

National Agricultural Research, Education, Extension and Economics
Advisory Board

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***Organic Specialty Crop Production Research
Priority Suggestions***

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The following items summarize major groups of long-range research and development objectives for organic, specialty-crop production. These objectives combine the goals of maximizing the economic opportunities of organic production, and the environmental benefits derived from expanding organic management.

1. Monitoring and managing the transition of soils from conventional to organic production to maximize yields and the biological benefits inherent in organic farming systems.

The transition to organic management remains a serious economic and production-oriented constraint to expansion of specialty crop acreage under organic management. Farmers need better information and tools to map a strategy through the transition period that maximizes income, minimizes costs, and achieves the benefits of enhanced soil quality as soon as practical.

Essential ingredients of such information and tools include –

- A characterization of soil quality encompassing physical, chemical and biological soil properties that relies on proven, accessible soil testing protocols and assays;
- Methods to project the impact of alternative tillage systems, soil amendments, and cropping systems on key soil quality parameters; and
- Work across multiple farms at various stages of the transition, and under mid- to long-term organic management, to identify soil quality thresholds that are not likely to be exceeded, and the management practices required to reach those thresholds.

2. Impacts of organic production methods and systems, and in particular nitrogen levels and forms, on the nutrient content and total antioxidant capacity of food, crop organoleptic qualities, the efficiency of nitrogen uptake by plants and amount of N lost to surface or ground water, and susceptibility to pest attacks.

Several high-quality studies have recently highlighted the role of nitrogen levels and forms in determining crop yields, nutrient density, flavor, and storability. Research is needed on the impacts of nitrogen levels and forms on crop growth rates, average cell size, nutrient density, and the levels, forms, and biological impacts of sugars in plant systems. The role of nitrogen levels in determining carbohydrate levels in growing plants, and on the glycosylation status of plant proteins, vitamins and antioxidants needs to be explored from both the perspective of impacts on plant physiology, growth, and defense mechanisms, as well as in terms of the nutritional quality and bioavailability of nutrients in fresh fruits and vegetables consumed by humans.

3. The area-wide impacts and implications of widespread adoption of organic production systems in regions producing predominantly high-value specialty crops.

Limited evidence suggests that the human health and ecological benefits of organic farming might increase substantially in response to widespread adoption of organic methods across a major farming region. Clearly, area-wide management of certain insect pests, in particular the codling moth in the PNW and California, has greatly enhanced the efficacy of mating disruption technology. With the recent decision of Stemilt Growers Inc. to convert all its cherry acreage in the PNW, and an increasing share of apples to organic production, an opportunity is now available to study ways to document and work toward maximizing the benefits of area-wide adoption of organic production systems. In particular, studies are needed on primary and secondary insect complexes; populations of beneficials and the cost-effectiveness of biological control; efficacy of biochemical based pesticides; the health and pollination efficacy of wild and domestic bee populations; impacts on farm worker health and well-being; impacts on bird and fish populations; and improvements in water quality and aquatic habitats.

The regional food system-wide economic impacts associated with widespread adoption of organic production methods, and a growing presence of large corporations in the organic food sector, also needs to be carefully studied and documented in order to maximize the benefits to consumers, farmers, and rural communities, and to avoid the possibly negative consequences that can accompany concentration of economic power within a production sector or market.

4. Impacts of nutrient levels and forms, irrigation practices, and soil amendments on the vulnerability of specialty crops to fungal and bacterial pathogens, and on the interactions between farming systems, pathogen colonization and proliferation, microbial biocontrol, and the efficacy of plant defense mechanisms.

Clearly, farming systems impact the vulnerability of specialty crops to fungal and bacterial attacks, thereby impacting the risk of mycotoxin and microbial contamination and food safety problems. There is ample evidence in wheat systems linking use of fungicides, high levels of nitrogen, and short-statured cultivars to increased risk of mycotoxin formation. In leafy greens, nitrogen levels, irrigation practices, and the quality of soil amendments clearly influence the risk of bacterial contamination problems. Current food safety “good agricultural practices” need to be broadened to include a range of management innovations designed to alter the biology of specialty cropping systems in ways that lessen the chances of fungal or bacterial colonization and growth. Progress in preventing pathogens from gaining a foothold in crop fields have potential to substantially improve the effectiveness of other, also essential food safety GAPs.

5. Development of advanced probes and assessment systems to monitor and assure the stability and safety of compost, compost teas, and other soil amendments.

Applications of composted animal manure, and other forms of organic soil amendments, are essential in building soil quality, sustaining sufficient levels of nutrients to support economic yields, and in order to turn waste streams into renewable resources. Clearly, new science is needed to update and refine compost and soil amendment manufacturing procedures and related safety and stability testing protocols. In addition, cropping systems differ by several orders of magnitude in their vulnerability to fungal or bacterial pathogens in manure, composts, and other soil amendments, with low-lying leafy greens intended for fresh consumption sitting at the high-risk end of the spectrum. Work is needed to establish practical standards governing compost and soil amendment quality as a function of the intended use of the compost or soil amendment. Such standards and testing procedures will reduce the cost of utilizing manures, crop residues and wastes, and other biological inputs for the purpose of soil quality improvement.