Research Directions for Organic Tree Fruit Production in North and South America

David Granatstein
Center for Sustaining Agriculture and Natural Resources
Washington State University
Wenatchee, Washington
USA

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Abstract

Organic pome and stone fruit production in both North and South America expanded dramatically during the 1990s in response to growing consumer demand for certified organic foods. Nearly all production is located in the semi-arid regions where disease and insect problems tend to be significantly less. Tree fruit producers and researchers in more humid regions are attempting to develop viable organic systems for their climates. Key challenges for producers in all regions include crop load management (fruit thinning), effective and economical weed control, fertility management, and control of replant disease. Insect pest problems vary by region, with some pests such as codling moth being a nearly universal problem. Advances in insect pest IPM for conventional production have directly helped organic producers. Researchers are focusing more attention on ecological design concepts and techniques to minimize pests and provide other benefits to the system.

INTRODUCTION

Organic farming has established itself as a viable alternative system in American agriculture (Greene, 2000). Organic food production of all kinds expanded dramatically during the latter 1990s (USDA, 2000). This can be attributed to many factors, including consumer concerns about pesticides, a general increase in environmental awareness, much broader availability and selection of organic foods in groceries, improved quality of organic products, good economic times, and new tools and techniques to address organic production problems.

Organic farming is in congruence with important societal trends such as a desire for greater environmental stewardship, more interest in food integrity, and reduced use of pesticides (NRC, 1989; Hartman, 1996; Swezey and Broome, 2000). These trends are expected to continue for the foreseeable future. The expansion and legitimization of organic farming is also leading to much more research, development and education, both from the public and private sectors, providing growers with important production assistance.

But these same trends have attracted numerous growers to organic production, initially because of the generally higher prices paid for organic foods (Featherstone, 2000). Often, the new organic growers are long-time conventional growers who can readily adapt to the organic regime and rapidly expand organic acreage, both domestically and abroad, leading to oversupply and depressed prices as has occurred for organic apples (Gabriel, 2001). Organic and conventional systems are converging for many crops, and it may be harder to distinguish them in the future and make a credible case to the consumer. And consolidation and industrialization are rampant within the organic food sector, promising many of the same outcomes we have seen in the conventional sector, such as downward price trends and the economic squeeze on moderate-sized farms (Pollan, 2001).

Organic growers will need research on consumers as much as on farming practices. Key areas include consumer preference, national and worldwide production trends, organic standards and comparative advantage, and other food labeling programs. Growers need to communicate their unique research needs to public agricultural

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institutions and stay abreast of all tree fruit research, as many new developments apply equally well to organic and conventional orchards. Conversely, new techniques developed for organic farms may be attractive to all growers.

PRODUCTION TRENDS FOR ORGANIC TREE FRUIT

Based on conversations with growers and marketers, organic tree fruit production generally lagged behind demand until 2000. However, the large increase in organic apple acreage in Washington State in 1990 as a response to the Alar incident (Fig. 1), and the resulting crash in organic apple prices, was a warning to growers to be aware of expanding production beyond the market demand. Since agriculture statistics services were not tracking organic production, growers had no information source to turn to. In 2000, the report "Trends in Organic Tree Fruit Production in Washington State" was released (Granatstein, 2000a), providing the first comprehensive look at organic apple, pear and stone fruit production. This information, recently updated with worldwide trends, has helped current organic growers assess their plantings as well as enabled prospective growers to evaluate whether organic production is a viable option. Tables 1 and 2 and Figures 1 and 2 provide a snapshot of production trends, suggesting a rapid increase in acreage domestically as well as overseas.

The predominant production of organic pome and stone fruit in the U.S. and Canada occurs in the semi-arid regions of the West, where pest and disease pressures are generally lower. Similar regions in Argentina also have successful organic production. The trends for organic tree fruit acreage in the West are upward, especially in Washington and California. Future tracking of acreage will show whether many new entrants into organic tree fruit production exit with the current and anticipated reduction in prices. Often, growers who try organic production end up adopting certain practices (e.g. mating disruption, use of compost for nutrients, etc.) regardless of their organic status.

