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# FUTURE HORIZONS: RECENT LITERATURE IN SUSTAINABLE AGRICULTURE

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**EXTENSION AND EDUCATION MATERIALS  
FOR SUSTAINABLE AGRICULTURE: VOLUME 6**

***FUTURE***  
***HORIZONS:***



***RECENT LITERATURE IN  
SUSTAINABLE AGRICULTURE***

**Gabriel Hegyes and Charles A. Francis, Editors**

**September 1997**

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***FUTURE HORIZONS:  
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***FUTURE HORIZONS:  
Recent Literature In Sustainable Agriculture***

***Chapter I***

***Introduction***

**A Foundation for the Future**

Here is one building block in the foundation for a future agriculture. Increasing trainer literacy in sustainable agriculture can be defined on several levels. At its most literal, it is an anthology of reviews familiarizing the reader with some of the authors, topics, and titles that have composed the sustainable agriculture literature over the last decade or more. It also serves as an annotated bibliography where the dry abstracts of many such works are replaced with insightful essays. Most importantly, this primer is a language text, exposing the user to the semantics, symbols, and syntax of sustainable agriculture. This collection of titles is not meant to be exhaustive, but rather to be representative. Our primary audience was identified in the legislative language that established a Professional Development Program in the Sustainable Agriculture Research and Education (SARE) program: Extension staff and other Federal personnel who deal directly with farmers. This collection also can be useful to others interested in food and natural resource systems: teachers, resource specialists, farmers and ranchers, activists, or others who want to brush up on current thinking.

Opponents, skeptics and fence-sitters of sustainable agriculture often take refuge in the slogan that there is no commonly held operational definition to drive further discussion of the topic, let alone define research to pursue its aims. This bibliography is yet another attempt to counter those claims and point out to the reader the common threads that run through the works of those involved in sustainable agriculture.

Sustainable agriculture is, first and foremost, historical in its assumptions. Many adherents are familiar with depredations of agriculture to the environments in other eras. Examples such as the destruction of the “Cedars of Lebanon” in part to build King Solomon’s temple; the salinization of the irrigated land in Mesopotamia, one of the “cradles” of Western Civilization; and the desertification of Northern Africa remind us of historical precedent. There can come a point where consequences outpace our abilities and the capacity of nature to mitigate the effects of ruinous farming practices. Today’s sustainable agriculture professionals— farmers, researchers, non-profit organization members and conscientious consumers — are mobilizing for the future, betting that there is still time to counter the unparalleled pace of change in this post-industrial world that is leaving ecological capital irreparably diminished for future generations.

The historical perspective of sustainable agriculture is often labeled retrograde and nostalgic. Certainly, practitioners and researchers of alternative systems are reexamining practices that worked before: methods that kept more of the farmer’s resources and livelihood within the family and the community. But there

is also widespread recognition that farming in the past was often thoughtless and wasteful even by those who fit one of the favorite images of the American farmer: the small landowner whose self-sufficiency provided the source for Jeffersonian, democratic idealism.

Opponents of sustainable agriculture's historical perspective also fall into the slippery conceits that historian Barbara Tuchman recounted so well in *March of Folly*: our culture and technology are too superior to base decisions, or actions, on the lessons of the past; or that the steady and patient pace of indigenous knowledge cannot compete with organized, well-funded information production. Two follies she cites are British conduct in the American War for Independence, and U.S. military doctrine in Vietnam.

The "hard" science of sustainable agriculture is conceptualized holistically, which means that it is multi-disciplinary, interdisciplinary, ecologically based, and ultimately a biologically-compliant system that cannot be calibrated like a carburetor. Programs like SARE were explicitly designed to encourage this kind of research. In fact it requires that diversity in order for a proposal to be funded. Integrated Pest Management and Integrated Weed Management are examples of farm management strategies that emerged from this same recognition of the interrelationships inherent in the biosphere.

Practitioners of sustainable agriculture put great stock in indigenous knowledge, that is, the culture and wisdom that farmers practice, based on their own experience or that handed down from their past. Research that encourages partnerships with farmers, academic researchers and extension staff can produce a richer and more forward-looking production system that will undergird the stewardship goals of sustainable agriculture. One example is a W.K. Kellogg Foundation-funded project in Washington state that involves approximately 23 management support groups across the state in which farmers, ranchers, extension, state and federal agencies, tribal members, and environmental community people are functioning as teams teaching whole farm planning and environmental education (Goebel, 1997)<sup>1</sup>. For many advocates of this approach, lessons need not be learned only from the Developed World. Cultures that have kept their inhabitants fed for millenia should not be ignored simply because their technology is not bought, bright and shiny. The multiplicity of lessons learned from intensive, multiple cropping systems in the tropics that now find application in the Developed World serve as an example of a robust body of valuable indigenous knowledge.

Proponents of alternative systems look beyond production when they consider agriculture. Issues of quality of life for the individual farm family, the profitability of the whole farm system, and the resilience of the rural community are frequently factored in along with environmentally benign practices. The sustainable agriculture non-profit community has been instrumental in keeping these fundamental issues from being ignored just because they are not easily quantified, or that they increase the collective blood pressure of the establishment. In fact, there are a number of people who will not accept a definition of sustainable

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<sup>1</sup>Goebel, Jeff. 1997. Re: Programs with government and nonprofit staff teams? SANET e-mail network, 9 February 1997.

agriculture that excludes any one of these three elements: environmentally benign, economically viable, and socially just.

The environmental concerns of the sustainable agriculture community fall into two categories:

- a) Conservation of finite natural resources, such as water and soil. These concerns include the over-pumping of aquifers or surface waters for irrigation, and soil erosion due to a myriad of practices.
- b) Amelioration of the environmental impacts of modern, conventional farming practices. These concerns include the runoff or leaching of pesticides and fertilizers into surface and ground water, and the silting of waterways and reservoirs from excess soil loss during fallow periods in the growing season.

Motives for pursuing research in alternative farming systems are many. There is increasing recognition that if farmers do not change their ways soon, they will be forced by regulation. There is little chance that the calls from the suburbs and cities for the farming sector to clean up its act will subside; the likelihood is that they will increase. Measurements of farm chemicals in drinking water, rivers, and streams are cause for alarm to many. There appears to be wide-spread mistrust of the people speaking for conventional farming interests who still insist the concerns are fictitious, misguided or manufactured by a politicized press. There is also little chance that an industry that depends on sales of agricultural chemicals and fertilizers will actively pursue a research agenda to replace those products with sophisticated management of cropping production practices. This seems obvious, in spite of the widespread use of the term "sustainable" to describe the next generation of chemical farming systems.

Sustainable agriculture means to many people a more management- or information-intensive approach to the farming operation. In other words, instead of relying so much on purchased fertilizers, a farmer uses crop rotations and leguminous cover crops to provide much of the fertility that crops need. With an ideal balance, the soil need never be mined but nutrients extracted would be replaced, and the farm would remain in a productive nutrient balance over time. Weed control would rely less (or never) on herbicides, but would use rotations, planting dates and densities and mechanical controls more intensively.

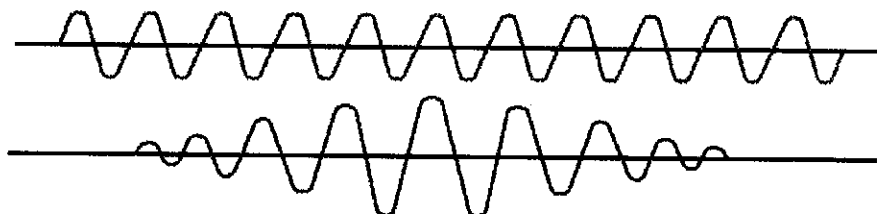
Concern over soil is a major theme that runs through sustainable agriculture. It is a research area that weaves throughout the community, especially the area of soil organic matter. There is shockingly little quantifiably known about the contribution of soil organic matter to soil health, but the intuition and some qualitative studies point to a major impact. Farmers for generations have known about the descriptor, soil tilth, even if they used other language. Today, a growing group of agriculturalists, who often talk about soil health, are trying to translate that term through their research for their colleagues in the experiment station and on the farm.

We offer this anthology on behalf of the several reviewers who have contributed time, ideas, and energy to the process. A number of reviews are reprinted and we thank the authors, journal editors, and publishers for permission to use them. The breadth of titles, from science to fiction, represents our appreciation of

different ways of knowing. We each learn in different ways. Omissions of key books are due to a variety of reasons, all valid yet inexcusable, and remain the responsibility of the editors.

**Gabriel Hegyes, Keiser College, Daytona Beach, Florida**

**Charles Francis, University of Nebraska, Lincoln, Nebraska**



## **National Online Resource Examples**

### **NAL/AFSIC**

The Alternative Farming Systems Information Center (AFSIC) is one of 10 information centers at the USDA National Agricultural Library. Room 304, NAL/ARS/USDA, 10301 Baltimore Blvd., Beltsville, MD 20705-2351, (p) 301-504-6425, (f) 301-504-6409.

AFSIC E-mail: [afsic@nal.usda.gov](mailto:afsic@nal.usda.gov).

AFSIC Web page: <http://www.inform.umd.edu/EdRes/Topic/AgrEnv/AltFarm/>

NAL Web page: <http://www.nalusda.gov>

### **SAN/SARE**

The Sustainable Agriculture Network (SAN) is a cooperative effort of university, government, farm, business and non-profit organizations dedicated to the exchange of scientific and practical information on sustainable agricultural systems. SAN is funded by the USDA's Sustainable Agriculture Research and Education (SARE) program. SARE is a federal competitive grants program with regional leadership and decision-making structures. SAN is the information dissemination arm of SARE. Address for the SAN national coordinator is the same as for AFSIC. Address for national SARE office is Room 3868 South Bldg., Ag Box 2223, Washington, DC 20250-2223, (p) 202-720-5203, (f) 202-720-6071.

SAN E-mail: [san@nalusda.gov](mailto:san@nalusda.gov)

Web page: <http://www.ces.ncsu.edu/san/>

### **ATTRA**

Appropriate Technology Transfer for Rural Areas (ATTRA) is the national sustainable agriculture information center which links people involved part- or full-time in commercial agriculture to information and resources that will assist them in the development of sustainable farming systems. ATTRA, P.O. Box 3657, Fayetteville, AR, 72702, (p) 800-346-9140.

E-mail: [askattra@ncatfyv.uark.edu](mailto:askattra@ncatfyv.uark.edu)

Web page: <http://www.attra.org>



**FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture**

**Chapter II**

**Introduction**

**Third Rock from the Sun:  
What is the Condition of Earth?**

Few topics in science and development generate as much discussion and controversy as the assessment of the current condition of the planet, and projections for the near future. Every serious writer in this arena has access to similar statistics, and it is astounding to read the range of conclusions that is drawn from an essentially similar data base. At one end of the spectrum are books such as those published by Worldwatch Institute (e.g. *State of the World*, 1997, and others) that describe the disappearance of resources, biodiversity, and options for the future. At the other extreme are *The True State of the Planet* (1995) and other books that urge more private ownership of resources and greater reliance on the free market economy. In each book, authors with convincing credentials present compelling arguments and statistics to back them up. From this bewildering array and versions of the truth, how do we sort out the real condition of Earth?

In each case the truth appears to reflect the philosophy of the author(s), and also the vested interest that their organization represents. We must ask ourselves, "What is the motivation behind this book?" Does it represent a strong commercial interest? Who supported the writing project, supplied the grants, or published the book? Is this an attempt to create a best selling exposé and market a trade book to the general public? In the two examples cited, *State of the World* represents a voice for the environmental community, one that is committed to correcting past ills and seeking a sustainable path to development; conversely, *The True State of the Planet* presents a strong case for the continued march of the status quo, a reliance on free markets and unbridled capitalism, and an assumption that what is good for business makes for the common good. These books are described in the following reviews.

Along the spectrum between the two extremes are found other descriptions of global challenges and how they are being solved or ignored. *Full House: Reassessing the Earth's Population Carrying Capacity* (1994), by Lester Brown and Hal Kane, again presents the perspective from Worldwatch Institute, with focus on resource security and declines in real production per capita. *A Moment on the Earth* (1995) describes a new wave of environmental thinking, optimistically called 'ecorealism' or 'environmental optimism.' Gregg Easterbrook describes with eloquence the many problems caused by human habitation and population growth, and presents his opinions on how the Earth and the resilience of Nature are causing those to heal. Specific impacts of our food system are catalogued in *Environmental Impacts of Agricultural Production Activities* (1986), with an in-depth background given on conservation tillage, water and soil quality, air and noise pollution, and solid waste; author Larry Canter also provides emerging technology clusters that are being used to solve the negative impacts of agricul-

ture. In *Agriculture and Natural Resources - Planning for the Twenty-First Century* (1991), the results of a strategic planning exercise for agriculture and natural resources in the University of Wisconsin is described, including both the process of the review and the background that led to the activity. Finally, Daniel Hillel in *Out of the Earth* (1991) surveys problems and lessons from the past and how these have created the challenges of the present.

Perhaps a desirable course of action for the thoughtful reader is best described by Daniel Hillel. He describes the richness of our past, and how research continues to add to our understanding of the natural environment and the impact of human activities. From this strong foundation, he suggests serious action but not pessimistic frenzy. His 'conditional optimism' is based on our human abilities to analyze, learn, and make positive changes that will solve the root causes of environmental problems rather than applying band-aids. Hillel contends that an alternative future is not an option, but rather an essential pursuit. He asks only when we will have the insight and the fortitude to start the process in serious.

With this series of reviews, we hope that you are stimulated to pursue your own version of the truth. We challenge you to decide:

***What is the condition of the Earth?***

**Charles Francis and Gabriel Hegyes**



**FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture**

## **State of the World**

Lester R. Brown and others, yearly since 1984

W.W. Norton, 500 Fifth Avenue, New York, NY, 10110. 288 p, cloth \$25.00, paper \$13.95

What is the true state of the world? People concerned about global population, resource depletion, and environmental damage look forward to this annual update on critical challenges. A comprehensive analysis of nine to eleven issues each year, this well-known publication is currently translated into several major languages and sells hundreds of thousands of copies each year. Extensive sales of the book and its distribution to decision makers around the globe make this one of the most influential publications currently in print. Why the popularity of this often critical assessment of our world's condition?

Published since 1984 as a "report on progress toward a sustainable society" from the Worldwatch Institute, the *State of the World* has tried to answer many of the questions and concerns about the fitness of the biosphere. Under the guidance of Lester Brown, *State of the World* has been highly regarded over the years. An effective way of showing policy makers and activists salient environmental and food systems issues, the book series helps point out practices and techniques to change negative circumstances into positive ones, and move us closer to sustainable systems.

Over time, authors have included Brown, Christopher Flavin, Sandra Postel, Hal Kane, Anne Platte, Linda Starke, Alan Durning, Jodi Jacobson, and others from the Worldwatch group. Some of these (Flavin – "Power Surge," Brown – "Who Will Feed China," Postel – "Last Oasis," Brown and Kane – "Full House," Durning – "How Much Is Enough?") have expanded particular chapters into full length books, very suitable for background discussion groups or as class texts.

Chapters in the *State of the World* have covered population and demography, urbanization, transportation, oceans (fisheries, water), conserving soils, protecting forests, recycling, energy (sun and wind, nuclear power, reducing dependence on oil),

food supplies (production and productivity, security), and global economics. The most recent edition shows the wide range of topics: change, history, food, climate change, water strategies, freshwater ecosystems, agricultural resources, bio-invasions, infectious diseases, human rights and environmental justice, sustainable industries, and "harnessing the market for the environment."

As a single volume, each book offers an overview of timely subjects which the editors from the Worldwatch Institute feel are crucial to a sustainable society. Read individually, the articles serve as an impressive glimpse at the dominant trends and salient data surrounding the matters of sustainability. Viewed over the years, the *State of the World* serves as a rich and robust source of facts, trends, and disclosures. Each article includes extensive end notes and specific references.

Each volume begins with an overview chapter ("New World Order," "Nature's Limits," "Thresholds of Change") and then moves to nine or ten key areas of emphasis for that year. In these roomy and very well written essays, Lester Brown takes the opportunity to look at the big picture, at the state of the world for that year. Generally, it is one of human drama, pushing the environmental limits of the biosphere. "...The history of the next few decades will be defined by food, specifically by rising prices of both oceanic and land-based food products, by a spreading politics of food scarcity, and by an increasingly intense struggle to achieve a sustainable balance between food and people." Given the trends in the decline in grainland area, lack of irrigation growth, and declining fertilizer use, the outlook is not good for increased food production to match the pace of population pressures. Brown does focus heavily on population, and he uses statistics well.

While he is often criticized as a doomsayer, Brown offers specific examples of what countries are doing



to deal with the real and serious issues of sustainable economics, population, climate, and energy. With many diverse illustrations, he provides a worthwhile and useful inventory of positive responses that fits a variety of cultures. He does not depend on a singular, undefined response, the totally western world perspective of free-enterprise solutions. When reading Brown, a confirmed capitalist could certainly see wonderful opportunities and possibilities in the efforts of other countries. With adaptation, many of these ideas, such as bicycle-friendly transportation systems, wind farms, limits of public subsidies for large families, could be used in the U.S. and other big, industrialized countries. The rest of the *State of the World* will reinforce and provide many examples for these first ideas.

Although many chapters tackle the most difficult issues of our time — loss of farmland and fisheries potential, excessive military spending, water and air quality, the over-riding complications of a growing population — they invariably include solutions and alternatives. In this way, *State of the World* is far more than a catalog of global ills; in a real sense, it is a rich catalog of creative approaches to solve these problems.

In addition to well known, highly publicized issues, *State of the World* also looks at more obscure challenges. The case of mountain peoples and other indigenous groups, as well as their fragile ecologies

and economic futures, are examined in detail. The loss of biodiversity, the impacts of poverty, the challenges of health, and the widening economic differences between North and South have all come under scrutiny. This annual exposé of problems rarely advocates the status quo; rather it identifies key issues that limit our collective ability to achieve a sustainable path toward global sustainability.

This series is a work of scholarship and creativity. It seems to break with the past by offering innovative, tested ideas on how to deal with the key issues leading to a sustainable society. It is distinguished from similar books in that it offers many authors, although they are in general agreement about the precarious *State of the World*. It is well written and edited—rich in tables and figures, and it is marked by a very good reference section, almost without equal in this type of book. There is a concern of all the authors about the circumstances of the world, and of the individual and cultural differences that shape particular responses.

This series is highly recommend, both as contemporary information and as reference material. Serious students and practitioners in development eagerly await the publication each year of *State of the World*.

*Reviewed by:*

*Jim King*

*University of Nebraska, Lincoln, NE*



## **The True State of the Planet**

[First Review]

Ronald Bailey, Editor, 1995

The Free Press, 1230 Avenue of the Americas, New York, NY 10020. 472 p, paper \$15.00

What is the true state of the planet? Since 1984, the Worldwatch Institute under Lester Brown has tried to answer this query with their series, *State of the World*. They have been very successful in helping us see and attend to environmental issues.

But is there another, competing world view? Are there additional perspectives and opinions on the state of the planet? Should we hear them? Yes indeed to all these questions. *The True State of the Planet* extends another, not often heard, view of the condition of the environment.

This is a commendable compendium of conservative contemplation on our worldly circumstances from the Competitive Enterprise Institute. Editor Ronald Bailey and “ten of the world’s premier environmental researchers...” present interesting and thought-provoking essays to confront the voguish environmental movement. Bailey and friends go beyond just challenging, they specify vivid strategies and tactics for realizing their visions.

Contributors include Bruce Ames and Lois Swirsky Gold (The causes and prevention of cancer: the role of environment), Terry L. Anderson (Water options for the blue planet), Dennis T. Avery (Saving the planet with pesticides: increasing food supplies while preserving the earth’s biodiversity), Robert Balling, Jr. (Global Warming: messy models, decent data, and pointless policy), Nicholas Eberstadt (Population, food, and income: global trends in the twentieth century), Stephen R. Edwards (Conserving biodiversity: resources for our future), Indur M. Goklany (Richer is cleaner: long-term trends in global air quality), Kent Jeffrey (Rescuing the oceans), Stephen Moore (The coming age of abundance), Roger A. Sedjo (Forests: conflicting signals), and Fred L. Smith, Jr (Reappraising humanity’s challenges, humanity’s opportunities). While readers may be acquainted

with some of these authors and arguments, the complete collection of papers is a valuable supplement to the standard, environmental bookshelf.

Environmentalism for the 21st century, Bailey writes, is in need of revisitation because it is based on a failure of theory — Malthusianism. This error, combined with others, has led the world to develop a series of “first-wave” responses to our global environmental problems. These generally have as a dominant theme, “top-down imposition of laws and regulation, some of which, in turn impair the capacity of people to change their behaviors on their own.” Bailey provides an example, the “deplorable state of global fisheries,” whose depletion stems from the “tragedy of the commons” mentality.

He declares that “first-wave environmentalists fail to realize that the problem lies in the commons, not in the herdsmen. They (the first-wave environmentalists) typically want to regulate the herdsmen instead of abolishing the commons. History shows that the better way to avoid the tragedy of the commons is through privatizing resources ownership.” Thus, second-wave environmentalists, those who argue that technology can nourish the optimum solutions to the century’s environmental problems, “propose that private owners, individual or groups, commercial or noncommercial, offer the best defense against environmental degradation.”

These essays do not make a “doom and gloom” book. Rather they beam with past environmental and agricultural successes as models and hopes for the future. Some examples: “today, humans beings eat better, produce more, and consume more than ever before in the past;” “modern high-yield farming is responsible for preserving a great deal of the world’s biodiversity;” “the expansion of

American forests has been made possible by improved tree-growing technology, the advent of tree plantations, improved control over wildfire, and the reversion of many agricultural lands, especially in the South and East, to forests;" "the idea that there is an epidemic of human cancer caused by synthetic industrial chemicals is false;" "richer is cleaner; anything that retards economic growth also retards ultimate environmental cleanup;" "drift nets, which indiscriminately net and kill any species they entangle, are an example of the inappropriate measures taken in the absence of property rights;" and "technological improvements and advances in productivity have continually outpaced our consumption of natural resources and have led to the net creation of more resources available to future generations."

Most of the arguments presented are done with a detailed seriousness and scads of statistics, charts, and tables, all selected to show a unique perspective. Nevertheless, the essays combine and integrate in a generally readable fashion. While some of the articles labor and drag, the propositions are important, and the voices and approaches add critical elements to the environmental debate at this time.

While Julian Simon is not an essayist in this crew, he is the hand behind the extensive natural resource

arguments and economic words in this book. For example, most authors in *The True State of the Planet* assume that "a drop in price (of natural resources) is a market signal of less, not more, scarcity."

