

The Conversion to Sustainable Agriculture: Principles, Processes, and Practices

S.R. Gliessman and M. Rosemeyer, editors. 2010. CRC Press, Taylor and Francis Group, Boca Raton, Florida. Cloth, \$89.95, 370 pp. ISBN 978-0-8493-1917-4.

The process of converting conventional systems to those more sustainable over time should be the key focus of courses in agricultural science. Whether these classes present a focus on components in genetics and crop improvement, nutrient management, irrigation, or integrated control of pests, the pieces of the puzzle need to come together into a coherent, productive, and profitable integrated production system. Editors Gliessman and Rosemeyer have assembled a collection of chapters that deal with basic principles of how the conversion process works, and how this fits into a historical progression of agricultural systems as implemented in organic production. What follows are eleven chapters of specific examples from geographically distinct regions, plus a final statement on how to convert the global food system. This would be a useful teaching reference.

A framework and context for conversion is provided by senior editor Stephen Gliessman (Ch. 1) with a list of current critical issues:

- Uncertain energy costs
- Low profit margins in agriculture
- New and promising practices in organic systems
- Increased environmental concerns and regulations
- Awareness of links between nutrition and health
- Appreciation of integrating conservation with other goals
- Growing markets for organic/ecological products

Especially useful to those not acquainted with conversion is a series of guiding principles taken from Gliessman's own popular textbook *Agroecology* (2007): recycling and use of renewable resources, management of whole systems rather than the parts, greater dependence on biology and natural processes, adapting systems to natural conditions rather than dominating the environment, and seeking justice and equality of benefits as integral goals in system design. Steps in the process follow the well-known methods introduced by Stuart Hill (1985) in Canada – efficiency, substitution, redesign – but add a fourth level which is reconnecting consumers with farmers who produce food.

Details about conversion are provided by co-editor Martha Rosemeyer – production and economics, plus social and ecological dimensions that emerge while farmers make this change (Ch. 2). She emphasizes the role of farmers in our learning process, and gives weight to practical experience along with the results of controlled experiments. The useful strategy of replicated or long strip comparisons on farms, where the designs provide statistical comparison as well as visual demonstration, is endorsed as a way to combine farmer and researcher wisdom into the process. Especially valuable in this chapter is a description of parameters that are used to evaluate success in systems, easily quantified in production and economic terms but less well understood and accepted in the environmental and social spheres. Dr. Rosemeyer concludes that practical methods and measures are needed to help farmers make the conversion, but that quantifiable criteria for evaluating systems success are also important for policy makers who influence the food system context in which these changes take place. The last chapter in this section on history of organic farming (Ch. 3) provides a useful overview, but for more depth and broader coverage of the roots in northern Europe the serious reader is referred to the excellent review by Lockeretz (2007) that for some reason was not cited in this chapter.

The most extensive section of the book, *Global Perspectives*, chronicles the research and farmer experience in conversion to sustainable systems in three regions of the U.S., two in Mexico, and six other countries and regions around the world. Highly specialized farming systems that separate crops from livestock, as in the Northern Midwest of the U.S. (Ch. 4), complicate the conversion process since farmers are locked into large land and equipment investments. For decades they have pursued a strategy of enlarging operations rather than making them more ecologically sustainable. This farming environment has created a type of personal expectations and community norms that accept the status quo and disappearance of small towns and rural infrastructure, creating barriers to sustainability that are difficult to overcome. The road to sustainability in northwest fruit production (Ch. 5) is complicated by market concentration on a few varieties, on growing competition for water, and by insect pests that are difficult to manage with controls other than chemicals. Conversion of strawberry production in California to systems less dependent on chemicals also presents unique challenges (Ch. 6). Loss of approved chemical fungicides for soil fumigation has forced the industry to adopt new IPM strategies, and

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problems are only now being solved by research. What emerges from these examples is recognizing the importance of different challenges in each region and each type of cropping system. As complex as ecosystems themselves, the solutions do not follow any simple established menu of practices.