RESEARCH NEEDS FOR ORGANIC ORCHARDS

Organic orchardists often have certain research needs that are different than conventional growers due to the constraints imposed by organic production rules. As the acreage of organic production increases, public agricultural institutions are responding with more research on organic systems. In addition, societal goals for environmental stewardship have prompted much more research on methods of direct relevance to organic production even if not conducted specifically for or in organic systems. Organic farming advocates are pushing for a considerable increase in organic research by public institutions (Sooby, 2001) and some new funding is emerging to help support this.

All production regions share a number of common research needs, based on presentations and discussions at meetings such as the First National Organic Tree Fruit Research Symposium (Rom et al., 2001) and the Southern Hemisphere Workshop on Integrated and Organic Fruit Production (INTA, 1999). These include fruit thinning, weed control, soil fertility, rootstock and variety evaluation, influence of organic production on fruit quality, and production and price statistics.

The Organic Farming Research Foundation (Santa Cruz, California, USA) has conducted biennial surveys of organic farmers in the U.S. to document their perceived research and education needs (Walz, 1999). In order to better understand the research needs in the Northwest U.S., a survey of 14 organic apple growers was conducted in 1994 (Cornwoman and Granatstein, 1999) to examine the range of practices being used and the research and information needs of the growers. The growers were all experienced in organic production, and represented a range in farm size and location in Washington and Oregon. Results from the latter survey are incorporated into the sections below.

Arthropod Pests

The most critical need identified by organic orchardists in the western U.S. historically was control of codling moth (*Cydia pomenella* L.). Inadequate control of this pest in organic apple orchards was a primary barrier to production of organic apples. With

the widespread availability of pheromone mating disruption in the mid-1990s, and its efficacy in most situations, growers perceived that a major research need had been met, even though the technology was not specifically developed for organic systems. Growers recognize that continued research on codling moth is necessary, including strategies that meet the organic rule.

Surveyed growers did not consistently mention any other arthropod pests as a high priority for research, as these were being controlled adequately in most cases through available tools and enhanced biocontrol. Growers did comment on the need to know more about the potential to enhance biocontrol through plant diversity in the orchard. In more humid regions, growers face other pests that may be of equal importance to codling moth (e.g. plum curculio [*Conotrachelus nenuphar* Herbst], apple maggot [*Rhagoletis pomonella* Walsh]).

Recent research has provided new biorational pest control options for organic growers, including products such as kaolin, neem, spinosad, oils, and repellents. As the organic sector grows, agricultural supply companies are targeting products for this market and investing in research and development. In addition, researchers are investigating cultural techniques such as orchard floor mowing frequency, the use of planned border vegetation, and cover crops to enhance pest management in organic systems.

Weeds and Diseases

Weed control is a challenge for organic growers in all regions. In the absence of herbicides, most growers have turned to tillage for control of weeds in the tree row. This practice is very costly, can have undesirable effects on soil quality, and does not always sufficiently control weeds and limit competition, especially with young trees. Surveyed growers expressed interest in thermal methods of weed control, mulching systems (including living covers), biocontrol (e.g. pathogens of weeds), and a better understanding of weed competition with the trees. Organic growers have welcomed the current research on mulching that is underway in the region to help fill this void (Granatstein, 2000b). Organically approved herbicides are also becoming available, but their effectiveness is not known, especially for perennial weeds.

While foliar and fruit diseases are generally not a major problem for many organic apple orchards in the semi-arid regions, apple replant disease complex does pose a significant challenge. The use of organic soil management practices does not appear to provide meaningful suppression of this disease (M. Mazzola, pers. commun.). Some organic growers fumigate their soil before replanting to avoid the risk of a failed planting, since there are no reliable proven methods for organic systems. They then start their organic transition again after fumigation. Due to international agreements to phase out methyl bromide use (a common fumigant for apples), the USDA-ARS launched a research program looking for alternative practices for controlling replant disease. The current focus is on cultural and biological options that will be directly usable by organic growers (Granatstein and Mazzola, 2001) rather than simply screening other fumigants and fungicides. With the growing organic acreage and the pressure to keep varieties current, a replant control scheme useful to organic growers is an important need.