This is a stern and timely book. For example, in the epilogue, Smith contrasts two breeds of environmentalists — the alarmists (Brown, Ehrlich) and the cornucopians (Simon, Cato Institute). While *The True State of the Planet* group does not see the catastrophes and breakdowns forecast by the alarmists everywhere, they admit to being positive and realistic. They feel the problems of global warming, fresh water, air pollution, the oceans, forests, population, agriculture and food, resources, synthetic and natural chemicals, and biodiversity are concrete and substantial, and solvable. There are constructive and market oriented processes to solve these significant environmental issues, and within the approaches and idea in *The True State of the Planet*, there are results that will allow us to progress and extend humanity's environmental wealth.

*Reviewed by:*

*Jim King*

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## **The True State of the Planet**

[Second Review]

Ronald Bailey, Editor, 1995

The Free Press, 1230 Avenue of the Americas, New York, NY 10020. 472 p, paper \$15.00

Green\*wash: (gr~en-w^osh) -washers, -washing, -washed 1) the phenomenon of socially and environmentally destructive corporations attempting to preserve and expand their markets by posing as friends of the environment and leaders in the struggle to eradicate poverty. 2) Environmental whitewash. 3) Hogwash<sup>1</sup>

Corporation, Transnational: Dominant institution of the late twentieth century, comparable to the medieval church or the Roman legions of the First Century A.D. Because it exists in the realm of pure abstraction (like money and the Holy Ghost), it can give birth to its own parents.<sup>2</sup>

*The True State of the Planet* is a greenwash of psychedelic proportions. It is an ambitious addition to the environmental counter-Reformation that the right has launched. Likewise, the book is a militant apologia for the transnational benevolence of corporate culture. One dizzying essay after another misrepresents the gravity of issues like overpopulation, loss of biological diversity, global warming or pollution. Even more fantastic are the free market solutions, which call for everything from privatizing the oceans to conserve fisheries to intensively farming only the most productive acres on Earth. Not one author acknowledges the colossal military commitment that would be necessary to inflict these measures, let alone the tyranny that would be needed to enforce them. Would certain entities—nations, corporations, or

some 21st Century *chimera*—control access to fundamental human needs like food, water and livelihood to a new order of magnitude?

The reader is enveloped in a dervish of often lightly documented assertions that would test the stamina of the most ardent exegetist to rigorously refute. One particularly nasty example is found in Dennis Avery's essay, "Saving the Planet with Pesticides." Praising Norman Borlaug and the Green Revolution, Avery adds, "More recently, some environmentalists, including biologist Paul Ehrlich and Lester Brown, have asked whether it was a good idea to save 500 million people from famine."

There is a relentless wall of information that is carefully, and sometimes outrageously, aggregated to support one denial after another that much is wrong. Avery reasons that, "The UN's Food and Agriculture Organization estimates that despite progress, the number of people with inadequate diets increased in the past ten years, from 540 million to 580 million. Nonetheless, it should be relatively easy to boost the vast majority over the threshold of hunger, since 90 percent of those with inadequate diets are now within 10 percent of having enough calories for good health" (Avery, p. 50). Dare one ask the obvious: "So, why hasn't it been done?"

Then, there are the examples of improvements over the years. "In the United States, sulfur dioxide emissions per capita are down 60 percent from the peak in 1920. Both particulate and carbon monoxide emissions per capita have declined more or less continuously since World War II..." (Golklany, p. 340). What the author conveniently omits, and he is not alone in this tactic, is that these positive trends came about only because of the ability of ordinary citizens through their government and its agencies to force industry to do the right thing.

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<sup>1</sup>From Corporate Watch Homepage:  
<http://www.corpwatch.org/trac/greenwash/greenwash.html>

<sup>2</sup>Lapham, Lewis, H., "Economic Correctness", Harper's Magazine, February, 1997

Bailey divides the book into twelve sections: a prologue by the editor; 10 essays; and an epilogue by Fred L. Smith, the founder of the Competitive Enterprise Institute, which commissioned this work. The editor argues that on the first Earth Day, the First Wave of the environmental movement was launched. It brought a frenzy of concern, NGO membership and environmental regulation. In the Western world it scored some major successes: cars run cleaner; smoke stacks billow scrubbed smoke, air and water are cleaner. There were important theoretical failures, however: global famines expected in the 1970s did not materialize (*but regional ones wrought plenty of misery*); Europe and North America were not deforested (*but much of their stands were homogenized*); the Earth is not warming according to the gloomy models, and may be in fact cooling (*the developers never claimed to be modeling for the short term*); and overpopulation is an unscientific and unlikely scenario (*but population shifts could do as much damage*). First Wave environmentalist dogma was wrong because its Malthusian assumptions were wrong. First Wave environmentalist practice worked for a time, the argument continues, but the infrastructure built for it is now applying pressure on the last 10% of the problems, which makes the benefits realized increasingly expensive and intrusive.

Clearly a Second Wave is needed, one that "...propose(s) that private owners, individual or group, commercial or noncommercial, offer the best defense against environmental degradation.

Simply by protecting their property—trees, animals, fish, grazing areas, rivers—they incidentally protect the Earth for the rest of us." The invisible hand of Adam Smith will protect our Planet. This Second Wave will recognize that instead of "fighting about every last drop of 'toxic' waste" it will grapple with a major threat to global health, "...indoor air pollution in the form of smoke and carbon monoxide—the result of burning biofuels like wood and dung in houses in the developing world...." (Bailey, p.4)

To be fair, there are a couple of essays which are quite penetrating in identifying problems, challenging unexamined beliefs, or questioning powerful assumptions. These articles are: "Water Options for the Blue Planet," which describes the wasteful consumption habits of Americans, due mostly to politics depressing prices; "Rescuing the Oceans," that recounts the enormity of overfishing in the World's oceans. But, then the solutions snap the reader back to the reality that this entire book is, more than anything else, a call for corporate hegemony which bases its legitimacy on "eliminat[ing] the distinction between economic and ecological values, to encourage institutions that ensure the widest possible scope for human valuation of environmental values." (Epilogue, Smith, p. 382).

*Reviewed by:*

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## **Full House: Reassessing the Earth's Population Carrying Capacity**

Lester R. Brown and Hal Kane, 1994

W.W. Norton, 500 Fifth Avenue, New York, NY 10110. 261 p, paper \$8.95

The debate over the limits to global agricultural production has a long history. It is often cast as a conflict of Cornucopians vs Malthusians, of optimists and pessimists. Optimists point to technological progress in intensive agriculture, success in raising per capita food production, and declining population growth rates. Pessimists stress limits on arable land, diminishing returns to fertilizer inputs, environmental degradation, and the continuing momentum of still-increasing net additions to global population growth. This recent volume by Brown and Kane presents a powerful case that we are indeed reaching limits. In this context, the optimist/pessimist dichotomy appears to avoid the real and immediate issue of feeding the earth's growing population without doing irreversible damage to its life support systems.

In the foreword, Brown describes his experience as an agricultural policy analyst working with the U.S. Agency for International Development in India during 1965. He describes how, when India faced a drastic grain harvest shortfall, the immediate crisis was met with massive U.S. food aid. To respond to the long-term problem of inadequate food supplies, he and Indian officials prepared a plan to double production through introducing high-yield grain varieties and expanding fertilizer use and irrigation. The plan succeeded, but as grain harvest doubled over the next three decades, so also did population. Per capita consumption rose only slightly. An extra 450 million people were fed by transforming India's agriculture, dramatically increasing fertilizer use and irrigated area. But how, Brown asks, will India feed a further 590 million additional people over the next forty years? The "backlog" of easily available agricultural techniques that existed in 1965 has already been used. No dramatic yield-boosting innovations are on the horizon, and environmental problems with irrigation and soil

degradation are growing. The food problem is as serious as the 1960s shortfalls, but the solution is much less clear.

In fact, we are reaching global and regional carrying capacities. This concept is anathema to many economists, whose models imply infinite expansion of carrying capacity through technological innovation. But biophysical analyses and the growing discipline of ecological economics assert that the limits to carrying capacity are real. Gilland (1979), for example, used biophysical limits to derive a maximum global carrying capacity of about 10 billion, close to the U.N.'s medium variant population projection for the mid-21st century. Regionally, limits on water and arable land often impose more stringent constraints, as in much of Asia. Brown and Kane give us a detailed picture of the stresses on the world food system as these limits are approached.

Population drives the issue. Overall population growth rates are declining, but net annual additions to population are at an all-time high and will not decline much for decades. If we were merely discussing our response to environmental problems created by present agricultural production, our task would be more manageable. But a projected increase of at least 50% in world population (100% for Africa), together with an inevitable increase in per capita demand with economic growth, means we must double present agricultural output over the next forty years.

Brown and Kane review what this will mean for major nations and for the world as a whole. They survey evidence leading to several discouraging conclusions: limits have already been reached or exceeded in fisheries and grazing lands; there is little scope for further expansion of harvested area; soil erosion and degradation are widespread; large

areas are characterized by water limits and groundwater overdraft; and yield response to additional fertilizer is decreasing. Based on this evidence, they disagree with recent World Bank projections of steadily increasing yields. After steadily increasing since World War II, global grain consumption per capita has declined during the last decade. They conclude that we have reached a turning point from a period of steady growth in food consumption per capita to a much more uncertain future.

Perhaps Brown and Kane place too much emphasis on a decline in consumption per capita that may be only temporary. In general, world food prices are still stable or falling, indicating that the slowdown in growth is more a matter of demand than of supply. If supply constraints were limiting food availability, we would expect to see rising food prices. With the possible exception of rice, this has not occurred for major food grains. But if supply constraints are not the explanation for the recent slowdown, this by no means proves that they will not be crucial in the near future.

*Full House* offers projections of country and world grain supply and demand through 2030 that indicate a massive shortfall, around 500 million tons. There is a good support for the assertion that China and other major nations of Asia must soon become big importers. Asia's population dynamics, as well as their arable land and water limits, are well defined. Only the most optimistic project that Africa will not be a large net importer of grain when the continent's population doubles. We take as given that the United States is a major grain exporter, but as U.S. population grows (to nearly 400 million in 2050 by recent Population Reference Bureau assessment [Pollard, 1994]), domestic demand will take a larger share of output. Potential U.S. exports are not nearly sufficient to fill the projected Asian and African deficits. Latin America will be doing well to hold its own, and more probably will be a net importer. In reality world trade must balance, but for this to occur in the *Full House* scenario would require a reversal of the per capita consumption gains of the past four decades. This could only occur through rising prices, which would impose the harshest constraints on the world's poorest people.

Brown and Kane are not alone in their prediction of supply limits. Hazell (1994), of the International Food Policy Research Institute, reaches similar conclusions; my own projections (Harris, 1995) suggest a smaller, but still serious, shortfall of 250 million tons in 2025. Other analysts have been more optimistic, assuming continuing yield increases and reduced population growth. But we must surely acknowledge the tremendous ecological strains that will accompany further doubling of global food output. In this context, Brown and Kane's policy proposals are crucial.

Prominent among their recommendations is population policy. By filling the "family planning gap" — the lack of access to family planning services because of inadequate funding — and by improving literacy and women's education, we might approach the United Nations Population Fund's target of stabilizing world population at 7.8 billion by 2050. This would be crucial for relieving demand pressures on agricultural supply. Lower meat consumption could lead to a major reduction in grain demand. On the supply side, Brown and Kane emphasize increasing efficiency in water and fertilizer use and in food distribution and storage. Soil conservation and ecological restoration, support for agricultural infrastructure, and reversing the trend of reduced funding for agricultural research round out their agenda, along with taxing fossil fuels to promote energy efficiency and to reduce environmental damage to health and agriculture. This menu contrasts with the panacea of ever-increasing food output through high-input technologies, the standby of agricultural economics.

We hope the message in *Full House* will shatter the complacency of those who assume that the future will be like the past, with yield increases forever compensating for population and environmental problems. Once this is accepted, progress on the specifics of population and food policy will be possible.

*Reviewed by:*

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## **A Moment on the Earth: The Coming Age of Environmental Optimism**

Gregg Easterbrook, 1995

Penguin Books, 375 Hudson Street, New York, NY 10014. 745 p, cloth \$27.95

If you have found yourself frustrated by the environmental doomsayers and want to enliven discussions with facts that dispute every angle they put forth, this substantial text is for you. The primary intention, as stated by the author, is to present the new wave of environmental thinking that he calls 'ecorealism.' This new script "reconciles the ideals of environmentalism with the observed facts of the natural world." Easterbrook has not only written from a relatively unique perspective, but accompanies his points with such overwhelming numbers of examples that he deserves credit for his painstaking work, even if you consider yourself part of the environmental fanatics' club.

The book tackles a long list of topics that are hot on environmentalists' griddles such as population growth, ozone depletion, acid rain, toxic wastes, agrichemicals, petroleum-based energy, and biodiversity. He reduces their seriousness through success stories or through the healing of all in Nature's time. With some regularity, the author reminds the reader that he in no way condones the harm that humans have wrought on Nature, but simply asks us to note how much we have improved on our behavior through conscious decisions and the wise use of technology. A common thread in his discussions is the more powerful-than-human hand of Nature that deals more blows and greater forgiveness than can be displayed by our petty actions. Extinction may not be reversible, but most other conditions can be rejuvenated with surprising speed.

Easterbrook divides the book into three sections. The first explores how Nature and humans compare in their effects on the Earth's problems: for example, the intense construction of cities and roads versus the general annihilation by glaciers, or the ubiquitous, but gentle, nature of toxic

chemicals relative to the catastrophic dusting by just one large comet. Nature is forever changing, accommodating, perhaps even becoming stronger and better over time. Present day humans "moment on the Earth" is the result of millions of years of evolution, and the author is not hesitant to announce our superiority to all creatures of the Earth.

Section Two focuses on the specifics of current ecological problems, broken into twenty-four topical essays. In his coverage of population pressures, Easterbrook begins with the suffering of the poorest Third World regions but quickly moves to the theory that numbers of people are not the issue, but rather what any given habitat and society can support. He has no patience for those who desire to reduce the world's population just so that individuals can have unadulterated views of open expanses; with proper planning, the Earth can support vastly more humans than it does at present. "Nature might prefer some features of the materialist life—putting most people in relatively small urban areas, drawing most energy resources from nonliving geologic strata, using high-yield agriculture that produces society's food from relatively restricted acreage—to scattering people across the land in some romanticized hunter-gatherer format."

The third section is an attempt to balance the long-term perspective of Nature with the more personal, brief viewpoints of the human scale. The author begins with a compelling story of a sea turtle hatchling, from birth in Florida to a journey that spans thousands of miles to Africa, only to be lured by some deep longing back to the exact spot in Florida to reproduce. It is the story of longing, of life, or as Easterbrook states it, "the longing of life over matter, the most insistent force in all the firmament." He proceeds to ask not only whether



humans, technology and Nature can be symbiotic, but the much larger question: is there meaning to life other than some chance accident of evolution? Chaos theory dissolves under the focus of the "complexity hypothesis" that proposes the function of life is to defy entropy. Intriguing topics follow on how Nature changes itself, and what a New Nature might be like. Easterbrook presents creative visions of an end to predation by all, extinctions, disease, killer comets, aging, and waste of the Sun's energy. He ventures to the possible endlessness, even, of the soul. Vegetarians will appreciate his image of Eden, where no member fears another, and the lamb lies down with the lion.

*A Moment on the Earth* ends with a look at life beyond the Earth. No evidence has been found for such, and Easterbrook implies this means we must somehow spread our life from this planet. "Human intellect, flawed as it is, must until further notice be stipulated as the foremost achievement so far recorded by the whole of Nature." Nature in entirety is "priceless" and "Earth's living biosphere must be assumed the most important location in the entirety of the cosmos. And the preservation

and expansion of that biosphere must be presumed the central task in all the firmament."

I commend the author for a timely, relentless challenge to overzealous emotional reactions to human impact on the Earth. His viewpoints stimulate thought and clarification of possibilities for future work. The book's grand finale, however, left me with a sense of urging him beyond his genetic limitations. Conquering our foes has been a part of the male psyche since leopards stalked, and conquering new Worlds through exploration and war has dominated recent history. Science tells us that the hormone testosterone makes males relatively more aggressive than their female counterparts. At this moment in time, on the Earth, can we not allow for creative exploration into other planets while focusing most of our resources on living the absolute best on this one? We may be highly evolved, but beware of the deep urges that reflect our "central task." They may be hormones talking.

*Reviewed by:*

*Jeana Myers*

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## **Environmental Impacts of Agricultural Production Activities**

Larry W. Canter, 1986

Lewis Publishers, 121 S Main Street, PO Drawer 519, Chelsea, MI 48118. 382 p, cloth \$49.95

This book summarizes actual or relative environmental impacts resulting from present and emerging agricultural production technologies. Its objective is to provide information useful in preventing or reducing environmental deterioration while allowing for needed future expansion of agricultural production.

The contents are organized into seven chapters and three appendices. Chapter 1 gives a brief introduction. Chapter 2 summarizes agricultural production trends, constraints to agricultural production increases, and several emerging agricultural technologies. Production constraints particularly addressed are land use pressures, rising energy and water prices, and conservation and environmental improvement practices. Chapter 3 reviews case studies on the environmental impacts of several agricultural practices such as conservation tillage and organic farming. Trends and developments related to both nonirrigated and irrigated croplands are included. Chapter 4 presents detailed information on the effects of agricultural practices on the water and soil environment. Soil and water impacts are identified, models are given for their quantification, and management and control are discussed. In Chapter 5 a similar format addresses air quality impacts, and a summary of air pollution effects on agriculture is included. In Chapter 6 the same topical headings of identification, quantification, and management or mitigation are applied to noise. Chapter 6 also contains a section dealing with the identification, evaluation, and control of agricultural solid waste impacts. Chapter 7 examines 11 emerging agricultural production technological clusters, eight in crop production and three in animal production, and provides a trade-off analysis of each based on their anticipated efficiencies and environmental impacts. Crop production decision factors include land use

efficiency, natural resource use efficiency, and environmental impacts relating to water quality, erosion, land quality, air quality, noise, and solid waste. Decision factors for animal agriculture include feed efficiency, reproductive efficiency, and environmental impacts similar to crop production except for land quality and erosion. The trade-off analysis identifies four crop production and two animal production practices as being the most promising. For crops these include plant genetic engineering; water management; plant growth regulation; and the soil-related cluster of soil management, erosion control, and waste utilization. In animal production, disease and pest control along with improved reproductive capacity rank highest.

Appendix A is a glossary of key agricultural terms used in the book, and Appendix B is an annotated bibliography of 118 pertinent references on environmental impacts of agricultural practices. In Appendix C the author has summarized the top lines of research identified for the 11 technological clusters already described in Chapter 7.

The organization of the subject matter is probably as appropriate and logical as any. However, the subject matter on the impacts and management of solid wastes in agriculture seems out of place, being addressed in the same chapter as noise. Solid waste is of sufficient importance to have merited a chapter of its own. The book contains a wealth of information extremely useful in any course dealing with environmental effects of agricultural activities. It also will be useful to researchers as a source of baseline information and references. Most of the data presented and references cited are from the 1970s and early 1980s through 1983.

Most chapters contain many tables of data or descriptive information with some of the tables being very detailed and lengthy (2-3 or more

pages). The figures consist entirely of graphs, line drawings, and flow charts, some of which are quite complex. The general quality of reproduction of the figures ranges from good to poor.

The process of identifying the most important technology clusters and predicting their impact on environmental problems as well as agricultural productivity is an ongoing process. New technology, government programs, or economics can quickly interact with plant or animal production systems to significantly change the direction or severity of environmental impacts. One may differ with the emphasis that has been given or not given to a specific technology or its potential impact, but such will always be a problem when addressing environmental concerns.

The book could serve as a basic textbook for graduate level or upper level undergraduate courses concerned with the environmental effects of agricultural practices and activities. It also will be useful as a reference for lower level undergraduate courses but would require some specific guidance and interpretation from lectures or other sources to be used as the primary textbook.

*Reviewed by:*

*Lou Greub*

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## **Agriculture and Natural Resources: Planning for the Twenty-first Century**

W. G. Haney and D.R. Field, Editors, 1991  
Westview Press, 5500 Central Avenue, Boulder, CO 80301. 193 p, paper \$27.00

Haney and Field present elements of the recent strategic planning effort for agriculture and natural resources in the University of Wisconsin System (UWS). Their intention is to represent both the planning process and the content driving the planning process. The book is divided into three parts. Part 1 summarizes the basis for strategic planning; Part 2 is a compilation of presentations from a systemwide kick-off conference for the strategic planning process that was held circa 1989; and Part 3 is a summary of the final recommendations from the UWS strategic planning committee.

In Chapter 1, Eugene P. Trani and Ruth C. Robertson, UWS administrators, establish the UWS strategic planning as an 18-month process of gathering information, articulating a vision for the future, and establishing goals and strategies to meet challenges for the next 20 to 30 years. The premise is that involvement of the systemwide community in this process will generate commitment and improve future decision making. In the next chapter, Haney and Field summarize the insights of the UWS strategic planning steering committee into global environmental and economic conditions affecting Wisconsin and the UWS. Further, they review the critical issues of food safety and human nutrition; natural resources and the land ethic; and rural people, communities, and quality of life.

Eight presenters from the systemwide conference contribute to the environmental scanning stage of the strategic planning process in Part 2. The presenters and their topics include the following: Charles Benbrook, "Tapping the Full Potential of Wisconsin's Human and Natural Resources"; M. Ann Tutwiler, "The International Economy: The Next Thirty Years"; Duane Acker, "For 2020: Trends and Issues in Agricultural Production and Marketing"; John C. Gordon, "Forestry and the

Environment: From Spare Time to Big Time"; Mark B. Lapping, "Rural Land and Natural Resources Management"; James J. Zuiches, "The Viability of Rural Populations and Communities"; Mary E. Heltsley, "It's in Someone Else's Backyard, So Why Worry? Rural Youth and Rural Families"; and Russell W. Peterson, "The Biosphere, Future Generations, and the University." These national leaders were called upon to share their "individual wisdom and collective thought on the future of agricultural and natural resource education" with UWS. They were to help "define goals and strategies for meeting the needs of the present and adjusting to the demands of the future."

Each chapter of Part 2 is distinctively different in style and presentation. Some are well documented, others resemble personal statements. Some clearly address the strategic needs of the Wisconsin system, others could have been comfortably presented in any number of other settings. Each presenter is confident in the veracity of his or her assessment of the problems and description of necessary solutions. The challenges for the future are often linked more to cultivating organizational will and purposeful responsiveness than to dealing with the uncertainty of the future and the continued efficacy of our historical approaches.

