

Editorial: Sustainable agriculture systems in a resource-limited future

Welcome to the special issue on *Sustainable agriculture systems in a resource-limited future*. Its focus is the development and promotion of the appropriate agri-food systems in the face of the global issues of climate change and energy and resource depletion. The purpose of the special issue is to invite selected authors to provide their perspectives on important issues affecting the food and agricultural system of the USA and elsewhere, given the dramatic ecological shifts and accelerating depletion of critical natural resources such as oil. For the most part, the authors for this special issue are social scientists of various types (economists, geographers, policy analysts and sociologists). We believe it is clear that social, political and economic changes are at the core of solving the climate change and resource depletion problems we face. But we also realize that changes in practice and appropriate evidence-based and farmer-centric technology development are essential vehicles to create the agri-food systems needed to promote and realize sustainable outcomes. All the articles have been peer-reviewed by prominent experts in the field.

In part, we are attempting to shift the parameters of current debates within agricultural research, policy and practice away from the standard organic versus conventional, and initiate important conversations on how we can shape research, policy and practice toward creating sustainable outcomes. This is not to argue that organic agriculture is no longer an important concept or production system. Rather, we wish to change the focus to understanding how organic systems, as currently organized, can help achieve societal goals in this new era. And we wish to discern how other systems can be developed in ways that contribute to long-term and holistic solutions to ecological and energy issues in agriculture and food manufacturing.

The special issue is composed of three parts.

1. An introduction to the special issue and overview of the socio-economic issues.
2. A set of papers addressing policy and food-system issues.
3. A set of papers taking up potentially important technology development trajectories, such as organic agriculture, agri-biotechnology, energy biomass crops and anaerobic digesters.

In an introductory commentary, Fred Kirshenmann provides a conceptual overview of the various topics and critical issues that face us today and in the future. He argues that 'Agriculturalists are recognizing that resilience is at

least as important to food security as maximum production, and consumer concerns provide us with unprecedented opportunities for farmers and consumers to come together as "food citizens" to determine appropriate changes in our food system'. That is, increasing environmental awareness has been translated into greater reflexivity on the part of consumers of all types, perhaps especially food consumers. The rise and increasing popularity of labels designed to compensate producers for adopting certain types of food production and manufacturing practices coincide with an unprecedented need to reward firms that shift toward more sustainable systems.

In the following section, but in the same vein, Andrea Woolverton and Carolyn Dimitri consider the role of green marketing in addressing the pressing environmental, production and social problems we face currently. Leslie Duram and Lydia Oberholtzer follow by delving into the geography of local food and the various claims associated with it regarding natural resource conservation '... including food miles, consumer transportation, scale and community, agricultural methods, and diet'. And Ann Sorenson and Jimmy Daukas provide a helpful overview of available and suggested *Policy approaches to energy and resource use in US agriculture*. As they put it, they wish '... to expand our view of agriculture as a source not only of food, fiber, biofuels and renewable energy but also of other critical ecosystem services, like cleaner water, carbon sequestration and wildlife habitat, and to adjust policies to realize this potential on all agricultural lands'. The theme linking these first four papers is the potential for agricultural governance (public regulation, private labels and social movement organizations) to evolve beyond the minimization of externalities of all types, and to become a complex web of integrated systems that lead toward solving environmental and other social problems and act as vehicles for ecological improvement and resiliency. Cornelia Flora concludes this section by addressing adroitly the interaction between the issues raised in this special issue and the imperative of food security where it is most insecure—sub-Saharan Africa. Flora references the Millenium Villages approach and the growing awareness of the smallholder's fundamental role in achieving sustainable food security in Africa. Specifically she argues that 'Priority be given to developing technologies that follow the systems principles of sustainable agriculture, integrating biological and ecological processes (such as nutrient cycling, nitrogen fixation, soil regeneration, and biodiversity) into the

production processes; minimizing use of non-renewable inputs that cause harm to the environment or to the health of farmers and consumers; and making productive use of the knowledge and skills of farmers and their collective capacities to work together to solve common problems’.

The final section includes papers that address specific suites of technologies that have been put forth as having the potential to move agriculture toward becoming a vehicle for realizing beneficial environmental change and ecological, social and economic resiliency. The list is not exhaustive, but the articles provide helpful and provocative discussions on how to embed technological change and development within governance structures (e.g., government regulation and funding imperatives, and ownership and control of critical resources and intellectual property) that make it more likely that technological change will enhance rather than hinder the development of sustainable agri-food systems.

Specifically, Teresa Selfa uses data collected from ‘... community surveys, focus group and individual interviews and an analysis of environmental violations [to examine] the local impacts of biofuels production ...’ in Kansas and Iowa. And Ervin, Glenna and Jussame move beyond environmental impacts and argue that agri-biotechnologies can promote sustainable social and economic outcomes ‘... if fundamental changes [are made] in the way public and private research and technology development and commercialization are structured and operated’. Nadia El-Hage Scialabba and Maria Müller-Lindenlauf illustrate the promise of organic agricultural systems for slowing global warming through carbon sequestration, improving soil fertility, enhancing the economic and ecological viability of smallholder agriculture, and increasing and sustaining yields of farms in the

developing world. This article complements well the prior presentation of Flora and thereby emphasizes the critical importance of ecological approaches to farming for smallholders in lower-income nations. Finally, Welsh and colleagues conclude the issue with an examination of the research, development and extension trajectory of anaerobic digester (AD) technology. They argue that the emphasis on AD technology as an approach to limit the negative environmental externalities of larger-scale livestock operations has obscured its potential to provide similar benefits to smaller livestock, especially dairy, operations. Again, smallholder agriculture emerges as an integral and indispensable part of sustainable agriculture.

This issue emphasized critical socio-economic themes with regard to sustainable agriculture systems in a resource-limited future. The next issue of the journal will include a number of articles that detail specific farming systems that provide vehicles for realizing sustainable outcomes. For example, Moore finds that biointensive onion production in Pennsylvania results in higher yields and greater energy efficiency than ‘mechanized systems’. And Michel and colleagues find that the ‘implementation of biogas systems may lead not only to reduced gaseous emissions when fossil fuels are replaced but also to indirect benefits from changed handling of animal wastes and organic crop residues’. In addition, Liu and colleagues investigate the energy efficiency of organic pear production in greenhouses in China.

Rick Welsh

Professor of Social Science
Department of Humanities and Social Sciences
Clarkson University, Potsdam, NY 13699, USA
welshjr@clarkson.edu