In humid regions, effective control of apple scab (*Venturia inaequalis*) is the highest priority research need. Work continues on development of resistant varieties that have consumer and commercial acceptability. Apple scab represents the largest barrier to successful organic apple production in humid regions.

Horticultural Management

The surveyed growers indicated that the research with the largest potential economic payoff would be the development of blossom thinning techniques that could reduce labor. Most growers rely on hand labor for thinning, and costs can range from 10-100% greater than in conventional orchards. Increasingly, tight labor supplies are also a threat to a hand thinning program. Investigations into chemical blossom thinners that would be acceptable under the organic rule are underway by a number of researchers in

the U.S. and other countries and a practical and affordable solution is likely in the next several years (McFerson and Schmidt, 2001).

Another area of increased cost identified by growers is fertility management. The reliance on bulky, low analysis organic amendments leads to higher costs to purchase and apply nutrients. Growers suggested research that could help use these materials more efficiently by understanding their nutrient release and their effect over several years. They also were interested in the potential to provide fertility internally through practices such as legume ground covers.

Information

In addition to help with production issues, the surveyed growers pointed out the need for organic crop statistics that could assist them, as well as producers considering organic orcharding, in their business planning with facts on the industry status. Public agricultural statistics services generally lack the resources to do this. Washington State University faculty conducted the research to produce the first profile of trends in organic tree fruit production (Granatstein, 2000a) and are producing updates to keep the information current.

CONCLUSION

As the search for more environmentally sound farming practices continues throughout agriculture, an increasing amount of mainstream research is directly applicable to organic farms. This is true in the public sector as well as the private sector. New biopesticides are being developed and companies recognize the need for formulations that meet the organic rule. The greater acreage of organic production and more funding available for organic research have combined to induce more university researchers to conduct studies explicitly on organic systems. Organic apple orchards around the world are facing many similar challenges on fruit thinning, weed control, fertility management, and cost reduction. This provides a strong incentive for more interaction and collaboration among researchers involved in organic production to speed up the development of new techniques that can address the common priority needs.

The increased media attention given to organic farming can also bring added scrutiny, as in the case of the Hudson Institute critique of organic foods for microbial contamination from manure (Avery, 1998) and the recent findings of widespread contamination of foods with genetically engineered genes (Vorman, 2001). In addition, organic growers may face criticism about the sustainability of their systems on issues such as tillage, labor management, and use of certain pest control materials (e.g. sulfur). Research on what organic farms may contribute to society other than food (e.g. ecosystem services, social benefits) will be useful for public policy development.

As mainstream fruit production in many regions of North and South America moves ever closer to organic, growers will need continued understanding of their customers and markets and may need to communicate attributes about their products that are ‘beyond organic.’ This could include fair trade and labor aspects, wildlife impacts, and energy use. A major research challenge will be development of strategies to market large volumes of organic fruit in a manner that captures attributes of direct marketing, thereby retaining some of the economic benefits that organic orchardists have enjoyed in the past.

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Tables

Table 1. Estimated world area of organic apple and pear production – 2001.

	Certified Hectares	
Country/region	Apple	Pear
U.S.	7,114	1,133
Canada	324	24
Europe[1]	3,512	1,484
South America	560	377
New Zealand	1,163	66
Total	12,552	3,084

[1] Europe data are for 2000.

Table 2. Organic tree fruit area (ha) in the U.S. – 2001.

