include the suppression of weeds and soilborne diseases.

- Animal manures

Livestock manure has traditionally been used to fertilize soils on both organic and sustainable farms. Manure can be applied to the field in either a raw or composted form. The Final Rule has specific requirements for using raw or composted manure, which the organic farmer must follow. Raw manure supplies nutrients to the soil, adds organic matter, and encourages biological processes in the soil. However it is important to know what is in the manure since some may contain contaminants. It is best to compost manure, since the heat created during composting may kill most of the contaminants. Before adding either raw or composted manures, farmers should have the soil tested so he or she can add the proper amount of raw or composted manure to their plots and avoid nutrient imbalances.

2. Weed Management

Weed management is based on prevention. As the soil health improves, weed populations decline (Ngouajio and McGiffen 2002). Weed populations may also be reduced by using crop rotations, eliminating weeds before they set seed and reproduce, and not allowing weeds onto the farm. Some crops can be grown to out-compete weeds for sunshine and food. Mulches help suppress weeds by preventing light from reaching them or by significantly decreasing the amount or quality of light reaching the weed seed or leaf. Also, there is evidence to suggest that using certain mulches with naturally occurring allelopathic chemicals can help prevent the germination of weed seeds.

3. Pest Management

Insect pests are going to be found in any ecosystem. Under conventional management regimes, a majority of pests may be eradicated with insecticides, but these chemicals also eliminate benign and beneficial insects. Repeated applications lead to the pests' increase resistance to pesticides, necessitating the use of ever-higher concentrations of insecticide. Eventually, the pest population may rise, leading to massive infestations. Under the organic system ecological balance is the main goal, instead of complete eradication. Ecological balance is maintained through the use of beneficial insects, predatory or parasitic mites, and spiders to keep pest populations down. To attract beneficial populations, farmers manipulate the farmscape by growing hedges and planting flowers.

In situations where particularly severe infestations occur, the Final Rule states that farmers may use biorational pesticides that are not as harsh as conventional pesticides as a last resort. These include microbial insecticides such as Beauveria bassiana (a fungus that attacks a wide range of both mature and immature insects), soaps that interfere with an insect's ability to respire, pheromones used as bait for traps and as disruptors of mating cycles, and botanical plant extracts such as neem that interfere with an insect's metabolic processes.

Farmers use integrated pest management (IPM) to determine the best approach to pest control. IPM involves monitoring to identify the pests. A pest management system is designed after conducting research into the insect pests' life cycle and into that of the pests' natural controls.

For detailed information on any of these practices, please refer to upcoming articles.

For additional information, please refer to the following Web sites:

http://attra.ncat.org/ Appropriate Technology Transfer for Rural Areas, National Sustainable Agriculture Information Service.
http://www.ams.usda.gov/nop/indexIE.htm National organic program homepage and Final Rule.
http://www.sare.org/ U.S. Department of Agriculture's primary means of studying and spreading the word about sustainable agriculture.

Suggested Reading Material:

Building Soils for Better Crops. 2nd Edition, 2000. Sustainable Agriculture Network.

Managing Cover Crops Profitably. 2nd Edition, 1998. Sustainable Agriculture Network.

Pickett, C.H. and R.L. Bugg (eds.). 1998. Enhancing Biological Control: Habitat Management to Promote Natural Enemies of Agricultural Pests. University of California Press, Berkeley, CA.

Steel in the Field: A Farmer's Guide to Weed Management Tools. 1997. Sustainable Agriculture Network.

A Whole-Farm Approach to Managing Pests. 2000. Sustainable Agriculture Network.

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Kuepper, George. 2003. Manures for organic crop production. ATTRA. www.attra.ncat.org/attra-pub/.

Ngouajio, Mathieu, McGiffen, Milton E. 2002. Going organic changes weed population dy namics. Hort Technology. Oct.-Dec:590-596.

Sellen et al. 1995. A comparison of financial returns during early transition from conven tional to organic vegetable production. Journal of veg prod. V.1(2):11-39.

Sullivan, Preston. 2003. Applying the principles of sustainable farming. ATTRA. www.attra.ncat.org/attra-pub/.

Zinati, Gladis. 2002. Transition from conven tional to organic farming systems: I. Chal lenges, recommendations, and guidelines for pest management. HortTechnology. Oct.-Dec:590-596.

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