Paradoxical strains appear throughout this section. At times the papers simply reflect the basic tenets of the land-grant mission and methods, then project from that base to solutions for the future. Likewise, the appropriateness of the current planning environment as the basis for the projected future trends is generally unquestioned. Alternatives to the existing trends are generally not considered. For instance, a call to overcome the "blindness of the past" is followed by defining the purpose of the university based on this new perspective to "provide solutions for people of the state"

(Zuiches). Nevertheless, there are occasional calls for innovation. Tutwiler cites the need for generalists, Acker suggests the relevance of integrative research and teaching, Gordon wants to relax the parsimony in thought and research, and Russell proposes a new class of "professional generalists," but these are set in a context of the need to accommodate the assumed future. Perhaps the most significant conclusion to be derived from this section is that indeed this is a time of paradox for the land-grant system.

A wide range of alternative perspectives from which to create informed visions of the future and the associated novel organizational responses to confront the paradox are missing from Part 2. Gordon's substantive and focused suggestions for the "invention and propagation of landscape science" are a highlight of this section. His are not cliches, nor are they simply reporting the status quo. Although intended for forestry and natural resources in the UWS, Gordon's thoughts are also widely applicable in scope for other disciplines and land-grant universities. Russell's call for Colleges of Integrated Studies and all they would entail may be the single most dramatic departure from existing approaches for traditional land-grant institutions, such as the UWS, to consider.

In the final chapter of the book, "Charting a Course for 2020," seven goals for UWS agricultural and natural resource programs are presented:

1. Provide the knowledge base to accommodate rapid change.
2. Prepare students for leadership in traditional and emerging professions and as educated citizens.
3. Serve a broader public from an expanded knowledge base.
4. Provide integrated, holistic, and anticipatory educational service to Wisconsin.
5. Strengthen and augment collaborative approaches.

6. Diversity by design.

7. Implementation, flexibility, and planning.

Within each of these are strategies and one to three recommendations that are the substance of the strategic plan. Many of the recommendations continue traditional efforts, but there are innovative recommendations as well. The one glaring deficiency is a lack of sensitivity to resource limitations. It may be easier to describe activities than to meet their requirements during a period of diminishing resources.

Although when reading this volume one gets a sense of invading the privacy of another institution's most intimate processes, it is a laudable effort to share that experience so that others can learn from it. More timely publication would have enhanced the value of the chapters in Part 2. The few tables and the two figures are very basic, variable in quality, and generally add little to the presentations. The material in this book may seem best suited to the responsibilities of administrators, but other faculty could benefit from reading the book. Some of the ideas presented could be the basis of personal decision making by faculty, independently of an organizational planning effort. Or, if one is called upon to participate in a strategic planning activity, learning about the experience of a comparable organization could enhance one's ability to contribute. The Wisconsin participants believe that the translation to other conditions can be easily made. This book also could be read with advantage by those who are outside the land-grant system, but concerned with its performance.

*Reviewed by:*

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*Reprinted with permission from the Journal of  
Natural Resources and Life Sciences Education  
21:189-190. 1992.*



## **Out of the Earth**

D.J. Hillel, 1991

The Free Press, 866 Third Avenue, New York, NY 10022. 321 p, cloth \$22.50

Hillel establishes his credentials for this work early in the prologue of Section I. He has been an academic, and a bureaucrat, is ever a scholar, but perhaps most significantly for this, his latest book, he is also an adventurer. Few academics or bureaucrats can match the breadth of his experience, particularly in the special environment of the desert. Perhaps it is the challenges of survival in this marginal environment for human habitation that sensitized Hillel to the Earth and the human condition in general. It seems that life at the extremes of the human range can heighten the feelings for all conditions. In the five sections of the book, Hillel first creates the philosophical and technical foundation for the following surveys of lessons from the past and the problems of the present. He concludes the sometimes frustrating accounts of human affronts to Nature on an optimistic note.

Hillel's surveys of lessons from the past span the settings of irrigated agriculture in the Near East, the riverine environment of Egypt and the upland agriculture of the Mediterranean. Among the problems of the present, he describes saline seeps in North America and Australia, the tension of flood control along the Yellow River in China, deforestation, the plight of Africa and the fate of wetlands. Each description, whether of lesson or problem, is captivating, with enough detail to present each theme without long discourses to tax our attention. He weaves into the fabric of each chapter his personal scholarship and illustrations of his technical experience that support the breadth of his perspective. Nevertheless, he seems to struggle in those areas where most of us would do likewise. When he tries to address the whole, rather than the part (as in his descriptions of soil in Chapter 3), or to look at Nature without valuing agricultural productivity ("the substitution of one type of vegetation for another may even be beneficial in the long run provided the new landscape is more productive," p. 62), he confronts the blinders that are ours.

Hillel's book can be read easily by the concerned layperson and become a basis for action, but it has special meaning to professionals in agriculture and natural resources. Hillel is not a doomsayer; he is someone whose feet are firmly anchored to the Earth and whose discipline we share. His call is to action, but not for more of the same nor pessimistic frenzy.

He promotes a "conditional optimism" (p. 278) that acknowledges and acts on the underlying causes of our environmental problems. The condition is not IF an alternative future can be created, but when we will have the fortitude to start.<sup>1</sup>

Hillel's major contribution is to ground us in the richness of our past, to point out the conditions of the day, and to challenge us to contemplate the future. He demonstrates the relation of our particular knowledge of soils, landscapes, and their processes to the past and current problems. He states the case to us. It is up to us to respond in our own way. New perspectives from other biological and physical sciences as well as new understandings of individual cognition and community action are accumulating each day. They are part of our expanding set of tools. Hillel has brought us to the forum. He has demonstrated how our technical knowledge is relevant and hinted at the breadth of perspective that is needed. Our response is the future.<sup>2</sup>

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<sup>1</sup>"Cleverness has reached its limit. Wisdom is now needed." (p. 270). "The problems of the time call for greater humility and mutual respect." (p. 274)

<sup>2</sup>"The wisdom we need will not be found ready-made in any single profession or organization." (p. 274)





***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter III***

***Introduction***

**What is Sustainable Agriculture?**

*Alternative Agriculture* (National Research Council, 1988) provided a degree of national legitimacy to what we often call today 'sustainable agriculture.' Yet one of the most frequent questions still posed by speakers, at workshops, and addressed in chapter introductions, is "What is sustainable agriculture?" Numerous reasons for this confusion have been advanced from many quarters:

- "This is a philosophy and set of goals, not a way to farm."
- "Sustainable agriculture is a new name for organic farming."
- "I'm already sustainable, or I would not be in business."
- "You're suggesting that what I've been doing is unsustainable!"
- "If we can't define sustainable agriculture, can we research it?"

The scholarship reviewed in this section provides only a flavor of the wide opinions abroad on sustainable agriculture. Someone in the U.K. recently declared that they had catalogued over 800 published definitions of "sustainable agriculture" (source unknown). In the comprehensive reviews of the subject, primarily in multi-authored edited books, there is a plethora of definitions. Examples here are *Sustainable Agricultural Systems* (1990) by Edwards et al., *Alternative Agriculture* (1989) from the National Research Council, *Sustainable Agriculture in Temperate Zones* (1990) by Francis et al., and *Sustainable Agriculture Systems* (1994) by Hatfield and Karlen. In this wide array of opinions we begin to feel the pulse of the research, the education, and the farming communities about an important topic and its emerging meaning to people involved in our long-term food supply.

The collection of papers edited by Clive Edwards and colleagues represents the output of one of the first international conferences held in the U.S. on sustainable agriculture. Chapters dealt with historical roots, as well as current practices in alternative farming systems. Economics, political decisions, and ecological dimensions of innovative systems were included. Published by the Soil & Water Conservation Society, this book in its fourth printing is the best selling title in their organization's history. Similar in scope is the book edited by Charles Francis, Cornelia Butler Flora, and Larry King, a multi-authored volume that is more focused on temperate region agriculture. The recent book edited by Jerry Hatfield and Doug Karlen brings our understanding closer to the present. A remarkable overlap of authors among these books indicates to some extent the narrow base of academic support for what appears to be an emerging paradigm for agriculture and food system.

Another closely related genre that has been more accepted in academia is "agroecology," or the so-called marriage of agriculture and ecology. Since the first edition of Miguel Altieri's book *Agroecology: The Scientific Basis of*



*Alternative Agriculture* (1987), there has been an expanding interest in universities and other post-graduate learning centers in the whole realm of practical ecology as applied to food production systems. Three books in 1990 (Gliessman, Carroll et al., and Tivy) all dealt with the interface of production systems and the environment. The publication of a new and greatly revised edition of Miguel Altieri's book *Agroecology, The Science of Sustainable Agriculture* (1995) and the publication of a teaching textbook by Steve Gliessman provide ample resources for the creative instructor in this arena. Gliessman's *Agroecology: Ecological Principles in Sustainable Agriculture* (1998), is a new text already proven successful in the classroom at the University of California – Santa Cruz. Add to these such standard academic treatments as *Crop Ecology* (Loomis and Connor, 1992) and *Crop Evolution, Adaptation and Yield* (Evans, 1993), and we recognize a rich reference and resource base for preparing course material and background reading for undergraduate and graduate students in this area (the latter two books were not reviewed here).

Two books add international flavor to what is mostly a compendium of U.S. based writers describing alternatives in North America. *From the Ground Up: Rethinking Industrial Agriculture* (1993) provides a comprehensive overview, from a team of international experts, of the current directions in development and how those streams should change. *Toward Sustainability: a Plan for Collaborative Research on Agriculture and Natural Resources* (1991) outlines an approach envisioned within the USAID-financed Collaborative Research Support Program for a multi-site effort in participatory development in Third World countries. These critiques challenge mainstream and conventional farming and provide points of departure for why strong feelings remain in some quarters about this new “bandwagon approach” that is “unlikely to really solve the world’s food problems.”

“Why Green Ideas Raise a Red Flag” (1993) is reprinted from a Cornell University newsletter; Judy Green quotes a number of practical questions from producers about what this “sustainable agriculture” really means to them. Why does the “s-word” make people so defensive, she asks. Finally, William Lockeretz’ 1988 article “Open Questions in Sustainable Agriculture” presents a series of challenges that remain relevant today. What is this concept, and why is there so much debate? We leave the challenge with the reader. In fact, the most important definition is the one that you personally carry around. That is the one that you will make operational! Perhaps this section will help.

**Charles Francis and Gabriel Hegyes**



## **Sustainable Agricultural Systems**

C.A. Edwards, R. Lal, P. Madden R.H. Miller and G. House, Editors, 1990  
Proceedings, 1988 International Conference on Sustainable Agricultural Systems, Ohio State U.  
Soil and Water Conservation Society, 7515 NE Ankeny Rd, Ankeny, IA 50021. 696 p, cloth \$69.95

This book contains a wealth of information from a global perspective on the status, problems and needs of sustainable agriculture from nearly a decade ago. It is interesting to see the vast changes that have taken place since this conference. For example, nearly all authors of the 40 papers give their definition of sustainable agriculture. Most of us are beyond that stage now. Also, the terminology has changed significantly. There is no mention of quality of life but rather a frequent use of LISA (low input sustainable agriculture). Thus it is more a reference item than a text book on the subject. This does not diminish its importance, but simply defines and limits how it can be used. The reference lists associated with each chapter alone serve as a valuable benchmark of known literature at that time for each topic addressed.

The conference was organized in six sections. The "Overview" includes the history of sustainable agriculture. In the opening chapter, Richard Harwood discusses biodynamic and organic systems as well as the green revolution. The next chapter furthers the global view of sustainability and challenges us to develop linkages that span the developed and developing countries for our mutual benefit. The goals and roles of the International Centers are reviewed with a sustainable focus and then a similar assessment of USDA's involvement with sustainable agriculture is given. The focus changes to society's stake in sustainability in Charles Benbrook's paper and he prophetically said that sustainable agriculture adoption may come by necessity as government programs end. The late Robert Rodale challenged us with a view that the problems of that time were opportunities for leadership, and he certainly demonstrated that at the Rodale Research Center until his untimely death.

The "Components of Sustainable Agriculture" comprise the second section of this volume. The

nine chapters are rather straight forward in their coverage of topics such as soil nutrition, crop rotations, biotechnology, pest management, weed management, pasture management, conservation tillage. All are written by experts in their fields and thus very credible. One of the most interesting comments in this section was by entomologists John Luna and Garfield House who wrote the IPM chapter and observed, "Sustainable agriculture is not merely a collection of discrete farming practices, but is a vision of the future. Its success ultimately depends upon our willingness to accept and implement a new philosophy of agricultural production."

Next follows the "Importance of Integration" section, the shortest, with interesting papers from German and Dutch farming systems. Then we move to "Sustainable Tropical Systems" and very interesting papers from China, Africa, India and Latin America. Not surprisingly, the scope of these titles often exceeded what the authors delivered but they give an adequate overview of the situation for their respective country or continent. The role of perennial crops, especially tree crops, in Latin America was particularly insightful and well documented with systems that work in the humid tropics. The story of India's goal to increase production and keep up with population growth illustrates the wonderful success of the green revolution as there was wide adoption of high yielding varieties, irrigation and fertilizers. However, they now realize that the future increases must come from less intensive input systems and there numerous agricultural researchers have a golden opportunity to move to a new level of sustainability.

"Policy Development" included papers with a review of the LISA program of the USDA and several economic perspectives of sustainability. The most unique paper in this section was the one that

illustrated the sustainability of compound and household farming in African agriculture. These systems fully illustrate the use of indigenous knowledge in traditional production systems. The last section on "Improved Ecological Impacts" of sustainable agriculture dealt more with the parts of the systems (nutrition, water, microbial life and human health) than the bigger picture the term "ecological" suggests. However, the chapter on rural landscape defined that concept as it clearly relates to sustainable agriculture and also highlighted the great utility that landscape ecology has to assess ecological sustainability. The last chapter is one of the most intriguing of the book because it is written by a non-agriculturalist. Stephen Viederman, a historian, gave a very insightful critique of how he sees sustainable agriculture and in particular how he sees our level of commitment to it. He emphasizes that sustainable agriculture

must not become just another "technological fix" to the problems of agriculture today but rather it must satisfy the needs of both the present and future generations. He rightly points out a dramatic change at the land grant universities. For years, they operated on the premise that said, in effect, "Listen – we are speaking." Now the tide has turned and we need to hear them say, "Speak – we are listening," or more likely, "Let us sit down and talk together." And this is happening with many universities, foundations, non-governmental groups and others as new alliances are formed to help frame the questions on sustainability that need to be asked as we move to the new millennium.

*Reviewed by:*

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## **Agroecology: Researching the Ecological Basis for Sustainable Agriculture**

Stephen R. Gliessman, Editor, 1990  
Springer-Verlag, 175 Fifth Avenue, New York, NY 10010. 380 p, cloth \$89.00

### **Agroecology** [First Review]

C. Ronald Carroll, John H. Vandermeer, and Peter M. Rosset, Editors, 1990  
McGraw-Hill, 11 West 19th St, New York, NY 10011. 641 p, cloth \$89.95

### **Agricultural Ecology**

Joy Tivy, 1990  
Longman Scientific and Technical, Harlow, Essex, England (co-published in the United States with John Wiley & Sons, 605 Third St, New York, NY 10158). 288 p, paper \$34.95

Agroecology is still at the stage in which authors and editors feel obliged to define what it is before they talk about it. The three books reviewed here all attempt to delimit agroecology or give an overview of its major topics. The common ground of definitions is the fusion of ecology with the agricultural sciences. This allows ecological methods and theoretical insights, often developed with non-economic species occurring in natural communities, to be applied to agricultural phenomena. Frequently, agroecology is assumed to be strongly linked to sustainable agriculture. Agroecology is supposed to be the science that will provide the knowledge required to achieve and quantify agricultural sustainability. Looking at these three books together helps us identify what agroecology can deliver, beyond promise, and what is missing from current conceptions. These questions are important if agroecology truly is the scientific base from which to make agriculture more sustainable.

The first book (Gliessman) is the most ambitious. The editor believes that the challenge for agroecology (and this book) is to "find a research approach that consciously reflects the nature of agriculture as the coevolution between culture and environment, both in the past and the present"

(page 8). Therefore, the field should involve "the integration of ecological and cultural knowledge" (page 10). The purposes of the second book (Carroll et al.) are more modest: to provide an overview and introduction to agroecology and "a critical attitude with regard to both the scientific and sociopolitical aspects" of agroecology (page xii, Preface). At the other end of the spectrum, Tivy does not claim to be either comprehensive or definitive, but merely hopes to interest "students of whatever agricultural and/or environmental persuasion" (page v, Preface).

The first two books continue a style of agroecology that began, according to Gliessman, with Cox and Atkins's 1979 book *Agricultural Ecology*. Both books include a section on the biological or ecological principles underpinning agriculture and examples of specific management problems that call for an agroecological approach. Carroll et al. includes a section on agricultural research, plus background material on the history, geography, sociology, and environmental impacts of agriculture. Tivy has much less background material and dives immediately into components of agroecosystems and agriculture in specific climatic zones.

A strength of both Gliessman and Carroll et al. is that they integrate contemporary ecological work and agricultural production sciences with discussions of the environmental effects of agricultural processes. Both books have fine examples of the kinds of contributions agroecology can make. In contrast, the failure to merge ecology, agricultural sciences, and environmental science is a serious flaw of Tivy's book, reducing it to little more than a general introduction to worldwide agricultural production. Tivy ignores severe environmental problems until the final chapter, "Agriculture and the Environment." For example, on page 89 she describes "waste" of nutrients as a problem merely because of reduced efficiency of fertilizer use and lowered productivity, with no mention of the environmental consequences of those "wasted" nutrients ending up in the wrong places.

Tivy's view of agroecology is excessively constricted, but the catholic perspective of Gliessman and Carroll et al. has its own problems. Both books have a very broad scope, ranging from the technical details of intercropping to social relations of agriculture. Such openness is refreshing—ecologists and agronomists have too frequently shunned the social implications of their science—but it needs to be coupled with more discrimination than is evident in these books for agroecology to have coherence and direction.

Lack of focus crops up especially in Parts 1 and 4 of Carroll et al. For example, only one of the four chapters in Part 4, "On Agricultural Research," deals specifically with agroecology. Although some individual papers in these parts are interesting and well written, the extraneous material bogs down the treatment of relevant topics. The fuzzy focus also leads the editors and authors of both Gliessman and Carroll et al. to include social problems that agroecology cannot reasonably address e.g., "the agroecological approach focuses on the system as a whole with an eye toward the multiple goals of productivity, profitability, reduced uncertainty and vulnerability, equity, protection of the health of producers and consumers, environmental protection, and long-term sustainability and flexibility" (Levins and Vandermeer, page 342 in Carroll et al.). These are all worthwhile goals, but some are in the realm of politics and social sciences, not intrinsic to agroecology. Including such a diversity of disciplines and hence methods under the heading of agroecology passes over the question

of whether it can be a single field or the "research approach" Gliessman hopes to establish, or merely a gathering of topics related to agriculture.

There is a fundamental confusion in both Gliessman and Carroll et al. about how humans should be included in agroecological analyses. The vision of agroecology promoted by Gliessman is "more than just ecology applied to agriculture." It takes on a cultural perspective as it expands to include humans and their impacts on agricultural environments (page 369). The possibility of linking the study of social forces and environmental processes is immensely exciting. Gliessman, Carroll et al., and their contributors deserve credit for recognizing critical social causes of agriculturally related environmental degradation. But, there is a wide gap between recognizing and analyzing.

Human culture requires very different methods of analysis than ecological phenomena. Ecology's methods were designed to study organic processes and the behavior of organisms that lack most forms of intentionality. Human capacity for intentional action—our abilities to use indirect strategies, to learn from mistakes, to delay gratification, to persuade others to work collectively—imposes a layer of complexity that is qualitatively different from that of the naturally occurring societies that ecological methods can study. The mechanism of reproductive advantage that explains much animal behavior is lacking in human societies. This means that human behavior and the behavior of animal populations require fundamentally different types of explanation (for a full discussion of differences in types of explanation, see Jon Elster, 1983, *Explaining Technical Change*, Cambridge, Cambridge University Press).

This tension over whether the study of human societies should be part of agroecology pervades both books. There is almost no social analysis (i.e., explanations of why people and societies behave as they do). This is hardly necessary for most of the topics considered, yet many of the authors seem uncomfortable with its lack. For example, the final sentence of a chapter about whether polycultures have lower insect pest densities reads, "A socio-economic perspective should parallel the biotechnical investigations" (Altieri et al., page 80 in Gliessman). Yes, but this is outside the domain of agroecology.

The social analysis that does get in is problematic. For example, in one paper the traditional or

“precapitalist” farmer is assumed always to be “rational and efficient” and “intelligent and reflective” (Deo and Swanson, pages 586-587 in Carroll et al.). These assumptions spring from particular political interpretations of events and motives, most evident and obtrusive in Part 4 of Carroll et al. Deo and Swanson’s chapter on agricultural research in developing countries is especially loaded with political code words, questionable assumptions, and imputations of conspiracy to oppress the Third World. Their arguments may well be true, but they have no special relevance to agroecology.

An additional problem marring several articles in the first two books is a level of abstraction that is excessive for qualitative or speculative relationships. Sometimes this is manifest in inappropriate theorizing and use of mathematics and sometimes in allowing data collection technology to take precedence over common sense and direct observation. For example, “visual symptoms should not be ignored” in detecting crop water deficits or selecting drought-resistant genotypes, but they are discussed after multiple paragraphs on the pressure chamber, acoustic emissions, and the infrared thermometer (Hall, page 221 in Carroll et al.). As another example, the factors for deciding which crop to plant in an area include soil protection and buildup, indirect contributions to pest control, and microclimatic effects; excluded are such obvious things as soil types and what farmers have experience cultivating (Levins and Vandermeer in Carroll et al.).

A final conceptual problem evident in the Gliessman book is the relegation of agroecology to systems ecology . . . with generalizations about the whole field that are only true for systems studies. For example, “through the application of ecological concepts and principles to the design and management of agricultural systems, a holistic perspective is established” (page 367). Much work in agroecology, including research reported in this book, is not holistic at all. It could be argued that ecology’s concepts and principles are least well developed for whole systems, so that this may not be the most fruitful area for combining ecology and agriculture. There are other more specific problems in the first two books. They are priced out of range for textbooks or most personal libraries. One article

(by Pimentel, Dazhong, and Giampietro) appears in almost exactly the same form in both volumes, with no note that it has been published twice. The papers in Gliessman’s book are uneven in their level of detail. A few are quite superficial, while others are excessively detailed. In both books, some papers have few ecological concepts, or the “agroecological” overview draws little from ecology that is not already entrenched in the agricultural approach to a topic. How much of agroecology is simply claiming and renaming fields that are moving along quite well without an explicit infusion of ecology?