State	Apple	Pear	Cherry	All fruit
Washington	2648	530	123	3416
California	1834	341	72	3508
Arizona	1134	--	12	1146
Colorado	621	40	54	779
Idaho	204	--	--	205
Oregon	142	202	10	478
Other	411	19	23	485
Total	6994	1132	294	10,014

Figures

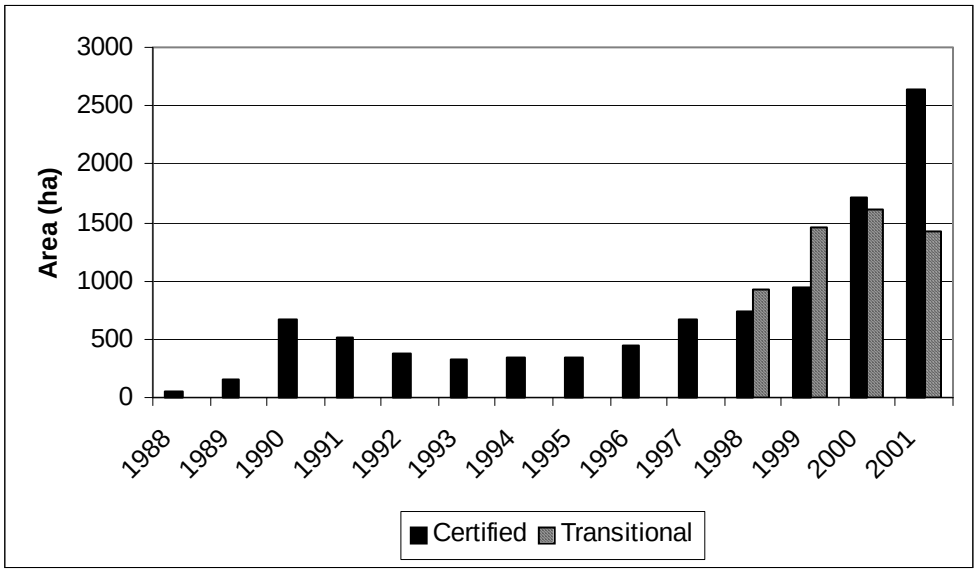

Fig. 1. Production trends for organic apples in Washington State, USA.

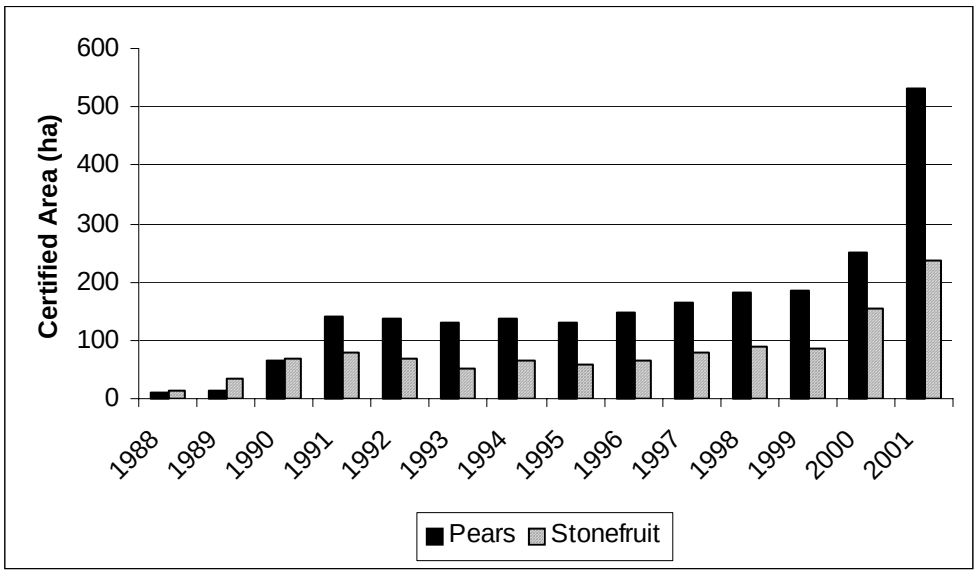

Fig. 2. Production trends for organic pears and stonefruit in Washington State, USA.