In Ontario (Ch. 7), the environmental farm plans provide federally funded support for conversion to more sustainable practices, but the program has attracted relatively few participants. The focus has been on ecological, economic, and social sustainability. Organic food production in Mexico in 2007 reached a value of \$430 million, and this specialized activity is concentrated in coffee for export and small farm agriculture (Ch. 8). The case for revitalizing traditional agriculture in Mexico is proposed as a way to solve the threats of diet changes, loss of traditional knowledge, and decline in biodiversity on farms (Ch. 9). The *ejido* program of land reform that accompanied the Mexican revolution in the early part of the last century provided a foundation for sustainable agriculture that endures to the present. Cuba represents a truly unique model of sustainability in agriculture, due to their loss of petroleum and economic support from the former soviet union and a massive modification of farming practices from chemical-based to essentially organic on a national level (Ch. 10). A neocolonial system gave way to more dispersed ownership and management, a move toward integrated pest management and vermiculture to promote soil fertility, and a large increase in urban and peri-urban food production. Cuba in fact provides an intriguing look at one potential future for sustainable agriculture in many more parts of the world where conventional production resources are scarce.

An example of strong institutional and government involvement is found in the European Union (Ch. 11), where substantial support is provided for conversion to organic/ecological production. From a low level in France of 2% organic to a high in Austria (11%), there is considerable interest in organic production and food sales across Europe. Prices are near double for certain products such as eggs, potatoes, and wheat, providing a significant incentive to produce these specialty products. Japan (Ch. 12) has a 2000-year history of sustainable farming, although agriculture now represents only 1% of the GDP. There has been recent legislation supporting sustainable and organic farming, and the marketing sector has been especially well developed.

In the Middle East, better known today as Southwest Asia, the three dominant systems are dryland cereals, irrigated agriculture, and extensive pastoralism (Ch. 13). The major limitation in all systems is water, while lack of appropriate production inputs plus poor government policies and support programs have seriously limited food security in the

region. Some of the most effective conversion strategies have included introduction of organic fertilizers and IPM for pests, system redesign to better use available rainfall, and national policies as well as research and education to promote sustainable food production. Australia is another dry environment for agriculture (Ch. 14), with changes in demographics, local demand, and international markets affecting stability in the food system. The collapse of world wool prices highly impacted the industry. Growing concerns about chemical residues in food, impacts of agriculture on the rural landscape, and the need for sustainability have sparked some changes. Ecolabels for food have emerged, but there is slow change toward more sustainable systems. The book provides two case studies from different regions to illustrate both current challenges and changes in agriculture.

In a concluding chapter on *Transforming the Global Food System*, editor Stephen Gliessman describes the growing role of the consumer in shaping how we grow food and the emerging perspective that we need to think beyond crop yields as the major indicator of success. More farmers are certifying for organic production in the U.S., and they appear to be younger and more diverse, with smaller farms and lower gross sales, and often have off-farm work, compared to the overall farm population. However, in the Midwest we currently have 80% of all farm families with at least one person working off farm, and 40% have both spouses working elsewhere; it would appear that the organic farmer profile is not all that different in our region. Most importantly, there is an emerging culture of sustainability, with concern about organic foods, value-added products, and specialty farming. These can all lead to greater stability on the farm and greater value that can accrue to the farm family.

Overall, this is a balanced book with chapters that fit together in a logical pattern. The book opens new perspectives to those in the U.S. and Europe with the focus of many chapters on countries and systems not familiar to many of us. The country case studies illustrate unique and successful alternatives that are being used around the globe. What is clear is that no single menu or formula exists for success, and profitable and sustainable systems must be developed in each agro-eco-region as well as market situation. National policies, economic situations, and incentives differ among countries, and globalization is impacting many local decisions. The book is recommended as a good introduction to global agriculture and for learning about alternative opportunities to develop sustainable food systems.

References:

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Illustrated Anatomy of the Bovine Male and Female Reproductive Tracts

By K. June Mullins and Richard G. Saacke, 2003, Germinal Dimensions, Inc., Blacksburg Virginia, soft cover, 87 pages, \$30.00, ISBN 0-9743745-0-4.

This book is of significance to persons deeply interested in reproductive anatomy of cattle. Target audiences for this publication include educators, students, veterinary technicians, and bovine artificial insemination (AI) and embryo transfer (ET) technicians. This monograph evolved from the authors' 35 years of experience teaching animal reproduction at Virginia Polytechnic Institute and State University (Virginia Tech) and is aimed toward bridging the gap between gross anatomy and histology/microanatomy of bovine reproductive tract structures. The authors note that their book purposefully excludes discussion of function or physiological importance of the anatomical features illustrated.

The uniqueness of this monograph is two-fold. Firstly, the book contains a collection of detailed, full-color illustrations that are well-labeled and easy to understand. Common terminology and Latin nomenclature are used for each anatomical structure, and text is fairly limited which helps keep readers focused. The basic format of the monograph is to have detailed figure legends on the left-hand page and the corresponding illustrations on the right-hand page (as the book is laid open). Secondly, the authors have combined their personal observations of reproductive tract structures with those published in the scientific literature for the development of their illustrations. In several cases, the authors report that their observations were not in complete concordance with previous publications. The bibliography contains 33 references spanning a time period from 1950 to 2000.