All three books have frequent misspelled or inaccurate references, and errors in figures, graphs, and equation notation (e.g., Vandermeer redefines parameters within the equations on pages 354-355 in Carroll et al.). These distract readers from the real contributions of the first two books, but the level of these kinds of errors is no higher than is common in recent technical books on agriculture. In contrast, Tivy’s book contains an unacceptable number of errors due to sloppy editing. Almost every species list has at least one wrong genus or species. This is more troubling than common typographic errors because the whole point of scientific nomenclature is to provide a consistent, internationally recognized system. Common and chemical names also do not fare well: triticale becomes “tricale” (page 13); and 2,4-D appears as “2.4D” (page 229). There are far too many figures and tables, often more than one per page and almost always taken from other publications. Borrowed figures and tables often contain excessive abbreviations, lack sufficient explanation in the text, or are inappropriate to illustrate the point they are supposed to show.

There also are too many factual errors in Tivy’s book. For example, we learn that the three major grains are maize, sorghum, and millet (page 14) rather than wheat, rice, and maize; that typical C/N ratios for organic matter in cultivated and unmanaged soils are 1:12 and 1:20 (page 65) rather than 12:1 and 20:1; that grass productivity data for rangeland are unavailable (page 126); that livestock play a relatively minor part in dry-farming agriculture except in South Australia (page 200); and that the use of zero tillage in the U.S. is for

seeding maize into a ley (page 231). The book is riddled with problems like these. Having this many errors interferes with the basic trustworthiness an author must establish for a book to be useful. An additional problem is Tivy's reliance on outdated references, which is egregious in such a rapidly expanding field. I found only 5 percent of the 565 total references to be later than 1985.

In sum, these three books are disappointing. There is no question that ecology and agricultural sciences can be mutually beneficial. The failure of agriculturists and ecologists of the last half century to work in collaboration has been detrimental because theoretical work in ecology generally has not been matched in agricultural sciences and because agricultural systems can provide a controlled environment for testing and refining these theories. The first two books have moments of insight in which ecological methods are used to test and explain why some observed phenomenon occurs, then to suggest improvements in agricultural systems. But the theme of agroecology's unique assets is not sustained clearly enough through the chapters.

Some of the authors in Carroll et al. (e.g., Weiner; Power and Kareiva) have considered precisely what ecology can contribute to their particular fields of expertise. At agroecology's incipient stage, this is a useful exercise; it needs to be done for the field as a whole, as well as for subtopics. In the final chapter

of his book, Gliessman argues for an "interface" between our understanding of ecosystem processes and the social, economic, and political systems within which agroecosystems function. We need a better understanding of what will comprise that interface, with the clear recognition that ecology's present methods cannot be used to analyze human social phenomena.

Given its constituent sciences, agroecology's most meaningful contribution probably will be toward understanding the interactions of various agricultural processes with the biological and physical environments. Applying ecological methods to agricultural systems promises to give useful results, but we will meet this challenge faster if we prune back the aims of agroecology to understanding what makes the tangible aspects of agricultural systems work, rather than trying to tackle cultural systems as well. Agroecology would benefit if we could be content with "just ecology applied to agriculture"—not a goal to belittle.

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*Reprinted with permission from the American Journal of Alternative Agriculture 6:40-42. 1991.*



## **Agroecology**

[Second Review]

C. Ronald Carroll, John H. Vandermeer, and Peter M. Rosset, Editors, 1990  
McGraw-Hill Publishing Company, 11 W 19th St, New York, NY 10011. 641 p, cloth \$89.95

*Agroecology* is a multidisciplinary book which attempts to integrate information from agriculture, ecology, anthropology, and rural sociology. Due to the diversity of topics included, the book consists of 23 chapters authored or coauthored by 32 different professionals. The book is organized into four sections: "General Background to Agroecology," "Ecological Background to Agroecology," "Some Management Questions," and "On Agriculture Research."

The "General Background to Agroecology" section consists of six chapters dealing with world hunger, climate and geography of agriculture, origin of agriculture, and social relations, energy use, and ecological impact of modern agricultural systems. Although all these chapters make interesting reading, the chapter on energy use is outstanding and discusses an important issue often neglected. The authors have determined that between 1700 and 1983 energy use per hectare increased fifteenfold while yields increased 3.5 times. I did find the portion of the chapter on climate describing atmosphere circulation and physical principles to be tedious reading due to the detailed nature of the information presented.

The "Ecological Background to Agroecology" section contains six chapters dealing with crop physiology (light, water, and temperature), population ecology, disease and insect dynamics, beneficial soil organisms, and the broader ecological community. The third section entitled "Some Management Questions" has seven chapters on interfaces with natural areas, nitrogen, integrated pest management, nutrition and agricultural change, intercropping, and genetic resources. These two sections provide a good general discussion of the very diverse topics included. Faculty and students specializing in

these areas are likely to find the discussions to be very general, while students not specializing in these areas will find some of the chapters to be difficult reading.

The last section "On Agricultural Research" has four chapters dealing with reasons to study traditional agriculture, agricultural research in developed and developing countries, and a case study on hybrid corn (*Zea mays* L.) to illustrate the political economy of agricultural research. These chapters are very thought provoking, and in general are very critical of the direction of agricultural research. I find these chapters to very eloquently demonstrate the limitations and problems of present research efforts. However, I also find them to be very biased as little discussion of the positive results evolving from research efforts is included. The case study on hybrid corn has many technical errors and takes previous research results out of context. The author's view that heterosis does not exist and that corn breeding of hybrids rather than mass selection is used today solely due to private industry's profit potential is not consistent with the bulk of genetic research findings. The unbalanced presentation in chapters in this section reduces the effectiveness of criticisms presented, and could lead to incorrect information transfer to those with limited agricultural research experience.

The effort to draw upon the expertise of many professionals in this book is both its major strength and weakness. The large quantity of multidisciplinary information makes it a valuable reference book for upper level courses in agriculture, especially those that deal with agriculture in tropical countries. Each chapter has an extensive list of references adding to its value as a reference. However, the multiauthor, multidisciplinary approach



also leads to a lack of continuity, and non-uniform complexity, writing style, and philosophical perspective across chapters limiting its usefulness as a textbook. The biased nature of the information presented in the last section (“On Agricultural Research”) is also a serious liability of this book.

*Reviewed by*

*Stephen C. Mason*

*University of Nebraska, Lincoln, NE*

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## **Agroecology: The Science of Sustainable Agriculture**

Miguel Angel Altieri, 1995 (2nd edition)

Westview Press, 5500 Central Avenue; Boulder, CO 80301-2877. 433 p, paper \$26.00

This revised edition of *Agroecology* brings together many ecological concepts as they apply to agriculture with the hope that readers will be able to open new doors to management options that fit with the objectives of a truly sustainable agriculture. The book is based on the premise that “modern” agriculture is no longer appropriate in an environmentally troubled and energy-poor era. Movement toward a self-sustaining, resource-conserving, energy-efficient, economically viable, and socially acceptable agriculture, i.e., sustainable agriculture, is needed.

Knowing that many do not understand the term agroecology, Altieri defines it in the first chapter as “... an approach that integrates the ideas and methods of several subfields, rather than as a specific discipline. It has roots in the agricultural sciences, in the environmental movement, in ecology, in the analysis of indigenous agroecosystems, and in rural development studies.” The focus is naturally more on the system than on targeted or single-discipline research. Agroecology, says Altieri, is really a different approach to agricultural development because it is based on broader philosophical premises than conventional agriculture. It may not reject the dominant premises of today. However, it tempers them with additional ways of understanding farming and how we might carry out rural change. Agroecology fits well with the technological issues that need more environmentally sensitive agricultural practices. While a young discipline that has raised more questions than solutions, agroecology has widened the discourse on sustainable agriculture.

The uniqueness of this work is the incorporation of traditional farming systems from developing countries, particularly Latin America, into the chapters with the hope that we can learn from these less modified systems what we might adapt to our more intensive, less diversified systems to enhance sustainability. Chapters such as “Polyculture Cropping Systems” and “Agroforestry Systems” are

rich with information from other countries, and this focus is found in many other chapters as well. The role and function of non-governmental organizations (NGOs) in Latin American rural development programs illustrate a way agricultural development can be done with little government intervention and with less system disturbance than is often the case with larger government or International Center directed development efforts. Altieri draws on his own initial experience as a graduate student and scientist to provide this focus.

The work uses tables and figures to present key ideas and definitions. For example, the terms atomism and holism, universalism and contextualism, objectivism and subjectivism and monism and pluralism are defined in a table that makes it easy to compare and ponder the differences. A figure in chapter 5 gives the objectives, processes, and methods that comprise a Model Sustainable Agroecosystem that makes it easy to capture the concepts at each phase of sustainability.

Other times a simple list of key concepts is provided. This is the case for the basic principles that relate to the structure and function of agroecosystems. These principles embody the idea that agricultural intensification will reach a point of no return. “How much longer humans can keep increasing the magnitude of nature’s subsidy without depleting natural resources and causing further environmental degradation is uncertain. Before discovering this critical point through unfortunate experience, one must endeavor to design agroecosystems that compare in stability and productivity with natural ecosystems. This is the driving force of agroecology.”

At times chapters repeat ideas and details already covered. This is to be expected with chapters contributed by several authors (these include John Farrell, Susanna Hecht, Matt Liebman, Fred

Magdoff, Bill Murphy, Richard Norgaard, and Thomas Sikor). The duplication is particularly evident in Chapter 7, "Ecologically Based Agricultural Development Programs." The previous chapter highlights the need for an additional proofreading as pages 118 and 122 contain incomplete and/or run together sentences. Occasional run together words, inconsistencies between text and literature citations, and inaccuracies in the name of at least one international organization also reflect a work published before all the errors were detected.

The chapter on organic farming is well done and describes very well the four phases of conversion from conventional to organic. This discussion leads into the next chapters on polyculture and cover crops and mulches. Critics who might say these chapters are fine in principle but will never become dominant in American agriculture, are given pause by the comment that "... any society that can land people on the moon and retrieve them safely should be able to design machinery to plant, maintain, and harvest polycultures." We could add "and carry out wide-scale adoption of organic farming systems."

The chapters on Crop Rotation and Minimum Tillage, Integrated Pest Management, Weed

Ecology and Management, and Plant Diseases give information on components of an agroecosystem. As such, they differ little from discussions of these topics in other books from different perspectives. The exception to this is the presentation of allelopathy and the ecological role of weeds in the chapter on weeds. Altieri states what many weed scientists today realize, namely that we need more holistic approaches to weed management and we lack much basic understanding of the biology of even our most important weed species. The chapters on Pastures and Soil Quality are less traditional as they contain descriptions of management intensive grazing and soil health, respectively.

The author is one of the first in North America to describe his profession as agroecology. As such, Miguel Altieri has carved a niche for himself in this discipline in all the Americas. His work, *Agroecology*, will stand as a widely used reference in planning, teaching and implementing sustainable agricultural systems for years to come.

*Reviewed by:*

*Jerry Doll*

*University of Wisconsin, Madison, WI*



## **Agroecology: Ecological Processes in Sustainable Agriculture**

Stephen R. Gliessman, 1998

Ann Arbor Press, 121 South Main Street, Chelsea, MI 48118; 357 p, cloth, \$49.95

The advantage of a book written by an experienced teacher is obvious in *Agroecology: Ecological Processes in Sustainable Agriculture*. Steve Gliessman brings over 25 years of research and education experience to a text that has been tested several times with an upper division class. The author knows the undergraduate learning environment, a perspective that is amply reflected in the book.

*Agroecology* begins with discussion of challenges facing our current food system — loss of soil, water resources, and genetic diversity, as well as a growing dependence on fossil fuels and an international economic system that does not reward stewardship. Gliessman describes the technological foundations of an industrial food production process: intensive tillage, monoculture, irrigation, synthetic fertilizers, chemical pest control, and most recently microbial engineering. He cites the recent leveling of yield increases in most principal crops, a stagnation that is occurring in the 1990's, one coupled to social conditions fast becoming less favorable for conservation. Most importantly, he describes the paucity of creative and viable solutions for the negative and unintended impacts of the green revolution complicated with loss of productive farmland. Gliessman poses the challenge that a sustainable food system can only be developed by looking at natural systems and designing an "agroecology" that can meet human needs while preserving both resources and the natural environment.

In defining an agroecosystem, the author describes the importance of looking at the framework in which large sets of inputs and outputs are crucial to a complex and interconnected system. Unlike farming systems, natural ecosystems often reach a state of equilibrium, characterized by both structure of the system and its multiple and dynamic functions. The concept of spatial hierarchy is useful in studying organisms, populations and commu-

nities where species live and interact, and how this complexity makes up the ecosystem. The importance of emergent properties is shown in the function of an agroecosystem, with sustainability one of the key goals in design of an alternative agriculture. After defining a number of properties of natural systems, Gliessman describes functions such as energy flow, nutrient cycling, regulation and feedback, and change over time. In brief, he contrasts cultivated with natural systems and asks students to accept the challenge of envisioning systems based on the natural model. This is an excellent introduction, easily accessible to the biologist and non-scientist as well. It reflects the author's classroom experience.

Although the book caters to a wide audience with different science backgrounds, it does not shy away from credible discussion of the important concepts of photosynthesis, plant nutrition, transpiration, and responses to the environment. In a section on plants and the environment, there are chapters on effects of light, temperature, rainfall, wind, soil, water, fire, and biotic factors. Although a brief chapter on each topic can only skim the surface, there is a useful introduction as well as key references that will lead the serious student to seek more detail. Adding interest to the presentation are numerous case studies and special topics. Examples are *Global Warming*, *Acid Precipitation*, *Hopi Agriculture*, and *Study of Allelopathy*.

The heart of *Agroecology* is the comprehensive section on system-level interactions, an in-depth look at how the principles of ecology can be applied to agriculture. This is approached through classical topics in ecology, such as population processes, diversity and species interactions, disturbance and succession, and energetics of systems. Population dynamics are used to illustrate the colonization of new areas, for example the planting of a crop and

the dispersal, establishment, growth, and reproduction of weeds that share the crop's environment. A specific ecological niche may be different in a cropping environment than in a natural ecosystem. Niche diversity is used to show how crop mixtures or sequences of different types of crops can best compete with weeds. Intercropping is a prime example of how managed systems can be designed to mimic natural counterparts. The importance of genetic diversity, and the perils of its loss, are presented along with a critique of the current emphasis on genetic engineering. The growing interest in care and maintenance of germplasm *in situ* is discussed. How species interact when found in close proximity is key to successful performance of cover crops, strip intercroppings, as well as more intensive multiple cropping systems and to designing strategies for weed management. Two well described case studies on cover crops in California serve to illustrate the principles of crop/cover interactions.

How diversity relates to stability of system performance is a topic of vigorous debate. Gliessman's chapter raises a number of key questions, but neglects recent work by Tillman (U. Minnesota) on how many species are needed to fulfill most of the functions in a system, and the review by Olson and colleagues (U. Nebraska) on how much is known about the function of diversity in agricultural systems. Most annual crop farming systems obviously create a major disturbance each year when land is prepared and a new crop seeded. The discussion of changes during succession are more relevant to perennial systems such as orchards or pastures than to large scale annual commodities such as maize and soybean. Agroforestry systems are used to illustrate a highly spatially and temporally diverse production strategy. The laws of thermodynamics and how they relate to energetics of agroecosystems are explored in a comparison of different farming systems around the globe. The range of energy efficiency in producing calories of food may range from 40:1 for traditional flooded rice in Thailand to 1:5 for beef production in the U.S. (calories out:calories in). A chapter on what farms look like structurally and how agroecosystems could be designed for better structuring of landscapes concludes this section.

The book provides a call to action with chapters on how to achieve sustainability by better

understanding the coevolution between cultures and their environments. There are lessons to be learned from current sustainable systems, both natural ecosystems and some managed systems of cultivated crops -- many of the latter are found in subsistence agriculture. A case study on conversion to organic apple production outlines the steps necessary for this transition. Finally, the vital connection is made between sustainable production on the farm and sustainable food systems. This is a dimension not often discussed by classical agricultural scientists other than agricultural economists. Gliessman suggests that it is time to look both upstream and downstream, to better understand the landscape and community interactions that give us clues about total systems performance. He argues that narrowly defined economic factors provide a too simplistic analysis for what society today conceives as a complex issue with a number of bottom lines. Beyond the biological, physical, and ecological dimensions of the challenge, the author presents linkages of agroecology and the social contexts of agriculture. Who maintains these systems? Who benefits from them? And who is in charge of stewardship of resources? Not easy questions, but they are the ones that may well determine our common future.

Steve Gliessman provides us with a remarkable and useful text for undergraduates -- a good summary of his experience and the current state of thinking in this complex emerging field. If there is a single criticism of the book, it is the lack of key examples from the heartland of the U.S. where the major crop commodities are produced. Here we find some of the largest challenges in our entire food system, from the heavy dominance of multinational chemical and seed companies to virtual control of the international marketplace by a few key players. Gliessman's examples come from a highly diverse California agriculture, and from selected places across the U.S. and other countries that reflect his experience and contacts. Nevertheless, this is not seen as a drawback to the book, but rather a challenge to whoever uses the text to bring imagination and relevant local examples into the learning environment. This is an excellent text, and one that should be considered by anyone teaching agroecology.

*Reviewed by:*

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***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

## **Alternative Agriculture**

National Research Council, 1989  
National Academy Press, 2101 Constitution Ave NW, Washington, DC 20418.  
464 p, paper \$19.95, cloth \$28.95

Scientists and policy makers around the world are searching for economically sound and environmentally sensitive methods to produce the food needed for an exploding global population. As we explore socially acceptable ways to bring our human numbers into more realistic balance with physical space and resource limitations, the international community in agriculture is testing alternative farming practices as well as implementing national policies that are designed to assure enough food in the immediate future. Since its publication by the prestigious National Research Council, *Alternative Agriculture* has become a landmark book in shaping official thinking and providing legitimacy for new approaches to food production.

Are farmers' decisions on specific practices and production systems consistent with societal goals for air and water quality, for long-term resource conservation and for a consistent and low-cost food supply? Do national policies in agriculture contribute to solving soil erosion, pesticide residue and other off-farm impacts of today's conventional agriculture? This well-written book from The National Academy Press explores key issues that currently challenge U.S. agriculture, especially as they relate to biologically integrated systems and policies that influence their adaption.

Developed by a highly respected team of scientists from U.S. universities and industry, *Alternative Agriculture* uses a non-conventional approach of combining a technical review of practices and economics of farming with eleven practical case studies taken from current farming operations across the country. Part one traces agriculture in the U.S. as it has developed over the past two decades and provides an overview of the importance of this industry to the overall economy. This review also explores problems facing agricul-

ture and the role of research in providing solutions. An extensive chapter on the known economics of alternative practices attempts to bring together the limited available information to contrast new strategies and practices with conventional cropping and livestock systems. Part two summarizes eleven case studies from crop/ livestock farms, vegetable and fruit operations, and a unique range of enterprises. The individual cases are described in detail, with farm size, equipment, practices, and management, and costs compared to county or state averages. Limited information is provided on the goals and philosophies of the owner operators of these farms, an unfortunate omission from this section of the book. An executive summary provides an overview of the total content and includes both recommendations from the study and speculation on the future of alternative farming.

From the summary, "The hallmark of an alternative farming approach is not the conventional practices it rejects but the innovative practices it includes. In contrast to conventional farming... alternative systems more deliberately integrate and take advantage of naturally occurring beneficial interactions... The objective is to sustain and enhance rather than reduce and simplify the biological interactions on which production agriculture depends, thereby reducing the harmful off-farm effects of production practices." Although this philosophy and the practices to implement alternatives appear in many places, this book brings a range of current topics together in a concise and understandable way.

*Alternative Agriculture* avoids the distraction of cumbersome discussion of whether specific systems are sustainable or not, and avoids to some extent the definition trap. "Alternative agriculture is **not** a single system of farming practices," but rather "it includes a spectrum of farming systems, ranging from organic systems that attempt to use no

purchased synthetic inputs, to those involving the prudent use of pesticides or antibiotics to control specific pests or diseases.” A series of examples of alternative practices is used to illustrate the range of options that has been used by producers.

Major findings from the study serve to illustrate the current state of alternative agriculture in the U.S. Many farmers are using components of systems that help cut costs or reduce environmental impact, while a small number currently use an entire modified system. Federal policies “significantly influence farmers’ choices of agricultural practices,” and “as a whole . . . work against environmentally benign practices and the adoption of alternative agricultural systems.” The study concludes that more emphasis needs to be placed on systems approaches in research and validation of new technologies, and that farmers must be recognized for their contributions to innovative new practices and integrated systems.

*Alternative Agriculture* is particularly critical of the way in which U.S. farm policy has served as a deterrent to the adoption of a number of desirable practices. Often ignored by many scientists in the research arena, this dimension of agriculture is discussed in practical terms and in a way that makes the treatment accessible to those from a wide range of disciplines. The sections on policy and economics should be required reading for anyone with a serious interest in the future of agriculture.

Since publication of the book, there have been predictable and negative reactions from many in the scientific community about the relevance and value

of case studies to our total understanding of agricultural alternatives. The confounding of many factors, lack of organized control treatments, and single “replications of systems” do not fit the prevailing paradigm of scientific investigation. To devote nearly half the book to such cases merely clouds the issues and adds little evidence to the debate, say these critics. Given our narrow perception of what constitutes research and the currently accepted ways of testing hypothesis, I think the approach in this book could broaden our vision in science, presenting a challenge to expand horizons and learn to address critical issues in new ways.

Although focused entirely on the U.S. food production system, *Alternative Agriculture* has instructive lessons for all those involved in improving production and designing policy. There is opportunity for other countries to avoid some of the negative consequences of the narrow route followed by U.S. researchers and decision makers. The message is particularly relevant to those countries attempting to regulate agriculture, when the unexpected consequences of government programs prove to be counter to the intended objectives. For its content, readability, and relevance to our industry in the future, *Alternative Agriculture* is highly recommended reading to the professional and would make an excellent text or reference for university courses.

*Reviewed by:*

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## **Sustainable Agriculture Systems**

J. L. Hatfield, and D. L. Karlen, Editors, 1994  
Lewis Publishers, Boca Raton, FL. 316 p, cloth \$99.95

Jerry Hatfield and Douglas Karlen have compiled a well-organized, measured, and accessible textbook that could be used to guide new students through Agronomy 101, or serve as a brush-up for practitioners in the field. Their intent, well carried out, was "...to assemble the information on the components which are embodied within the concepts of sustainable agriculture." An implicit argument throughout the essays is the need to make what is called sustainable agriculture today the conventional production of tomorrow. Reasons for this obligation include: political pressure from the non-farming sector to deal with the environmental consequences of today's farming—non-point effects including silting of rivers and reservoirs, chemical pollution of ground and surface water, and nutrient runoff; consumer concerns over food safety; and most novelly of all, that history has made dramatic examples of cultures that have abandoned sound stewardship of their agricultural resources. With an explicit recognition that discussions of sustainable agriculture often arouse strong emotions, the editors chose essays that frame the subject within the traditional areas of agronomic interest: soil, water, crops, economics and adoption. They operate with the cautious language of academic research.

*Sustainable Agriculture Systems* begins with an "Historical Perspective." Author John Pesek leads the reader through an overview that begins with the enormity of the impact of agriculture on human civilization, initially and today. He moves on to cite examples throughout time when major cultures fizzled because of calamitous oversights concerning their agricultural practices. The one instance that recurs throughout the book is that of Mesopotamia, one of the "cradles of civilization." This region between the Tigris and Euphrates, now current-day Iraq, was once a fertile agricultural area growing wheat and barley, mostly under irrigation. Over time, salt in the water accumulated in the soil, even damaging the yields of the tolerant barley. Major

Samaritan cities dwindled to towns, shrank to villages and were ultimately overwhelmed by the mightier armies of Babylon. Other sections include: the growth of scientific agriculture; how to include ecology in agricultural systems; the influence of political policy on agriculture; and complementary efforts to define sustainable agriculture.

In "Water Relations in a Sustainable Agriculture System," Sadler and Turner argue "that sustainable and productive agriculture must balance water available from rain, irrigation, and soil storage." At first blush this hypothesis appears trite, but their real point is that there are alternatives to water conservation too infrequently practiced in commercial American agriculture, such as runoff or runoff systems. These methods rely less on the industrial mining of water sources with electricity and petroleum for irrigation.

In "Management Strategies for Sustainable Soil Fertility," Karlen and Sharpley "examine factors which affect soil and present management strategies for sustaining fertility without adverse environmental or economic impacts." For a farm to achieve that goal a positive mass balance of nutrients must occur, i.e., when there is a net gain of nutrients in the system.

After comparing modern, Western land ownership with some ancient stewardship patterns, Robinson, Cruse and Kohler tackle the elusive notion of soil tilth in the essay, "Soil Management." Although undervalued by many mainstream soil scientists, soil organic matter is an important component of tilth, and in fact "may contribute more to soil productivity than any single soil component."

"Crop Management" by Clegg and Francis discusses interactions of crops, cultural practices, and the environments in which they take place. Their discussion centers on ways that producers can organize their management to best balance ecological concerns and their own livelihoods.



In "Pest Management—Weeds," Forcella and Burnside provide an impressive review of the four categories of weed control: physical, cultural, biological, and chemical. This forward-looking article contemplates the integrated strategies and models likely to be developed for economically and environmentally-sound weed suppression.

Funderburk and Higley make the case for Integrated Pest Management (IPM) in "Management of Arthropod Pests." Chemically resistant strains of pests, including arthropods, require a multi-disciplinary approach for control. Understanding the ecology of the target pest is a crucial element in developing strategies that suit the land, water and farmer.

A common thread running through sustainable agriculture communities is a distrust of the economics that produced today's agriculture. Thusly, White, Braden and Hornbaker introduce "Economics of Sustainable Agriculture." Never wavering from their faith in the market, White and company conclude by stating that there are three shortcomings of traditional agricultural economic theory: failure to consider the consequences of decisions on the outside world (externalities); "failure to assign the proper values to all outcomes (pricing)"; and failure to adequately value time and the impact of a decision on future generations (discounting).

The conditions necessary for change is the theme of "Making Sustainable Agriculture the New Conventional Agriculture." Padgitt and Petrzalka list four: awareness of a problem, knowledge of alternatives, motivation to change, and resources available for change. Changes needed to move toward a more sustainable agriculture are complicated by the site-specificity of many of the practices, the heterogeneity of the few farmers left on the land, and the paucity of the research needed to identify benevolent practices.

Hatfield and Keeney review the differing motives of people calling for sustainable agriculture in "Challenges for the 21st Century." They end with a list of "Research Needs and Challenges" that includes systems level research in agroecology, long-term studies to see how changes are really affecting a system, and incorporating germplasm studies to access genetic response to different practices.

Each chapter of *Sustainable Agriculture Systems* includes a table of contents, there are citations galore, and an index is provided. Anyone looking for a non-threatening introduction to some of the language and science of sustainable agriculture should pick up this book and read it.

*Reviewed by:*

*Gabriel Hegyes*

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## **Sustainable Agriculture in Temperate Zones**

Charles A. Francis, Cornelia Butler Flora, & Larry D. King, Editors, 1990  
John Wiley & Sons, 605 Third Ave, New York 10158. 487 p, cloth \$89.95

*Sustainable Agriculture in Temperate Zones* is a comprehensive, yet compact, textbook with chapters by leading authorities in the field. It provides an excellent overview of most topics in sustainable agriculture, with emphasis on the scientific principles and literature that form their foundation. It is an excellent resource that can be used to provide a broad and scientifically grounded framework for college students, and agricultural professionals. Due to the emphasis on scientific principles and references, however, most chapters are not as strong in practical applications as many agricultural professionals might want, and the emphasis is on cropping systems much more than animal agriculture. It is also rapidly becoming out of date. Published in 1990, it contains references up to the late 1980s, and therefore lacks nearly a decade of recent research during a time when sustainable agriculture research has been greatly expanding. Supplemented with readings from recent research, however, it is still a valuable text on sustainable agriculture for temperate zone cropping systems in the United States. Like any multiple-author work, it is somewhat uneven in style, but the quantity and quality of the combined knowledge of the authors is far greater than that possible in any single-author text.

The introductory chapter by Charles Francis and Garth Youngberg gives an overview of problems in modern agriculture, followed by definitions, common misconceptions, and history of sustainable agriculture and related concepts. Six chapters follow on various aspects of cropping systems: plant breeding, pest management, weed management, soil fertility, legumes and crop rotation, and soil biology and management. The pest management and weed management chapters contrast noticeably in approach, despite their similar topics. The chapter on pest management by George Bird et al. provides a strong intellectual overview of history and principles of integrated

pest management and "system re-design" needed for sustainable agriculture, with research examples in onions, soil management, and livestock. Despite its system-level emphasis, however, it lacks examples of system management by practicing farmers that would be useful for the agricultural professional. The weed management chapter by Matt Liebman and Rhonda Janke, in contrast, is arranged by weed management technique, with several practical, whole-system examples at the end. It is somewhat less intellectually cohesive than the pest management chapter, but probably more accessible to the practicing professional. The soil fertility chapter by Larry King similarly takes a practice by practice approach, with emphasis on three guiding principles: minimizing nutrient loss, maximizing availability of nutrients in the soil, and maximizing biological fixation. It would benefit from on-farm, whole-system examples to illustrate the application of the principles and methods in action. The chapters on legumes and crop rotation by James Power, and on soil biology by John Doran and Matthew Werner, provide background on topics that have been rapidly expanding in recent years. For example, a full chapter on cover crops, including grasses, legumes, and mixtures, and their pest-management effects, as well as soil effects, would be more typical of a book written today.

The next three chapters include much practical information and many examples. The chapter on pasture management, by Bill Murphy, covers grazing principles and a detailed, practical summary of rotational grazing (Voisin) principles and techniques. A case study of their farm by Richard and Sharon Thompson, and Iowa State University's Derrick Exner, provides a readable description of the farm and its context, the rationale for major decisions, and their results. The role of livestock is discussed, and two hypothetical farms are profiled: a cash-grain corn/soybean farm

that is typical of the area, and a more diversified operation such as the Thompsons' that includes oats, meadow, hay, pasture, and both cow/calf and farrow-to-finish hog operations. The comparison highlights such differences as capital required, use of labor, and profits, and illustrates the influence of government programs toward the cash-grain approach. Rebecca Andrews' chapter on converting a conventional farm to a reduced-input system takes a close look at the principles of conversion, drawing from the results of two major experiments in Pennsylvania and Nebraska, and gives step-by-step recommendations to those contemplating a conversion.

Patrick Madden's chapter on the economics of sustainable agriculture covers economics and related topics. The limited economic data available are reviewed, and issues are raised regarding how economic comparisons and projections are done, and the perverse effects of government policies. Due in part to Madden's influence on the USDA's Low-Input Sustainable Agriculture Program whose infancy he describes in this chapter (now re-named SARE, Sustainable Agriculture Research and Education), there are more economic data available today than at the time of his writing.

The final five chapters of the book stimulate the reader's thinking toward broader issues of rural community development, public policy, ecology, and future directions. Cornelia Flora's chapter on rural communities is important reading for those who want to define sustainable agriculture as merely profitable and environmentally sound production. It provides a thoughtful discussion of the many links between sustainable agriculture and issues of human and community development. It is long on reasonable hypotheses and logical reasoning, but short on data relative to other chapters, since the research base was (and still is) less developed in this important area. Its focus is primarily on rural communities, and thus lacks the current focus on tying in urban and suburban consumers into sustainability through issues of community food security and community food systems. The chapter on policy, also by Flora, identifies a number of public policy issues, but

focuses on the 1985 farm bill, whereas there have been two additional farm bills, in 1990 and 1996, since its writing. In contrast, Wes Jackson's chapter on "agriculture with nature as an analogy" is very future-oriented. It describes the work at The Land Institute on perennial polycultures based on the principles of the native prairie. The attempt to envision a different type of agriculture from basic ecological principles is something that should challenge every student and agricultural professional. The major issues addressed by William Lockeretz in the penultimate chapter question the basic concepts and definitions of sustainable agriculture and should be fascinating reading to the many agricultural professionals who challenge the somewhat vague definitions tolerated by many in the sustainable agriculture community. The final chapter on future dimensions, by Charles Francis, emphasizes cropping systems topics in both management approaches and the research agenda. The broader issues described under extension (systems vs. components, the role of information, the importance of a participatory approach, and the focus on community as well as farming and ranching) are equally relevant to the research agenda. The emphasis on the role of information as a critical resource certainly has been borne out. The information landscape has changed and will continue to change dramatically due to the growth of information technology that fosters participatory exchange rather than control by a limited group of "experts."

It is too easy to critique a seven-year-old book for what it is missing, especially in a field such as sustainable agriculture where the conceptual foundation, as well as specific research results, are expanding and changing. While this book is showing its age, it remains a readable and comprehensive treatment of fundamental concepts and the scientific evidence to support them, useful for students and agricultural professionals interested in temperate zone cropping systems.

*Reviewed by:*

*Jill Auburn*

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## **From the Ground Up: Rethinking Industrial Agriculture**

Peter Goering, Helena Norberg-Hodge, and John Page, 1993  
Zed Books, Ltd., 165 First Avenue, Atlantic Highlands, NJ 07716.  
120 p, cloth \$49.95 and paper \$17.50

If you are looking for a concise overview of the problems of industrial agriculture, and a visionary look at the worldwide movement toward ecological agriculture, you should get this wonderful little book. Its three authors are associates of the International Society for Ecology and Culture (ISEC), a non-profit organization based in Bristol, England and Berkeley, California. ISEC's primary goal is to promote critical discussion of various elements of modern industrial civilization, such as its high energy, pesticide intensive system of agriculture, while seeking alternative strategies for a more sustainable way of life. One of the authors, Helena Norberg-Hodge, Director of ISEC, is perhaps best known for establishing the Ladakh Project in Tibet, and for the summary of that experience in her 1992 book *Ancient Futures: Learning from Ladakh* (reviewed in AJAA, Vol. 8, No. 3); this volume, p. 93.

*From the Ground Up* is divided into two almost equal parts: Industrial Agriculture: Broken Promises; and The New Agriculture: Back to Basics. Part I discusses most of the major problems of modern industrial agriculture, such as its overemphasis on specialization, standardization, and centralization (Chap. 1); the relationship between corporations, seeds, and declining genetic resources (Chap. 2); the environmental and health effects of using chemical fertilizers (Chap. 3) and artificial pesticides (Chap. 4); the factory nature of our system of animal husbandry (Chap. 5); our over-reliance on fossil fuels (Chap. 6); and the decline of the family farm and the associated increase in regional poverty (Chap. 7). It concludes with a timely discussion of "free" trade, GATT, and biotechnology (Chap. 8).

I particularly like how Part 1 clearly identifies some root problems of our modern system of

agriculture, such as its intensive use of (if not blind faith in) science and technology to solve all problems; its increasing trend toward a narrow perspective through specialization; its drive to "homogenize" through standardization; and its demand for an economy that is highly integrated into world trade. What the authors fail to emphasize, however, is that these characteristics of industrial agriculture apply generally to modern industrial societies as a whole. Reversing the course of "modern" agriculture also will require a shift in how we think about and use our other natural resources, including energy, nonfuel minerals, forests, grasslands, wildlife, and freshwater and marine resources (Klee, 1991). Many parts of the world have experienced an agricultural revolution (beginning some ten thousand years ago in Mesopotamia), and an industrial revolution (beginning about 225 years ago in Europe). However, another revolution, that is, a revolution in thinking, will have to occur before there is any real change in our present industrial agricultural system. Perhaps one day historians will record that the modern U.S. environmental movement that began 25 years ago with the offshore oil blowout in Santa Barbara, California, was the beginning of an environmental revolution that again changed national and international ways of viewing and working with the earth.

Regardless, one can help move the nation and world toward a more environmental paradigm by rethinking industrial agriculture, exactly the subject of Part 2. Chapter 9, "The Context of Ecological Agriculture," is only three pages long, yet it accurately identifies and discusses seven essential ingredients for ecological agriculture: *holistic thinking*, instead of the reductionist, mechanistic view; *a sense of humility*, rather than scientific

arrogance; *generalism*, rather than the perspective of the specialist; *diversity of nature*, not simplified monocultures; *smaller scale farming*, not mammoth, energy intensive, fossil fuel dependent systems; *decentralization*, rather than centralized political and economic power; and *responsibility*, rather than corporate structures that often overlook principles of good land stewardship.

Chapter 10, "Learning from the Past," is among my favorites because it recognizes the value of studying indigenous or non-Western agricultural strategies from around the world. U.S. agriculturalists and modern resource managers clearly have much to learn from the long-standing conservation practices of traditional societies (Klee, 1980; in press). This notion is further supported by the numerous national and international organizations that study traditional agriculture, such as Iowa State University's Center for Indigenous Knowledge for Agriculture and Rural Development. Some newly established journals are devoted specifically to learning, protecting, and preserving indigenous knowledge related to natural resource perception and use, for example the Mexican journal *Etnoecológica* (*Ethnoecology*).

*From the Ground Up* then goes into the techniques of ecological agriculture, such as nurturing soil fertility and cultivating genetic diversity (Chap. 11). Chapter 12 deals with positive trends, such as the changing attitudes of farmers and the increasing demand for organic products. The concluding summary, "Counterdevelopment" and "New Ways Forward," is a wrap-up of a viewpoint stated earlier: that we should always question science—where it is leading society, and whether this evolution is really "progress." An additional point in this last section is a new role for education: "to restore respect for agriculture as a profession and to reflect the diversity of environments and cultures" (p. 90). How many educators in urban centers today encourage their students to pursue farming or gardening as a profession? Very few, I suspect. Although I teach at an urban campus in the

heart of "Silicon Valley" (a valley of silicon chips and computers where apricot orchards once stood), I still encourage my students at least to consider a career in which they can work closely with the soil.

The book also has an appendix that gives a brief background on some of the philosophical leaders in alternative agriculture, such as Wendell Berry, Masanobu Fukuoka, John Jeavons, and Wes Jackson. More importantly, it lists the names, addresses, and telephone numbers of 27 organizations that disseminate information and maintain directories of local contacts related to sustainable agriculture. It also has an up-to-date reference list and a useful index.

I have only one complaint about this book, which is its many many typographical errors. Something is seriously wrong when even undergraduate students complain about the number of misspelled words in an assigned reading. Apart from this flaw, I recommend it to teachers and students alike as a concise and highly readable argument for rethinking industrial agriculture "from the ground up."

#### References

1. Klee, G.A. (ed). 1980. *World Systems of Traditional Resource Management*. Edward Arnold, London, England.
2. Klee, G.A. 1991. *Conservation of Natural Resources*. Prentice Hall, Englewood Cliffs, New Jersey.
3. Klee, G.A. in press. Traditional concepts for 21st century living. *Etnoecológica* 1(3).
4. Norberg-Hodge, H. 1992. *Ancient Futures: Learning from Ladakh*. Sierra Club Books, San Francisco, California.

#### Reviewed by

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## **Toward Sustainability: A Plan for Collaborative Research on Agriculture and Natural Resource Management**

National Research Council, 1991  
National Academy Press, 2101 Constitution Avenue, N.W., Washington, DC 20418.  
147 p, paper \$19.00

This book contains a report by the National Research Council's Board on Agriculture concerning rationale and recommendations for the implementation of U.S. Agency for International Development's new Collaborative Research Support Program (CRSP) on Sustainable Agriculture and Natural Resource Management (SANREM). These recommendations resulted from a day-long forum and a subsequent three-day panel discussion sponsored by the National Research Council's Panel for Collaborative Research Support of AID's SANREM. This report includes the Panel's recommended design, research priorities, and administrative management arrangements for the new CRSP.

The book also contains five appendices that include the following topics:

- Background on operational issues facing AID
- On-going international development efforts that address sustainability issues in an interdisciplinary format
- Background on issues and research needs for soils in tropical areas
- Discussion of agroecosystems for various socioeconomic and environmental scenarios in developing countries
- Discussion of integrated nutrient and pest management issues in sustainable development

The first chapter, "Defining the Need," defines sustainable agriculture in a developing-country context. In particular, the definition addresses the difficult trade-off between economic development and environmental protection facing developing countries with growing populations, increased hunger, and limited arable land. An agro-ecologically-based systems approach is presented

and advocated to address these sustainability issues. This chapter also contains a subtle, but interesting, struggle that the authors have whether and how to include socio-economic criteria in the definition of sustainable agriculture.

Chapter 2, "Expanding the Management Challenge," provides background on AID's collaborative research support program and its evolution into sustainable agriculture. This chapter also introduces a discussion about the challenge of integrating science and technology with locally based, experiential knowledge in systems-based research.

Program recommendations are presented in Chapter 3, "Considerations and Criteria for the SANREM Program Design." Strong emphases are placed on agroecosystem interactions; inclusion of social, cultural, environmental, and institutional issues; and building on existing indigenous knowledge. An interdisciplinary approach is stressed in each of four research program areas common to agroecosystems: integrated pest management; integrated nutrient management; social, political, and institutional contexts; and integrated institutional management. Livestock enterprises are seldom, if ever, mentioned in this book, a curious omission, given farm-level integration of crops and livestock in some developing countries.

Recommendations concerning program organization and management are included in Chapter 4, "SANREM Program Management and Grant Administration." This chapter includes an overview of the recommended program management process that, although quite broad with respect to institutions and scientists, generally omits end users of the research. Recommended grant types and funding levels are also discussed in this chapter. These

recommendations cover a range of research activities, including team and component research support and, perhaps most importantly, planning grants intended to build teams that develop research-core-grant proposals to be entered into competition for longer-term funding. This chapter also contains recommendations on the content of the research proposals. Although a bit technical in nature, this part of the chapter contains a valuable discussion of interdisciplinary research and its integration into systems-based research.

The appendices contain additional background on operational issues facing AID and a collection of short, informative subject matter reports on various aspects of integrated crop management. These appendices have a strong crop and soils emphasis and are quite valuable in developing both a context and recommendations for research.

This book serves a number of important purposes and should, therefore, be useful to a range of audiences. The primary emphasis, of course, addresses the charge to the panel to make recommendations on the SANREM program. In that respect, the book is useful for those interested in the basics of AID's Collaborative Research Support Programs, recommendations on how to organize and fund sustainable agriculture research in developing countries, and the challenges facing these research efforts. The book also serves an important,

and perhaps unintended, purpose of raising the challenges of balancing (1) economic development, environmental quality and socio-economic dimensions of sustainable agriculture; and (2) integrating science-based methods and indigenous knowledge in systems-based research. The book's appendices serve another important audience in discussing important institutional and technical matters related to agro-ecological research issues in developing countries.

The book is well-edited and reads fairly well, considering its summary and recommendations. The book contains a wide range of information presented in a tight format over most of its 147 pages. Illustrations are not used very often and, frankly, could have been used more effectively. The bibliography is another strength of this book and should be useful for a variety of audiences. Finally, the book can also be useful for discussions of the challenges facing those conducting research and developing policy in sustainable agriculture and natural resource management in developing and developed countries.

*Reviewed by:*

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## **Sustainable Agriculture: Why Green Ideas Raise A Red Flag**

Judy Green, 1993

From *Farming Alternatives Newsletter*, Summer

Most of us find it easy to agree with the basic principles of sustainable agriculture, which call for the development of farming systems that are environmentally sound, socially beneficial, and profitable. It is not as easy to translate a broad set of principles and goals into a set of practical recommendations to improve farming practices, especially when the issues are charged with emotion, controversy, and misunderstanding. Why is the S-word such a red flag? Why does it raise the hackles of so many farmers? What are the roots of the polarization between those who advocate "sustainable agriculture" and those who feel skeptical, and even suspicious of it? A recent discussion with Cornell Cooperative Extension field staff, during an in-service training on sustainable agriculture, shed some light on these questions.

It is unfortunate, but true, that many in the agriculture community view sustainable agriculture as a personal criticism, or an attack, on conventional agriculture of which they are justifiably proud. "I guess that the main thing people get defensive about when you say sustainable," explained one agent, "is that it implies that what they've been doing is not sustainable. And that's the biggest issue."

"You have to understand," added another, "that there is no other industry in the world that has evolved so rapidly, and made so many technological changes that it increased productivity 300 - 400 times. And because of that agricultural productivity, we have been able to develop into an industrial nation." They feel that by promoting sustainable agriculture, society is unfairly blaming farmers for pollution, and unfairly targeting agriculture for reform. Farmers are willing to go the extra mile to improve environmental impacts, but consumers ought to share the burden. "Agriculture can do more than its fair share," an agent explained. "But it

is going to have to take a mind-set by the entire population.... You have to communicate not only to agriculture producers, but you have to communicate to the consumer. We are in trouble. We need to rethink our way of life. Do you need two television sets in the house? Do you need that VCR? That all consumes energy." And many are skeptical of the economic feasibility of sustainable agriculture, particularly related to labor and equipment costs. "If you go from chemical pesticides to cultivation, you gotta have more labor, and you gotta have more equipment," argued an Extension agent. At the same time, they feel that farmers are not given enough credit for what they're already doing to improve environmental impact. "We've been doing it with cover cropping and rotations in vegetables for years!" complained another. "And yet we don't get credit for what we are doing."