The authors have done a marvelous job presenting the anatomy of reproductive tract structures of the cow and the bull in a sequential manner, starting with illustrations of gross anatomy and progressing to sub-gross and then microanatomy depictions. This manner of presentation lets the reader see the "big picture" before delving more deeply into organs/glands at the tissue and cellular levels. Many of the 38 figures consist of two to six illustrations that collectively comprise the figure.

Female reproductive anatomy is the focus of the

first 18 figures in the monograph. Anatomy of the ovary, oviducts, uterus, cervix, and vagina is presented along with illustrations of the placenta and placental-uterine attachments in a pregnant cow. Highlights of these figures include detailed illustrations of the ovarian follicle wall and the corpus luteum, chronology of follicular development, changes in architecture of the oviduct along its length, and organization of tissue layers of the cervix.

Male reproductive anatomy is the focus of the final 20 figures in the book. Anatomy of the testis, scrotum, spermatic cord, epididymis, urethra, penis, and accessory sex glands (vesicular, prostate, and bulbourethral) is presented along with illustrations of spermatozoa. Highlights of these figures include the stages of the cycle of the seminiferous epithelium during spermatogenesis, a rotational view of ejaculated spermatozoa, the disseminate prostate gland, and the global view of male reproductive tract structures showing spatial relationships.

Although this monograph is excellent in many ways, some of the figures must be carefully studied to completely understand the structure being illustrated due to subtle differences in shading of adjacent cell types. Students with no previous background in histology and reproductive anatomy may initially find some of the illustrations a bit overwhelming; however, such students likely will need to spend only a few extra minutes with supplemental reference material before gaining a good understanding of the illustrations. Similarly, persons wishing to achieve a complete understanding of bovine reproductive anatomy and physiology will need to consult additional textbooks on physiology.

This monograph is an excellent value, and educators who teach a laboratory course in livestock reproductive anatomy may wish to consider adopting this as a laboratory textbook. Similarly, educators who teach a lecture course in domestic animal reproductive physiology may wish to consider placing this book on reserve for their students as a supplement to their required reproductive physiology course textbook (physiology is difficult to understand without strong knowledge of anatomy). Those who train AI and ET technicians also will undoubtedly find this monograph useful. This monograph would have been even better had the authors included the collection of illustrations in electronic format for use in classroom teaching and other educational presentations.

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Structure & Function of Plants

By Jennifer W. MacAdam. 2009. Wiley – Blackwell, John Wiley & Sons, New York. Paper, \$62.99, 287 pp. ISBN 978-0-8138-2718-6.

The first-time reader of a text on plant anatomy and physiology will be amazed by the level of detail and the sparkling presentation in *Structure & Function of Plants*, a valuable introduction on how plants are built and how they work. Those who may have taken botany courses some years or decades ago will find this book a pleasant departure from the older black and white texts and photos of yesteryear. Not only is much more known today about how plants work, the presentation here in detailed figures and spectacular photos brings this topic alive.

The author begins with chapters on the structures of plant cells, meristems, and tissues, and then aggregates these into discussions of roots, stems, and leaves. The segue into function comes with discussion of translocation, then reproduction, and followed by plant nutrition. Plant-water relations are presented, then the functions of macromolecules and enzymes. Chapters on photosynthesis and respiration describe these processes in great detail, with accompanying figures and photos that bring plants to life on the

printed page. Final chapters on environmental regulation of plant growth and development, hormonal regulation, and secondary plant metabolites conclude the book. There is an exhaustive glossary, four pages of references, and an index. Surprising to this reviewer was the omission of the two seminal texts by Katherine Esau on plant anatomy from 1953 and 1961, yet the preponderance of modern literature is a definite asset of the book.

Author Jennifer MacAdam is in the Department of Plants, Soils, and Climate at Utah State University. Although she credits colleagues for providing some of the excellent photos, and an illustrator for turning her ideas into easily accessible drawings, we must congratulate the author on an excellent choice of material and a clear writing style that provides the detailed anatomical precision and up-to-date biochemical explanation that makes this a scientifically credible text and useful reference. It would be an excellent book to have on the shelf for teachers and researchers who want to check on plant structural and functional facts to help support their work.

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