I suspect that underlying many of these complaints about sustainable agriculture is a deep-seated distrust of the organic farming movement, and an assumption that sustainable agriculture is really organic farming in disguise.

Many in the conventional agriculture community feel that supporters of organic agriculture don't understand "real" commercial farming. And that sustainable agriculture, too, represents an imposition on farmers by outside forces, environmentalists, ignorant consumers and other zealots, who don't understand and don't appreciate real farming.

Today, these assumptions are for the most part, incorrect. Both organic and conventional farmers will continue to make important contributions to sustainable agriculture. Unfortunately, the history of conflict, misunderstanding, and ignorance surrounding sustainable agriculture still divides the agriculture community. We need to cultivate a genuine respect for all who are sincerely concerned



about the future of agriculture. We need to learn how to work together to address both long-term societal goals of sustainability and the immediate needs of farmers to stay in business. Let's legitimize the S-word, create opportunities for dialogue between people with differing perspectives on sustainable agriculture, and work toward the

establishment of trust among farmers of all types, Extension field staff, the University, and the public.

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## Open Questions in Sustainable Agriculture

William Lockeretz, 1988

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### The concept of sustainable agriculture

"Sustainable agriculture" is a loosely defined term for a range of strategies to cope with several agriculturally-related problems causing increasing concern in the U.S. and around the world. Notable among these problems are the contamination of the environment by pesticides, plant nutrients, and sediments; loss of soil and degradation of soil quality; vulnerability to shortages of non-renewable resources, such as fossil energy; and most recently, the low farm income resulting from depressed commodity prices in the face of high production costs. Sustainable agriculture is based on several general concepts (Hodges, 1982; Harwood, 1985; Francis et al., 1986; Madden, 1987; Francis and King, 1988):

1. Diversity of crop species to enhance the farm's biological and economic stability with techniques such as rotations, relay cropping, and intercropping;
2. Selection of crop varieties and livestock that are well suited to the farm's soil and climate, and that resist pests and diseases;
3. Preference for farm-generated resources over purchased materials, and for locally available off-farm inputs, when required, over those from remote regions;
4. Tightening of nutrient cycles to minimize loss of nutrients off the farm, such as by composting of livestock manures and by rotations using legumes to fix nitrogen;
5. Livestock housed and grazed at low density, with preference for high roughage rations over concentrated feeds for ruminants, and with herd size scaled to the farm's ability to produce feeds and use livestock manure efficiently;
6. Enhancement of the soil's ability to take up applied nutrients for later release as needed by the crop, in contrast to direct uptake by the crop at the time of application;

7. Maintenance of protective cover on the soil throughout the year, through tillage that leaves crop residues on the surface, and through cover crops and living mulches;

8. Rotations that include deep-rooted crops to tap nutrient reserves in lower strata, and that control weeds by alternating between cool season and warm season crops;

9. Use of soluble inorganic fertilizers, if at all, only at a level that the crop can use efficiently, and only to the extent that nutrient deficits cannot be met first by livestock manures and legumes; and

10. Enhancement of conditions for controlling or suppressing weeds, insect pests, and diseases, with synthetic insecticides and herbicides used, if at all, only as a last resort and only when there is a clear threat to the crop.

### Evolution and current status

Sustainable agriculture's principles and techniques come from many sources, some recent, some going back several decades. It clearly owes an important debt to organic farming, a term that came into use sometime before World War II, although its originator is not known (Robert Rodale, private communication). Initially, organic farming emphasized recycling of farm-generated nutrient sources and discouraged bringing in nutrients in the form of livestock feeds and chemically processed fertilizers (Scofield, 1986). Today the term particularly emphasizes avoidance of synthetic pesticides.

Recently, this approach has evolved into a more general concept, variously labeled "sustainable agriculture" or any of several related terms (as discussed later). This evolution has come about as a broader range of people have become interested in the same goals for diverse reasons. The depressed farm economy has caused a shift in emphasis from "maximum production" to "optimal production," the idea being that a system should be evaluated not simply by how much it produces, but rather by the

relative value of what comes out compared to what goes in. This rethinking has given rise to the concept of "low input" agriculture, a reversal of a long-standing trend towards greater production through greater use of purchased inputs. In the United States we tend to think of this term as applying only to cultivated crops. However, it is equally applicable to pastures and forages, especially in Western Europe, for example, where conventional grassland management often involves a high level of inputs (Wagstaff 1987).

Often, the inputs that farmers can reduce to save money also are environmentally damaging or hazardous to health. Thus the trend towards "low input" agriculture can help meet other important goals that have become more prominent in recent years, such as avoiding further contamination of ground water by pesticides (Hallberg, 1986), and meeting consumers' growing demand for healthful, uncontaminated foods (Clancy, 1986). These issues have led to much greater interest in sustainable agriculture, but even its most basic ideas remain to be worked out, not just specific questions of technique. Although the term is singular in form, "sustainable agriculture" really denotes a multi-dimensional concept, and it is not surprising that no single view of it has so far gained universal acceptance.

It therefore is important to keep in mind the many fundamental questions that still need to be discussed, analyzed, and debated before we can know what "sustainable agriculture" really means. Some of these questions may never be answered, but sometimes they aren't even asked, or the answers are asserted rather than demonstrated. Until these questions are discussed explicitly, we cannot know whether we are using the same words to mean different things, whether a particular approach can simultaneously serve the several different goals we would like it to achieve, or even whether there might not be intrinsic contradictions among the various goals that have been thrown together under the single umbrella term "sustainable agriculture." Nor will we know the best economic, institutional, and political environment to allow sustainable agriculture to fulfill its potential.

### **Fundamental questions**

*What are the differences between "sustainable," "alternative," "low input," "ecological," and "regenerative" agriculture?*

In the past decade all these terms, plus several less common ones, have come into use as labels for agricultural systems that share basic goals: reduced use of purchased inputs, especially toxic or non-renewable ones; less damage to the environment; and better protection of water, soil, and wildlife. But both the technical and popular literature are unclear about the exact connotations of these terms.

Sometimes they appear to be used synonymously, or almost so (Merrill, 1983). For example, a recent article published by the U.S. Department of Agriculture, Economic Research Service (1988) began by talking about "alternative agriculture," also known as 'sustainable,' 'regenerative,' 'organic,' or 'low-input' agriculture." Other authors emphasize the differences among these terms. If defined according to everyday usage, these terms would have clearly differentiated meanings:

— "Sustainable" has a time dimension and implies the ability to endure indefinitely, perhaps with appropriate evolution

— "Alternative" describes something that is different from the prevailing, or "conventional" situation. Another implication of the word is that farmers should be able to choose among options, rather than having to follow a single prescription

— "Low input" refers to reduced use of materials from outside

— "Ecological" refers to the principles and processes that govern the natural environment

— "Regenerative" implies the ability to recreate the resources that the system requires

*But regardless of their literal meanings, what about their meanings as actually applied to agriculture?*

All these terms have acquired further overtones; some have become almost brand names. Thus "alternative agriculture" does not mean simply "a different kind of agriculture." It must be different in a certain way. But in precisely what way? By being more sustainable? Ideally, yes, but the way these terms are now used, it is not clear. For even though they carry specific implications when used in agriculture, terms like "sustainable" paradoxically have also come to be used in so many different ways by divergent groups that they seem in danger of losing any real meaning.

*What can we conclude from this semantic confusion, these ambiguities, this proliferation of labels that may or may not mean the same thing?*

At a recent conference on sustainable agriculture, I noted that many speakers felt it necessary to introduce their talks by giving their definition of the word "sustainability." Isn't something backwards here? It seems curious that a term is considered important (or at least that it is considered important enough to be the theme of a conference) even though we don't know what it means. Perhaps, as Buttel (private communication) has suggested, sustainable agriculture "remains a solution in search of problems."

Less pessimistically, there are three possibilities, of which two are mainly semantic problems. The first is that several fundamentally different concepts are involved, but authors are not always careful about choosing the most appropriate term. Thus, we really *do* need several labels, but imprecise usage has resulted in the impression that these labels are more or less interchangeable.

Conversely, a second possibility is that, when applied to agriculture, all these words are referring to the same concept; they may have proliferated because each was put forth by someone who believed that the previous terms did not capture that concept accurately, or who for some other reason chose to shy away from an earlier term. For example, "organic" is thought, by some people, to suffer from a negative image. Why else would an article that quoted verbatim the U.S. Department of Agriculture's oft-cited definition of organic farming never actually use the "O word," but instead claimed that "the U.S. Department of Agriculture defines alternative farming as follows" (Popkin, 1988 [emphasis added]).

A third possibility is more substantive: Whether these terms are interchangeable might depend on the context, such as whether one is talking about broad principles or specific practices. Perhaps the basic concepts implied by these various terms are different. When it comes to illustrating them by specific systems, however, everyone seems to end up using the same examples. For example, the first study of commercial organic farming in the United States (Lockeretz et al., 1981) only used the term "organic," and required only that the study farms not use synthetic pesticides and inorganic fertilizers. However, this same study has since been cited as dealing with "low input," "sustainable," and "ecological" agriculture.

This citation trail is fine as long as a given production system indeed embodies several of these

general concepts. But the confused semantic situation could reflect a more serious problem: people may assume, rather than demonstrate, that a given agricultural system can simultaneously fulfill several different goals and embody several different agricultural ideals. Actually, it is necessary to demonstrate that it even achieves its stated, primary goal.

*Does calling a system "sustainable" guarantee that it is sustainable, and if it is "sustainable" (that is, capable of enduring), is it necessarily "alternative" (meaning different from prevailing practices)?*

*Is an agricultural system that does not use so many inputs necessarily "ecological," that is, more like a natural ecosystem?*

In much of the literature, there is an implicit assumption that when one strives for any of these goals the others somehow come along automatically. There is little recognition that these goals are substantially distinct and independent, so that each has to be achieved in its own right. And rarely is it acknowledged that in designing specific production systems, rather than talking about abstract concepts, there can be incompatibilities that actually make it impossible to achieve them all (Lockeretz, 1986).

*Is sustainable agriculture primarily a matter of reducing certain inputs, or reducing inputs in general, or instituting positive practices that make some inputs unnecessary?*

The common identification of "low input" with "sustainable" agriculture raises some important questions. Organic farming, a precursor of sustainable agriculture, avoids or greatly reduces the use of two important categories of purchased inputs, namely synthetic pesticides and highly soluble inorganic fertilizers. The reasons for this rejection involve soil productivity, the environment, and other biological and chemical considerations. An additional consequence is that organic farmers may have lower cash operating expenses (Lockeretz et al., 1981).

More recently, the idea of eliminating certain inputs regarded as particularly objectionable has expanded to reducing purchased inputs in general, to the extent feasible. This extension has been motivated by the depressed economic conditions affecting much of American production agriculture, which could be ameliorated by reducing operating expenses. Another school of thought, more related to the original idea of organic farming mentioned

earlier, is that a farm should strive for self-sufficiency as an end in itself, not just because a particular input is either damaging or expensive. In this view, the mere fact of being tied to another region or another sector of the economy can cause problems. Rodale (1988) extends the distinction between a farm's internal and external resources — a key element in the concept of “regenerative agriculture,” of which he is the leading exponent — even to management decisions, although most authors confine themselves to physical and biological inputs.

Another view of the question of whether reducing inputs is intrinsically desirable is that sustainable agricultural systems should be based on positive steps that enhance soil fertility, control pests and perform the many other functions that in conventional systems are largely performed by purchased inputs. Merely doing without such inputs is not an end in itself; the goal is to develop a system in which they would not be needed anyway. This concept emphasizes nutrient cycling, natural pest controls, diversity, continuous protection of the soil by living crops or residues and wholesome housing and rations for livestock.

Interesting the current use of the word “organic,” was once regarded as the narrowest and most prescriptive (i.e., “thou shalt not”) of the terms under discussion here. The International Federation of Organic Agriculture Movements (1988), the only organization with sufficient status to presume to speak authoritatively on such matters internationally, begins its proposed technical standards for organic production with eight positive goals, ranging from high nutritional quality to maintenance of genetic diversity, to a decent return for farm workers. The standards go on to say that if techniques are chosen that will approach these goals, they will “make it possible to avoid...chemical fertilizers, pesticides, and other chemicals.”

The differences among these attitudes towards reducing inputs is not academic nit-picking. Organic farmers in the narrower sense of the term — those who do not use certain forbidden materials — do not automatically try to cut down on their use of inputs in general (Wernick and Lockeretz, 1977). In fact, they may compensate by increasing their use of certain other inputs. For example, controlling weeds mechanically instead of with herbicides requires additional implements and

fuel, as does applying manure rather than concentrated fertilizers. Some organic farmers buy organic fertilizer materials, which typically are more expensive than the same nutrients in inorganic form (Wernick and Lockeretz, 1977). If non-chemical pest control requires hiring professional scouts, then one expense (a service) is being substituted for another (a material). By environmental criteria, scouting is certainly preferable, but economically it could go either way.

In response to economic pressures, some farmers have been cutting back on pesticides and fertilizers, as well as other inputs, without doing anything else differently. According to one view, this the Wisconsin Rural Development Center (1988) puts the matter very simply: ‘Sustainable methods are those that use less commercial fertilizer, herbicide and pesticide.’ In some systems, such as dryland wheat in the Great Plains without herbicide-based chemical fallowing, pesticides and fertilizers have not been very important all along. Is this system sustainable? The Dust Bowl demonstrates that it isn't (Lockeretz, 1978). Is it organic? This system would come close to qualifying for certification as organic by several U.S. organizations (but not according to the proposed IFOAM standards), since certification programs generally emphasize what must not be done, and only secondarily mention what should be done. Is it the best possible system from the viewpoints of environment and resources? Probably not. Other systems could do more to enhance soil productivity, reduce erosion, preserve wildlife habitat and increase economic returns, while continuing to avoid the materials considered undesirable. This monocultural system certainly does not qualify as “ecological,” since it hardly reflects the complex ecological structure of the shortgrass prairie it replaced.

Another interesting contradiction arises if a farm changes its fertilization system only because it happens to be near a source of organic wastes that can be substituted for purchased inorganic fertilizer. Such a farm fulfills one requirement of sustainability, in that it avoids using a material that is nonrenewable and potentially damaging to the environment. (Of course the wastes must be applied in an environmentally suitable manner, or they will create just as much of a problem.) However, it is not a “low input” system; only the form of the input is changed. Therefore it is as vulnerable to external disruption as a system

dependent on inputs made from non-renewable resources. One merely has substituted one source of vulnerability for another: the source of the waste may close. This point has been made by Vail and Rozyne (1982), who found that organic<sup>7</sup> farmers near poultry plants in Maine — where the industry has been declining sharply — did not take positive steps to build soil fertility, but merely exploited the fortuitous availability of poultry manure as long as they could get it, to save some money on fertilizer expenses.

The relation between sustainability and some versions of “low input” agriculture is also critical for understanding how important short-term economic factors have been in helping “sustainability” gain acceptance. I therefore take it up again in the next section.

*Does sustainable agriculture require fundamental changes in either the economic and institutional environment or farmers' motivations and values?*

This question provokes widespread disagreement. Some authors confine their discussions of sustainable agriculture to agronomic, environmental, and biological factors, or to economic evaluations under prevailing conditions. They believe that the same farmers, operating the same farms, can switch production systems without a significant change in attitude or in the economic, political and social setting in which farming occurs.

In other discussions, far-reaching socioeconomic transformations are emphasized even more than the technical differences between sustainable and conventional farming methods. These transformations include reduced linkage between farming and the industrial economy; more direct ties between producers and consumers; greater regional food self-sufficiency; a preference for family rather than corporate farms; policies that reward resource conservation; higher employment in agriculture; equitable distribution of economic returns among different classes of farmers and between present and future generations; and the social and economic revitalization of rural communities (Douglass, 1984; Crosson, 1986).

The connection, if any, between such transformations and changes in specific practices can go in either direction. That is, a different socioeconomic environment could be a prerequisite for widespread adoption of sustainable methods, or it could be a consequence of this adoption. For example, intensive use of chemical pest control is sometimes

said by advocates of alternative agriculture to result from the domination of farming by agrichemical interests, who are described as exerting a strong influence on farmers' decisions and on research priorities. Therefore this domination must be reduced before farmers will be receptive to alternatives. On the other hand, if farmers decide to switch to reduced chemical methods because they perceive problems with the particular agrichemicals now in use, such as high cost, fear of liability, or threats to their health, this switch will reduce the influence of the agrichemical industry. A desire to reduce that influence might not be why they made the change, but some people would consider the reduced influence to be desirable in its own right, apart from the undesirable properties of pesticides.

Another important structural issue that is still open concerns the most appropriate scale for sustainable agriculture. Its supporters often consider that it is most suited for small to moderate sized family farms. However, the empirical support for this view is largely lacking, and the theoretical arguments are equivocal (Buttel et al., 1986).

Certainly, the trend towards larger farms has been associated historically with specialization, whereas sustainable agriculture favors diversification over specialization. Also, sustainable agriculture may require greater attention to management, as discussed below. If so, the farmer can give more attention to each field or each animal if the farm is not too large. On the other hand, larger farms may be better able to afford to hire specialized expertise, or to have better facilities and equipment.

The relation between the production system and the farmer's personal values is also unclear. Some authors see little connection. Today's farmers can, if they choose, adopt sustainable methods without any rethinking of motivations, values or broader philosophical considerations. Moreover, they will do so, it is argued, if the alternative is more attractive from the viewpoints of economic return or health and safety.

But to others, the reason a farmer farms is an overriding consideration. In this view, farmers should be concerned not just with short-term profits, but also with the well-being of future generations, the rural communities in which they live and work, the natural environment, the aesthetic appeal of the landscape, and the resources consumed in farming (Fischer, 1978; Bidwell,

1986). Such considerations are sometimes regarded as the distinguishing characteristic of sustainable agriculture (Freudenberger, 1986); the specific choices of production methods in turn follow from these goals.

As with the previous discussion of the institutional and economic environment, change can be started from either direction. If farmers can be persuaded to be more concerned about environmental values, they will adopt environmentally sounder methods. But if they can be persuaded to adopt these methods, for whatever reasons (for example, economics or more stringent environmental regulations), the result will be a system that in fact protects environmental values better, even if that is not why they chose to use it.

A possible objection to this last point is that changes made purely for economic reasons can be transient, given the variability of economic conditions. If farmers reduce pesticide use because crop prices have been too low to justify the cost, this environmentally beneficial change could be undone by the next sharp increase in crop prices, just as some good soil conservation work was undone by the exceptionally rapid price increases from 1972 to 1974, which led farmers to include even marginal land when planting "fencerow to fencerow" (Grant, 1975). The growing interest in "low input" agriculture has been closely tied to the distress in the farm economy during the mid 1980s. This connection points to a key difference between "low input" and "sustainable" approaches: even though both may have the short-term effect of reducing pesticide use, the latter does so for less ephemeral reasons than the temporary diseconomy of applying pesticides heavily when crop prices are low. The distinction between the two concepts is apparently eliminated by merging them under the singular term "lower input/sustainable agriculture." This term was proposed by Edwards (1987) as a solution to both overproduction and environmental problems. But trying to solve two problems for the price of one raises another question: what happens when the problem becomes scarcity, not surpluses? Must we give up sustainability when we need to produce more food? Similarly, the term "low input/sustainable agriculture" has been adopted for a new program of research grants administered by the U.S. Department of Agriculture. It is not clear what is meant by joining the two components of this term.

Are they to be regarded as equivalent, with one simply a different way of saying the other? Or is the composite term intended to cover any system that has at least one of the two characteristics? Or only those that have both (which may be only a subset of the previous category)?

It is difficult, but essential, to resolve the relationship between sustainability and the low input approaches adopted in direct response to current economic conditions. Although proponents of sustainable agriculture may prefer to emphasize longer-range considerations, short-range economic factors cannot be ignored: if a system doesn't return enough income to let the farmer remain in business, it isn't sustainable (Madden, 1987). The solution may lie in the earlier discussion of whether sustainable agriculture is primarily a matter of merely doing without certain materials, or of doing positive things that make these materials unnecessary. Ideally, with appropriate crop rotations, crop varieties, and tillage methods, the farmer who because of environmental reasons doesn't want to use pesticides won't have to and won't be tempted to, even when crop prices rise again.

*Does understanding sustainable agriculture involve concepts that are fundamentally different from conventional systems, or do we only need to extend the application of known principles to the conditions that prevail under sustainable practices?*

The literature on sustainable agriculture offers various views regarding qualitative differences between the basic processes underlying sustainable and conventional production systems. One view is that both kinds of systems can be described and analyzed using the same concepts, and that they differ only in the specific conditions created by differing practices. Another view is that the complex interactions among the components of a sustainable farming system cause new phenomena to emerge that are not observed in the more simplified structure of a conventional system, so that one cannot understand the former by merely extrapolating from the latter.

Each of these views has some validity, and the difference is often one of emphasis. An example is whether control of insect pests is fundamentally different in the two approaches. Sustainable control is generally described as using natural processes, such as predation on pests by other insects. Conventional control, in contrast, is sometimes

represented as a “magical bullet” approach (Hill, 1982) depending entirely on insecticides, which not only substitute for natural processes, but may even interfere with them. For example, an insecticide may wipe out a beneficial species that previously had controlled a pest.

Where this does happen, pest control differs in a basic way between the two systems: in one it is a matter of toxicology, in the other an ecological phenomenon. No matter how much one studied the pest’s mortality at different pesticide application rates, this knowledge would not be enough to predict the survival rate at zero application, where a different mechanism (predation) comes into play.

But sometimes the pesticide adds another control mechanism to the existing natural controls, rather than replacing them. If so, then the two approaches partially overlap. Even under “conventional” practice, many potential pests are actually controlled naturally—without the farmer even having to do anything—rather than by pesticides. Many elements of conventional pest control are the same as in sustainable practices, for example resistant varieties, good residue management, and best choice of planting date. Therefore it is not correct to describe sustainable and conventional practice as governed by fundamentally different principles and mechanisms—“natural” as opposed to “chemical”—despite the different relative importance of these mechanisms in the two approaches.

This question has important implications for agricultural research policy. Perhaps the established methods of agricultural research are appropriate for dealing with sustainable agriculture; all that might be needed is for more attention to be devoted to the particular techniques and particular conditions of sustainable agriculture. In contrast, some people believe that new approaches and methods are required, involving far-reaching differences in basic theories and concepts. The growing field of agroecology, as applied to sustainable agriculture, is an attempt to introduce new theoretical principles to analyze agricultural systems (new, that is, in the domain of agriculture, although well established regarding natural ecosystems). However, this field still is at a highly immature stage, and basic agroecological research is not yet receiving very strong support at most colleges of agriculture. Thus it has yet to demonstrate the potential that its supporters have claimed for it. In

the meantime, a considerable portion of the work labeled as “sustainable agriculture research” differs from earlier kinds of research that it is supposed to improve mainly by generously using terms like “systems approach.”

*To what extent do the resource-conserving and environmentally sounder techniques being developed at mainstream agricultural institutions already represent sustainable agriculture?*

Two points discussed earlier—whether acceptance of sustainable agriculture requires far-reaching economic or attitudinal changes, and whether understanding it involves a fundamentally different scientific outlook—raise the question of whether existing research and teaching institutions can deal with this area adequately. Long before the term “sustainable agriculture” came into common use, techniques with similar goals were already attracting attention. Examples include integrated pest management to reduce pesticide use, improved methods for storing and applying livestock manures to maximize their fertilizer value and reduce water pollution and reduced tillage systems to control soil erosion. More recently, many agricultural institutions have started programs specifically labeled “sustainable agriculture.” Such programs explicitly acknowledge the influence of the sustainable agriculture movement and indicate mainstream agriculture’s interest in accommodating its ideas.

However, some people interested in sustainable agriculture both within mainstream institutions and on the outside do not view with undiluted optimism the changes that have already occurred in mainstream research, teaching and extension. To some, the established research institutions are under very powerful confined, especially constrained by disciplinary boundaries and by researchers’ need to publish frequently. The latter, in turn, may discourage long-term projects such as studies covering several cycles of a many-year rotation. These carriers may make it difficult or impossible for established institutions to organize agricultural research appropriately for dealing with sustainable systems (Bidwell, 1986). Also, to those who believe that sustainable agriculture involves fundamentally different principles, older ways of thinking are too firmly established among the current generation of researchers to permit newer ideas to flourish. Although such people may welcome the new interest in sustainable



agriculture, they do not expect that the change will be able to go far enough in the current institutional environment. Buttel and Gillespie (1988) expect that the low-input work that mainstream research institutions are showing interest in will be done mainly by the same scientists—now “born again” agronomists—whose limited vision created the need for new approaches.

Some critics of current agricultural research believe that its limits are more fundamental and that they will not be eliminated even if appropriate institutional arrangements are provided and a new generation of researchers took over. This view considers the problem to be nothing less than the way scientists think about how the universe works. Our thinking, it is said, is too “mechanistic” and “reductionist” to encompass the complex relations of a sustainable agricultural system, a task for which a new scientific paradigm is needed (Cobb, 1984). However, this criticism may be making the mistake of attacking all science, rather than bad science. The most dramatic and exciting breakthroughs in the history of science include many that are profoundly “antireductionist”: quantum mechanics, evolution, and general relativity, for example. To believe that one has a better way of understanding how the world works amounts to placing oneself above Bohr, Darwin, and Einstein.

Finally, certain critics, including some individuals at mainstream agricultural institutions, have argued that such institutions not only have failed to grasp the spirit of sustainable agriculture, but do not even want to. The flurry of recently instituted programs is said to be merely a way to appear responsive to outside pressures, and to blunt the full thrust of the movement. In this view, advancing the cause of sustainable agriculture means challenging some far-reaching economic, social, or political constraints, a challenge that mainstream agricultural institutions are not likely to mount (Altieri, 1988). Similarly, Buttel and Gillespie (1988) argue that because a range of concepts has been advanced under the name “ecological agriculture,” mainstream agriculture has been able to choose the least-threatening version of it, sanitize it further to make it bureaucratically acceptable, and appropriate it as their own.

The relation between mainstream institutions and supporters of sustainable agriculture will undoubtedly clarify itself with time. The most

discouraging outcome would be for the term “sustainable agriculture” to degenerate into just another bureaucratized buzz word used to show that something new and exciting is going on, even though nothing has really changed. But perhaps the mainstream will prove highly receptive to the ideas now labeled as “alternative.” If so, it might still be intrinsically advantageous to have someone whose role is to continue to challenge the established institutions and to keep prodding them to move further than institutional inertia would otherwise permit. On the other hand, if the receptiveness extends to the spirit of sustainable agriculture as a continuing quest, and not just to the specific details of systems being advocated today, then eventually it should be possible to drop the distinction between “alternative” and “conventional” as irrelevant and unnecessary.

*Does sustainable agriculture require a higher level of management ability among farmers?*

Sustainable agriculture is commonly said to require more management than conventional practice, both in how much effort the farmer must expend and in the quality demanded. The explanation is that sustainable practices substitute knowledge and understanding for technological control of growing conditions (Stinner and House, 1987). For example, in conventional practice, a disease of livestock might be completely controllable by routine prophylactic administration of an antibiotic, whereas in sustainable practice the goal is to prevent the disease by reducing stresses that make the animals more susceptible, and by housing them in conditions less conducive to communicating the disease. The farmer therefore must monitor the animals carefully to be able to start treatment promptly should it become necessary.

Another source of greater management requirements is said to be the need to make decisions on an integrated, whole-farm basis, in contrast to the more compartmentalized approach possible in conventional systems. Also, sustainable management is often depicted as the adaptation of general principles to the specific circumstances of the individual farm, whereas conventional practice is sometimes characterized as a “cookbook” approach — a set of prescriptions that can be applied anywhere, without much understanding of the agroecosystem (Friend, 1983; Ehrenfeld, 1987). The sustainable agriculture literature

emphasizes the need for flexibility and stresses that there is no one best method under all circumstances.

Although these arguments are persuasive, the question of comparative management requirements is still open. Certainly sustainable agriculture will require farmers to acquire different kinds of knowledge and skills, but this does not mean it is necessarily more difficult. Some proponents of sustainable agriculture may exaggerate the extent to which purchased inputs obviate the need for judgment in conventional practice, and may not take due account of the many decisions that still must be made even if one uses inorganic fertilizers, synthetic pesticides, and livestock antibiotics. For example, specialization, expansion, and heavy use of inputs in conventional approaches may require a greater management ability in handling financial and marketing affairs. Also, the stereotype of "cookbook" farming may indeed apply to poorer conventional managers, but not to the more discerning ones who still bring knowledge and experience to their operations despite the availability of chemical help. Also, some of the expertise required for sustainable practices can be hired, for example professional services for integrated pest management.

Finally, even if sustainable agriculture imposes greater management difficulties now, this problem may be reduced after farmers have had more experience with it and after more effort has been devoted to it by established research, extension, and teaching institutions. The lack of reliable information sources has been a common complaint among organic farmers (Wernick and Lockeretz, 1977; Baker and Smith, 1987), and undoubtedly applies to other sustainable approaches as well. Eventually, the mystique surrounding the complexities of sustainable management may disappear, and what now may seem bewilderingly complicated very likely can be made much more fathomable (Coleman, 1985). Farmers have been called on many times in the past to take on new management challenges, and it seems plausible that with appropriate support the challenges of sustainable management can be met as well.

### **Conclusion: Let's do it right**

Sustainable agriculture is not so much a new idea as a synthesis of ideas originating from various sources, out of various motivations. It is continuously being modified and refined to reflect current

economic pressures on farmers and the increasing concern over agriculturally related environmental problems. Although its roots go back much further, sustainable agriculture as an explicitly formulated concept is young compared to the time it will take to explore its ramifications and to understand fully its basic principles.

### *What can be done to advance this understanding?*

Certainly, more research and development are needed to apply sustainable agriculture concepts to specific situations and specific problems. However, unless we move considerably beyond merely doing some additional detailed empirical studies, it will amount to little more than a faddish but empty slogan. To fulfill its full potential, sustainable agriculture needs greater intellectual rigor. Important conceptual questions are not being asked, let alone answered. Fundamental principles still need to be developed and refined. Too much that needs to be demonstrated is instead simply asserted, or unconsciously assumed, or removed from debate by being made a matter of definition. People with a particular view of what sustainable agriculture is all about sometimes are not willing to acknowledge that other versions may be equally legitimate.

Supporters of sustainable agriculture often claim with considerable justification that mainstream agricultural thinking is too reluctant to challenge basic assumptions, too dogmatic, and too quick to become immersed in technical minutiae even though fundamental questions remain unaddressed. Ironically, sustainable agriculture runs the risk of repeating these mistakes. Fortunately, the field still has time to take heed of previous experiences. If it does, it will not only generate new solutions to the particular problems now affecting agriculture but also set a new and better standard for thinking about agriculture in the future.

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## REFERENCES

1. Altieri, Miguel A. 1988. Agroecology: A new research and development paradigm for world agriculture. Paper presented at the International Symposium on Agricultural Ecology and Environment, University of Padova, Italy, April.
2. Baker, Brian P., and Douglas P. Smith. 1987. Self-identified research needs of New York organic farmers. *American Journal of Alternative Agriculture* 2(3): 107-113.
3. Bidwell, Orville W. 1986. Where do we stand on sustainable agriculture? *Journal of Soil and Water Conservation* 41(5): 17-320.
4. Buttel, Frederick H., Gilbert W. Gillespie, Jr., Rhonda Janke, Brian Caldwell, and Marianne Sarrantonio. 1986. Reduced-input agricultural systems: Rationale and prospects. *American Journal of Alternative Agriculture* 1(2):58-64.
5. Buttel, Frederick H., and Gilbert W. Gillespie, Jr. 1988. Agricultural research and development and the appropriation of progressive symbols: Some observations on the politics of ecological agriculture. Bulletin No. 151, Dept. of Rural Sociology, Cornell University, Ithaca, New York.
6. Clancy, Katherine L. 1986. The role of sustainable agriculture in improving the safety and quality of the food supply. *American Journal of Alternative Agriculture* 1(1):11-17.
7. Cobb, John B. 1964. Theology, perception, and agriculture. In G. K. Douglass (ed.). *Agricultural Sustainability in a Changing World Order*. Westview Press, Boulder, Colorado. pp. 205-217.
8. Coleman, Eliot. 1985. Towards a new McDonald's farm. In T. C. Edens, C. Fridgen, and S. L. Battenfield (eds.). *Sustainable Agriculture and Integrated Farming Systems*. Michigan State University Press, East Lansing, Michigan. pp. 50-55.
9. Crosson, Pierre. 1986. Sustainable food production: Interactions among natural resources, technology, and institutions. *Food Policy* 11(2):143-156.
10. Douglass, Gordon K. 1984. The meanings of agricultural sustainability. In G. K. Douglass (ed.). *Agricultural Sustainability in a Changing World Order*. Westview Press, Boulder, Colorado. pp. 1-29.
11. Edwards, Clive A. 1987. The concept of integrated systems in lower input/sustainable agriculture. *American Journal of Alternative Agriculture* 2(4):148-152.
12. Ehrenfeld, David. 1987. Sustainable agriculture and the challenge of place. *American Journal of Alternative Agriculture* 2(4): 184-187.
13. Fischer, C. 1978. Introduction to the conference theme "Towards a Sustainable Agriculture." In J. M. Besson and H. Vogtmann (eds.). *Towards a Sustainable Agriculture*. Verlag Wirz AG, Aarau, Switzerland. pp. 11-17.
14. Francis, Charles A., and James W. King. 1988. Cropping systems based on farm-derived, renewable resources. *Agricultural Systems* 27:67-75.
15. Francis, Charles A., Richard R. Harwood, and James F. Parr. 1986. The potential for regenerative agriculture in the developing world. *American Journal of Alternative Agriculture* 1(2):65-73.
16. Freudenberger, C. Dean. 1986. Value and ethical dimensions of alternative agricultural approaches: In quest of a just and regenerative agriculture. In K. Dahlberg (ed.). *New Directions for Agriculture and Agricultural Research*. Rowman and Allenheld, Totowa, New Jersey. pp. 349-364.
17. Friend, Gil. 1983. The potential for a sustainable agriculture. In D. Knorr (ed.). *Sustainable Food Systems*. AVI Publishing Company. Westport, Connecticut. pp. 28-47.
18. Grant, Kenneth E. 1975. Erosion in 1973-74: The record and the challenge. *Journal of Soil and Water Conservation* 30(1):29-32.
19. Hallberg, George R. 1986. From hoes to herbicides: Agriculture and groundwater quality. *Journal of Soil and Water Conservation* 41(6):357-364.
20. Harwood, Richard R. 1985. The integration efficiencies of cropping systems. In T. C. Edens, C. Fridgen, and S. L. Battenfield (eds.). *Sustainable Agriculture and Integrated Farming Systems*. Michigan State University Press, East Lansing, Michigan. pp. 64-75.
21. Hill, Stuart B. 1982. Steps to a hoste ecological food system. In S. Hill (ed.). *Basic technics in Ecological Farming*. Birkhauser Verlag, Basel, Switzerland. pp. 15-21.
22. Hodges, R. D. 1982. Agriculture and horticulture: The need for a more biological

- approach. *Biological Agriculture and Horticulture* 1(1):1-13.
23. International Federation of Organic Agriculture Movements. 1988. Technical Committee proposal for new IFOAM basic standards for organic agricultural production. *Internal Letter* 31 (June):19-31.
24. Lockeretz, William. 1978. The lessons of the Dust Bowl. *American Scientist* 66(5):560-569.
25. Lockeretz, William. 1986. Alternative agriculture. In K. Dahlberg (ed.). *New Directions for Agriculture and Agricultural Research*. Rowman and Allenheld, Totowa, New Jersey. pp. 291-311.
26. Lockeretz, William, Georgia Shearer, and Daniel Kohl. 1981. Organic farming in the Corn Belt. *Science* 211:540-547.
27. Madden, Patrick. 1987. Can sustainable agriculture be profitable? *Environment* 29(4): 18-20, 28-34.
28. Merrill, Margaret C. 1983. Eco-agriculture: A review of its history and philosophy. *Biological Agriculture and Horticulture* 1(3):181-210.
29. Popkin, Roy. 1988. "Alternative farming": A report. *EPA Journal* 14(3):28-30.
30. Rodale, Robert. 1988. Agricultural systems: The importance of sustainability. *Phi Kappa Phi Journal* (Summer):2-6.
31. Scofield, A. M. 1986. Organic farming: The origin of the name. *Biological Agriculture and Horticulture* 4(1): 1-5.
32. Stinner, Benjamin R., and Garfield J. House. 1987. Role of ecology in lower-input, sustainable agriculture: An introduction. *American Journal of Alternative Agriculture* 2(4): 146-147.
33. U.S. Department of Agriculture, Economic Research Service. 1988. Alternative agriculture gains attention. *Agricultural Outlook*, April. pp. 26-28.
34. Vail, David, and Michael Rozyne. 1982. Contradictions in organic soil management practices: Evidence from thirty-one farms in Maine. In S. Hill (ed.). *Basic Technics in Ecological Farming*. Birkhauser Verlag, Basel, Switzerland. pp. 32-40.
35. Wagstaff, Howard. 1987. Husbandry methods and farm systems in industrialized countries which use lower levels of external inputs: A review. *Agriculture, Ecosystems and Environment* 19:1-27.
36. Wernick, Sarah, and William Lockeretz. 1977. Motivations and practices of organic farmers. *Compost Science/Land Utilization* 18(6):20-24.
37. Wisconsin Rural Development Center. 1988. WRDC leads study on sustainable payoff. *Newsletter* 5(3):1.
- Agronomy group defines "sustainable agriculture"  
 "Sustainable agriculture" means different things to different people. A group of 350 American Society of Agronomy members, meeting in late 1988 at the society's annual convention in Anaheim, California, hammered out their working definition. Here it is.
- "A sustainable agriculture is one that, over the long term, 1) enhances environmental quality and the resource base on which agriculture depends, 2) provides for basic human food and fiber needs, 3) is economically viable, and 4) enhances the quality of life for farmers and society as a whole."
- Commentary article by:*  
 William Lockeretz  
 Tufts University.  
 Reprinted with permission from the *American Journal of Alternative Agriculture* 3(4):174-181. 1988.





***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter IV***

***Introduction***

**Importance of Ecology and  
Natural Systems**

A unique expression of the human condition is the ability to reflect, and to write, about our relationship with the rest of the natural world. But it is hubris to state that we hold *Earth in the Balance*. This planet has survived the appearances and extinctions of countless species before humanity appeared, and will no doubt survive many more, even after we are gone. Yes, we are a presumptuous species who can, fortunately, write books of this genre that are important to an understanding of sustainable agriculture.

In *Earth in the Balance: Ecology and the Human Spirit* (1992), Vice President Al Gore (then a U.S. senator) provides an articulate and compelling commentary on his observations, made during numerous international trips across several continents, of the interface between humans and nature. He gives countless examples of the depredations that occur from overcrowded conditions and exorbitant natural resource toll extracted on the landscape. In addition to documenting the history of this exploitation, Gore brings us up to date on the current population crisis (as of 1992) and provides an agenda for a Global Marshall Plan to meet the food and economic development needs of other countries.

Two additional historical statements on the relationships between agriculture and ecology are *An Ecological History of Agriculture* (1992) by Daniel Vasey and *Earth* (1990) by Wayne Pritchard and Wallace Akin. The first draws from the historical record about the rise and fall of several civilizations, and how closely their collapses were linked to their failures in managing natural resources and food production. Vasey draws our attention to the impacts and complications of viewing agriculture as a series of disconnected components, and how the rise of industrial agriculture based on the work of 'agricultural chemists' gave us an in-depth understanding of physical elements of the system but limited perspective on its overall health. In the second, a revised version of *Earth* gives the lay person a valuable description of the importance of stewardship and the finite limits of natural resource availability to meet human demands. Pritchard and Akin appeal to the feeling side of our being, providing information to arouse the emotions toward a conservation ethic, underscoring the need for people to take responsibility for the long-term care of natural resources.

Many of us in agriculture would be hesitant to pick up a book by a landscape architect or planner, yet the loss would be ours if we ignored *Gray World, Green Heart: Technology, Nature, and the Sustainable Landscape* (1994). Robert Thayer, Jr. draws from his rich experience in design and planning to describe the excesses of human behavior and how this affects the land. He paints a lurid

picture of a suburbia dedicated to the automobile and its temporary storage, as well as paving its access ways to our places of work and play. Thayer portrays our guilt about technology with the irony of underground telephone and power lines, green covers over air conditioners, and fenced enclosures to hide garbage cans. Both our love of technology and the guilt that it generates are embodied in his description of America as one large 'technological theme park.' The book concludes with an optimistic if unlikely projection of how Yolo County could appear in three decades if current California development strategies were modified to be more friendly to the environment.

It is hard to believe that a compendium of 100 book reviews could possibly attract and hold a reader's interest. This was one editor's experience (Francis) with Stephanie Mills' *In Praise of Nature* (1990) while on a cross country trip a few years ago. The same growth of interest and publications that fostered our idea for the current volume on sustainable agriculture is but a small tremor in comparison to the Pacific Rim scale explosion of literature about ecology and the environment. Mills' book taps into several classics, while concentrating on recent offerings in food and sustainability, agriculture, and rational use of natural resources. A creative organization of the book according to Native American tradition in sections labeled Earth, Air, Fire, Water, and Spirit provides a unique roadmap and route rarely taken into the literature in this vital landscape.

Embraced as a set of resources, these four books and one review (Mills) provide an unusually rich perspective on the current understanding of how ecology and natural systems relate to agriculture. It is a perspective that has been too long in arriving to join the mainstream of agriculture, and one that is only now beginning to spill over the sandbags that protect a channelized industry that depends intimately on the health of the natural as well as the inhabited ecosystem. We would be well advised to incorporate one or more of these books into the general background reading for our courses in Agronomy, Animal Science, Agricultural Economics, and other discipline-specific areas of study. There is a glaring need for the holistic perspective, and books relating ecology and natural systems to agriculture provide that insight.

**Charles Francis and Gabriel Hegyes**



## **Earth in the Balance: Ecology and the Human Spirit**

Al Gore, 1992

Houghton Mifflin Co., One Beacon St., Boston, MA 02108. 407 p, cloth \$22.95

How can we rationalize cutting down enough trees to produce yet another book on global warming, deforestation, and the environment? Such a book would have to be special. Written from the unique perspective of a U.S. Senator and former Representative to Congress, *Earth in the Balance* justifies the investment. This is a thoughtful and comprehensive treatment of our most pressing global problems. A former journalist himself, Al Gore brings a direct and articulate writing style that covers large topics with ease and efficiency. Unlike most books written by scientists, it makes compelling reading.

Gore begins with the predictable but still shocking examples of an Aral Sea shoreline that is 40 km from where the fishing boats are grounded; a mysterious and still unexplained death of 12,000 seals whose lifeless bodies washed ashore in the North Sea; and a 600% increase in the chlorine content of the atmosphere over the last four decades. Although cause and effect are not always apparent, increase in human population and demand for resources are at the core of the challenge.

In Chapter 2, "The Shadow Our Future Throws," Gore exhorts us that "the choice to do nothing in response to mounting evidence is actually a choice to continue and even accelerate the reckless environmental destruction that is creating the catastrophe at hand." He continues with a description of a scientific method that offers a single dimensional approach, a quest for certainty that will not serve us well in the current race against time toward understanding and reversing the environmental impact of a growing human population. He describes ecological systems that are highly interdependent, functioning with a series of feedback loops; simple rules of linear cause and effect don't easily explain the consequences of our actions in the total ecosystem.

"Climate and Civilization: A Short History" relates many of the major changes in human societies to

natural events and climate catastrophes. Gore describes how many of the principal migrations of peoples, the rise and fall of numerous civilizations, were in fact the consequences of ice ages, major volcanos and other dynamic natural events. This discussion is a new look at history, one that most of us missed in the usual treatment of the movement of peoples and changes in places over the centuries. The purpose of presenting such a perspective on history, along with the following chapters on air and water quality, on the fragile crust of the Earth, on the loss of genetic diversity, and on the accumulation of solid waste, is to focus attention on current human population pressures and their impacts on the environment. Further, Gore uses this approach to emphasize the immediate need for a massive global mobilization of resources and the resolve to make the changes necessary for survival. Mr. Gore proposes a type of *Global Marshall Plan* that would bring resources from Developed Countries to bear on the needs for food and economic development for the rest of the world. The elements include:

1. Stabilizing world population
2. Creating and developing environmentally appropriate technologies
3. Creating a new *economics* that measures the impacts of our decisions on the environment
4. Developing new treaties and agreements for regulating, planning, and enforcing needed changes
5. Establishing goals and setting directions toward sustainable development, especially in the Third World

At this point the author is focused primarily on problems in the Developing World, and appears to ignore the disproportionate consumption of energy and other resources by people in the Industrialized World. Nevertheless, the concept of a massive Marshall Plan for the coming century is a creative



and important advance that could bring together peoples from most countries to solve global challenges.

The perspective presented in *Earth in the Balance* is one that would be useful as a component of our introductory courses in agronomy and natural resources. The chapter titled "Climate and Civilization" would be valuable reading as an introduction to this global focus. The conclusions that Mr. Gore reaches could be seen as guidelines for how nations should work together toward a common goal. This is a well conceived and

thoughtfully written call to action. In his current political position as U.S. Vice President, the author has an opportunity to make some of these changes happen.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln.*

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## **An Ecological History of Agriculture: 10,000 B.C. to A.D. 10,000**

Daniel E. Vasey, 1992

Iowa State University Press, Ames, IA 50011. 363 p, cloth \$36.95

“Agriculture and society have evolved on a path that can be neatly summarized.... The first farmers depended upon knowledge of nature accumulated by their ancestors, thousands of generations of collectors of wild foods. That knowledge fed them and formed the base on which agricultural knowledge would be built. Agriculture still builds upon accumulated knowledge, now that of scientists as well as farmers, and present knowledge still feeds the innovators of future technology.” Important to Vasey’s historical discussion is that agriculture as the management of crops, animals, and ecosystems is governed by the same biological laws as those that act in natural ecosystems. These laws can be manipulated to help us meet our food production goals, but they remain laws that we cannot change. He describes the properties of systems that affect their function and stability, boundaries within which most energy and physical/biological elements exchange, and the imperfect process of energy capture. An intriguing hypothesis is Vasey’s contention that despite the cumulative nature of information and technology, knowledge may be lost due to colonization, collapse of a culture, or massive adoption of a specific modern farming system; the slash and burn farmer in the tropics may have as much or more knowledge as the U.S. corn belt entrepreneur, but it is different knowledge and specific to a different context.

Vasey introduces the ecological factors and interactions that provide the basis for agroecosystem function. Trophic levels through which energy passes and biomass is converted are intimately connected. Likewise the elementary requirements of primary producers and humans are summarized, providing the biological basis on which to explore agriculture and how it evolved. The evidence for the roots of agriculture described in Chapter 2 includes the regular burning of forests in Taiwan (12,000

B.C.), semidomestication of plants in Thailand (7,000 B.C.), and drainage and construction of raised beds in Papua New Guinea (4,000 B.C.). Domestication and diffusion of early crop varieties are often given as clear evidence of agriculture, as people and their crops and animals co-evolved in a gradually changing environment. One can conclude from the author’s discussion of origins that our rather arbitrary fixing of agriculture as 10,000 years old does not come close to capturing the diversity of known information and the discontinuous process by which cultivation of crops and animal raising in fact occurred.

Preindustrial agriculture is described as a series of steps of increasing intensity of land and resource use. The forest fallow system has one-two years of cultivation alternating with 20-25 years of secondary forest regeneration, with few inputs used during the cropping phase. Increasing population pressure has led to shorter fallow periods, more permanent cultivation, and complex intercropping systems. Irrigation was also practiced in a few favored areas. Pastoralism as practiced in grasslands and open woodlands is described as a system that increasingly interacts with agricultural activities in more sedentary societies.

How unique systems evolved that were unique to rainfall and latitude is explored in detail for the tropics (Chapter 5), dry lands with seasonal rainfall pattern (Chapter 6), and humid temperate regions (Chapter 7).

The critical interactions of a growing population and its demands on the ecosystem are described from both conflicting and complementary points of view and opinions: homeostasis; Malthusian population increase up to resource limits; and elasticity of systems and use of technology. What is certain is a complex series of relationships among human population, natural resource use, and the growth of

agriculture. In the chapters leading up to industrialization, Vasey's approach is chronological, comprehensive, and well referenced. The treatment does appear disjointed and irregular at times, however, and leaves the reader somewhat confused. Perhaps this disorder represents our understanding of preindustrial agriculture?

In Chapters 9-11, Vasey describes the process of industrial agriculture development from the early steps in growing productivity to the introduction of science and industry in the 19th Century. He outlines the contributions of chemistry and soil science, the role of "agricultural chemists" in the mid part of that century. Vasey is rightfully skeptical about the capacity of most soil scientists, even to the present day, to adequately define and manage soil health. An all too brief section outlines the emergence of chemical plant protection, and an awakening of interest in biological control as resistance to chemicals was recognized. More attention is given to the course or development of plant breeding. The discussion brings us up to date with current fertilizer use, mechanization, integrated pest management, and finally an overview of alternative agriculture. Social

consequences of the introduction of technological agriculture, including the widely discussed green revolution, receive proper attention in the chapter. There is strong social commentary about the concentration of land resources, but less emphasis on the ecological implications of development. In a final chapter, Vasey compares alternative energy paths and projections of human population for the future. These are discussions that appear in many places, and the book adds little to our understanding of the future. The current systems and future projections discussions also have minimal treatment of the ecological implications of various options. The primary value of Vasey's book is in the historical roots of agriculture and his discussion of ecological dimensions of early food production systems. The early history sections are well referenced. The discussion of present and future systems is less rigorous, but the book is valuable for its historical perspective and attempt to link ecology and agriculture.

*Reviewed by:*

*Charles Francis  
University of Nebraska, Lincoln, NE*



***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

## **Earth**

Revised by H. Wayne Pritchard and Wallace E. Akin, 1990  
University of Oklahoma Press, 1005 Asp Ave., Norman, OK 73019. 308 p, paper \$14.95

*Earth* is a book first written in 1962. It has been recently revised to bring issues such as acid rain, disposal of wastes, and the world food problem into the discussion of stewardship of the planet. The classification of soils according to *Soil Taxonomy* has also been partly updated. The intent of the book is to provide information about our planet so that the conservation (soil-land) stewardship concept may be emphasized. It is a book written in layman's terms, but that describes very well the finite limits of our planet and the damage (existing, current, and potential) the activities of our species have inflicted on it. From this, it is presumed the layman will be more aware of hazards, hence more willing to support, both financially and morally, the efforts in soil and water conservation, and in other environmental issues.

The book is divided into 14 chapters. These chapters have prophetic names—perhaps even poetic names such as “The Soil Beneath Our Feet,” “A Blade of Grass,” “The Soil in Man,” “The Breath of Life.” Each chapter has beneath its title a quote from the Judeo-Christian tradition (Psalms, the book of Genesis) or from writers such as Pearl Buck, John Milton, or Ralph Waldo Emerson. “The Earth is the Lord's and the fullness thereof; the world and they that dwell therein,” sets the stage for the Preface. The final chapter, “Land, Food, and People,” begins with a quote from James Norman Hall, “The thing that numbs the earth is this / That man cannot devise / Some scheme of life to banish fear / That lurks in most men's eyes / Fear of lack of shelter, food and fire for winters cold, / Fear of the children's lacking these, / This in a world so old.”

Within the chapters of the book are included many bits of information, usually called *facts*, that describe the various situations suggested by the chapters. For example, in “Planet Earth” a discourse on the universe, its age, the great distances, and a suggestion of its future, places the Earth in the

context of the rest of the planets, suns, and galaxies. Another example in “The Man With The Plow” is a map of the USA that shows the vast extent of damage from wind and water erosion. Various dates of significant legislation favoring conservation are included, as are averages within projects such as the Small Watershed Program. In the chapter “The Land on Which We Live,” it is pointed out that the FAO has accounted for 33,000 million acres on earth (a figure I had not seen before). Of this area, 3000 million acres are suited for “cropland”; 5300 million acres are in meadow or pasture; 8700 million acres are in forests and woodland; 1000 million acres are termed unused; and 15000 million acres are “waste or built over land.” There is no way for the reader to verify these quantities because the sources are “selected readings” and are not referenced in the text.

But then it's not that kind of book. Its style is to attend more to the “feeling” side of the land ethic than to the rational side. It is very well written for this purpose. Few scientific articles or memos from the national SCS office ever garner much “emotional” support from the public (or from those working in conservation for that matter). This book is able to touch that side of thinking, and for those who do most of their “thinking” through “feeling” this book should have great appeal if they're looking for information to support their ideas about the conservation ethics, land stewardship, and our responsibility for the quality of our own environment.

If *Earth* were to be an appropriate text, I think it would be for a course in the social sciences rather than in earth science. We are developing a course that will be entitled *Earth in Crisis*, or something to that effect. Topics will in part at least be selected from the Worldwatch Report. There is much of what we might aim at with that course in this book. In the part of *Earth in Crisis* that I teach, I plan to

use the book, at least for now, as a recommended reading.

In summary, if a book that uses poetic phrases such as, "...but death was the inhibiting factor," or "...In this struggle for existence," and starts its chapters with phrases like "and God said: Let the waters under the heavens be gathered together in one place, and let the dry land appear. And so it was." is useful to you, this is a very useful book. I would not use it

as a book to support rational application of the scientific method.

*Reviewed by:*

*David T. Lewis*

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*Reprinted with permission from the Journal of Agricultural Education. 19:228-229. 1990.*



## **Gray World, Green Heart: Technology, Nature, and the Sustainable Landscape**

Robert L. Thayer, Jr. 1994

John Wiley & Sons, 605 Third St, New York 10158. New York. 352 p, cloth \$44.95

Professor Thayer has produced a book about ordinary people and what they see in their landscapes. In *Gray World, Green Heart*, he describes “their love of nature and land, their hopes, dreams, frustrations, actions and reactions to technology as it molds and influences their personal, tangible worlds.... It is about the opposition between nature and technology in our everyday lives and surroundings, and the increasing uneasiness with which we confront this opposition.” He has created a masterpiece in contrast, and one we should read as we commit resources for construction and our own short-term creature comforts and enjoyment.

It is the best of times and the worst of times, as we confront the challenge of applying new technologies to meet human wants and needs. Robert Thayer illustrates one current extreme with the hyperreality of the Mirage Hotel Casino volcano in Las Vegas, an active mountain with a two-minute explosive cycle each 15 minutes from dark until 1:00 a.m.: “a spray plume enlarges ... and is accompanied by brilliant flares of natural gas, ... eventually engulfing the entire mountain top, ... climaxing in stabbing ridges of flame which emerge from the shallow water pond as if fissures or shafts of molten rock.... It is all over in two minutes.” Is this entertainment sustainable, or even necessary? One must question if the world is a better place for the use of this technology?

In contrast, the new Arcata Marsh in Northern California incorporates the latest in waste engineering in a combined wastewater treatment wetland, ponds for wildlife, and aquaculture. In this process, “waste enters the facility, ... solids are eliminated and the wastewater is clarified, ... chlorinated, dechlorinated, and fed through a succession of bulrush ponds into the secondary oxidizing lagoons, after which it passes into an additional set of ponds and wildlife enhancement

marshes which fix much of the nitrogen in the food chains of typical bay marsh ecosystems.... Tertiary water passes through an additional set of ponds and is mixed with sea water, in which silver salmon, cutthroat trout, and sturgeon are raised.” Here is an application of technology that solves a current human dilemma, enhances the environment, and produces food. We visited this site in summer 1995, and it is truly a model for the future.

Typical of Thayer's approach to looking at today's human attempts to modify the landscape, this comparison is described in an articulate and meaningful way. “The Arcata marsh offers a starkly contrasting alternative to places like the Mirage Volcano. The marsh is a manifestation of technology where a symbiotic process, carefully developed out of concern for the larger natural community of birds, fish, microorganisms, and humans sets a conspicuous and sustainable example for community development. It brings the essential human/nature/technology interaction to the visible surface, manipulating it in such a way that waste becomes natural resource. Salmon, trout and waterfowl thrive in a wetland environment where [human] residents jog, watch birds, or picnic.”

In early chapters, Thayer briefly outlines a history of human interaction with land and environment, and the increasing distance we have established from the natural world. Our love of technology is illustrated by “residential landscapes [that] are dominated by driveway and garage,” and streets to provide automobile access to dwellings and communities. We place a green facade over this urban landscape, and hidden behind is a complex technological support system full of gadgets and requiring vast amounts of fossil fuels to sustain. At the same time our guilt about technology is illustrated by covers over air conditioners,

underground power and telephone lines, and enclosures for garbage cans.

Once adopted, technologies can influence our life directions, and some decisions seem irreversible. The products we own define who we are; we become what we own. And Thayer points out that our ability to invent new gadgets and technologies far exceeds our ability to evaluate the impacts of these advances. He describes a number of cases where the philosophical dilemmas of love of technology and guilt about its consequences come to the fore. At one point, America [the U.S.] is described as a "technological theme park." Thayer's description of U.S. personal belongings brings to mind the recent Sierra Club book, *Material World*, a photographic and tabular comparison of U.S. families with those of other countries.

In the last section of *Gray World, Green Heart*, Thayer describes the potentials of sustainable landscapes as solutions to these dilemmas. The sustainable landscape is defined as "a physical place where human communities, resource uses, and the carrying capacity of surrounding ecosystems can all be perpetually maintained." He outlines the components of such systems, with reduced rates of consumption, closing of resource loops, and efficient recycling of all possible resources. He talks about the connectedness of elements in natural systems, and the potentials to tap into these principles in design of human systems in agriculture, construction, water use, and

wastewater treatment. The examples take into account the need for maintaining habitats large enough for other species, and the landscape linkages needed to connect them. A concluding essay describing a model small city [Davis, CA] in the year 2030 provides a visionary view of a future that could be created, if we were to make that choice and had the collective will to achieve such an objective.

*Gray World, Green Heart* is a book about sustainable landscapes. It is also a treatise on human behavior and perceived needs, and the impacts of this behavior on the natural ecosystem. There is a message about future society, and about the choices we need to make. For thoughtful students of agriculture, of communities, of rural planning, and of the human interface with natural ecosystems, this is a stimulating book. It would be highly useful for undergraduates as a mind-expanding resource, and one that would stimulate hours of classroom discussion. I highly recommend it for an insightful look at alternative futures, those that we create with our decisions today.

*Reviewed by:*

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*Reprinted with permission from the American Journal of Alternative Agriculture 11(1):48. 1996.*



**FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture**

## **In Praise of Nature**

Stephanie Mills, Editor, 1990

Island Press, 1718 Connecticut Avenue NW, Suite 300, Washington, DC 20009.

255 p, paper \$14.00

From Earth Day in 1970 to its recent 20th anniversary, a remarkable transformation has occurred. Due in part to growing awareness of the ecological impact of human activities on the environment, this transformation has permeated our thinking about development, about global political differences, and about the role of humans in charting their own path in the broad scheme of things. Some people now challenge whether this human role is unique.

Nowhere is the transformation more powerful than in the recent literature on ecology. A virtual explosion of new printed material related to pollution, resource scarcity, global warming, and other impacts of human and other factors on the environment threatens to use up the same trees that these books attempt to save. Yet there is a clear message to those who insist on pursuing the domination of our natural environment — in agriculture, industry, recreation. *Nature will survive, but we may not!* And there's an urgent message to those in education: agriculture is key to human survival, and our industry is closely linked to the health of the environment! How can we confront, sort out, and use this complex new information resource?

Stephanie Mills has provided a unique and valuable road map in her recent book, *In Praise of Nature*. Although several of her own essays are included, the majority of pages are dedicated to thoughtful reviews and excerpts from about 100 books, both historical and current. She contributes a few of the reviews, but most come from more than 50 other knowledgeable people who are themselves actively involved in building the literature and the educational foundation of a more sustainable agriculture and society. Reviews are short, from one to several pages, but they capture the essence of each book and provide an enticing invitation to rush

to the library to see how this information will fit into a lecture, a course, and a curriculum.

The books reviewed are not all recent. There is a small but important historical base that goes back to Chinese philosophers, and to early environmentalists such as Thoreau, Muir, and Leopold. There are references to agriculture that include Fukuoka, Jackson, and Rodale. Issues that relate to food and sustainability include books by Carson, Ehrlich, and Schumacher. But the primary strength of this review is the collection of recent literature and new thinking about the environment and how it relates to agriculture, food, and survival.

*In Praise of Nature* is organized according to the Native American tradition of viewing the elements of life on this planet: earth, air, fire, water, and spirit. Reviews of individual books are given in a relatively coherent sequence within these five topics, accepting the fact that interactions are critical, and that no book really fits entirely under a single category. There is a literary sense to this book that makes it exciting to read. At the same time, the book represents an opening of the blinds on a window that we in agriculture recognize, but seldom peer through. *In Praise* shows us a new range of resources perhaps not normally considered relevant to agriculture. This is best illustrated by the short descriptions of book sections found in the prologue, and the range of titles that each includes:

*Earth*. "...the seemingly passive but actually living soil, which tendered correctly, can foster the life contained in a tiny seed and husband the rain."

There is focus on the dynamism, the transformations, and the diversity that occurs on the face of the planet. We find reviews of *Permaculture* (Bill Mollison), *New Roots for Agriculture* (Wes Jackson), food system books (Francis Moore Lappe and John Robbins), *Biodiversity* (Ed Wilson), and *State of the World* (Lester Brown and colleagues).



This long section is perhaps the most readily and apparently applicable to our teaching in agriculture.

*Air.* "...the trembling of leaves, rippling of grasses, the tracks left by the invisible winds sweeping the Earth in great gyres, ushering the weather." There is an obvious concern in the media that reflects scientists' data on global climate change. What happens with temperature and rainfall will have strong impact on agriculture. In addition to *Global Warming* (Stephan Schneider), there is reference to *The End of Nature* (Bill McKibben), in which the author not only outlines current problems but a series of positive solutions. The section explores *Gaia* (James Lovelock), a hypothesis that the planet is really one large interacting organism.

*Fire.* "...the fascination of flame leaping gold and blue from chinks of wood as they blacken, vermillion to sere ash, warming cold wet bodies with their sacrifice." The impact of fire on traditional slash and burn agriculture is more critical than in our conventional cropping systems, although range management does employ or encourage the practice of controlled burning for rejuvenation. *The Forest and the Trees* (Gordon Robinson) is followed by writings of Amory Lovins and Peter Berg, among others, in this brief section.

*Water.* "...the color that is no color and sounds that are sublime of living water coursing downhill or jetting up from within the Earth to be tasted pure from a dipper at a spring." The section on water tells the story of the West (*Cadillac Desert*, Marc Reisner) as well as the story of the Great Lakes and other essential waterways. There are books on water quality, recycling, and waste management, plus such classics as *The Sea Around Us* and *Silent Spring* (Rachel Carson). This part of the book is perhaps the most disappointing from the agricultural point of view, as there are many books not included that describe the impacts of too much water or the lack of it on the current productive capacity of our farm land.

*Spirit.* "...the marvels of spirit, of loving acts, and giving; of mutuality and imagination— not just the traits of the human species, but of sperm whales buoying up a wounded sister, of bees fanning the hive." There are descriptions of indigenous cultures around the world, and how they approach the

environment and resources. In addition to reviews of classical U.S. environmental literature (Thoreau, Muir, Leopold), there are widely respected books such as *Small is Beautiful: Economics as if People Mattered* (E.F. Schumacher) and *Our Common Future* (World Commission on Environment and Development). There is a brief review of *Ecotopia* books by Ernest Callenbach. The human dimension, including criteria used for decision making, does not form a large part of our educational strategy. There are resources in the book that could help us broaden our perspective.

Through the medium of a review, and with the contributions of many others, Stephanie Mills has given us one clear and readable introduction to the past and current thinking about where we are and where we are headed. Although the organization into five sections appears somewhat forced at times, especially due to the complexity of interactions among these elements, she gives us pause to think about how they fit together. Mills provides a brief but enticing look in new directions—the Gaia theory, an introduction to ecophilosophy, to deep ecology, and to other themes that on occasion pass by our consciousness without making an impact. These are relevant to agriculture! We need to know what others are thinking, and to let others know what we are doing in the practical fields of agronomy, animal science, plant protection, economics, and other related fields. This book will stimulate the process of exchange of ideas.

There are many people thinking about resources, the environment, and agriculture. This book provides a clear window on much of the recent literature that is relevant to the future of our industry, and a map to guide us through some new territory that is important to education. We are well advised to take time to stroll through the pages of *In Praise of Nature*.

*Reviewed by:*

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***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter V***

***Introduction***

**Economic and Social Dimensions  
of Sustainability**

*"In any case, there is something wrong with making the survival of the fittest a guiding principle of civilized society. The main point [about laissez-faire capitalism] is that cooperation is as much a part of the system as competition, and the slogan "survival of the fittest" distorts this fact."*

*George Soros*

One clear distinction between sustainable agriculture and that practiced more conventionally is the explicit recognition of the ecological, community, and other social dimensions that are as intertwined with the farming environment as economics. In other words, sustainable agriculture rejects the supremacy of the Industrial Revolutionary model that has dominated conventional "scientific agriculture": that of *Homo economicus*, the solitary, grasping economic being. This description of the primal drive — self-interested acquisition within the marketplace — came from Adam Smith when he described the economic sea changes occurring in English economic life due to mass production, global trade, and concentration of wealth. This increase in power, as well as the speed of change, in industry, finance, technology, and war first garbled Smith's moral underpinnings with cruelly self-serving Social Darwinian banalities, then drowned out the quieter influences of community, faith, and tradition to make *Homo economicus*, for too many people, the only legitimate characterization of human behavior.

Although we have seen other motives for behavior in the books reviewed in previous sections — books on history, agroecology, sustainable systems and landscapes — it is in this chapter that the reader can explore the unique ideas brought together by economists and sociologists as they relate to building a viable food system. Finally, the works reviewed here make the argument loud and clear that simplistic, linear economic thought, devoid of the rich context of ecology and culture, conceptually bends the human line toward a potentially ruinous direction.

Since the publication of *Small is Beautiful* by E.F. Schumacher in 1972 (not reviewed here) there has been a small but growing cadre of thoughtful agricultural economists and development specialists who challenge the prevailing paradigm of economic growth. It is not unusual today to encounter the challenge, "Is sustainable growth an oxymoron?" We read of qualitative rather than quantitative growth, especially in the writings about an emerging 'post-industrial' economy era. In this spirit, we present a series of reviews on books about ecological or alternative economics. The reader who has skipped to this section is

urged to read the appropriate chapters in *Alternative Agriculture* (1988) for another comprehensive treatment of the economics of non-conventional systems.

*Ecological Economics: The Science and Management of Sustainability* (1991) is a collection of chapters that describes the merger of economics and ecology, an apparently unlikely marriage until we learn that a large issue is the search for a common currency. The new International Society for Ecological Economics in fact is looking for ways to rationalize the short-term goals and measurable gains that characterize conventional economics with the long-term objectives and a different view of our natural resource base. Several authors identify a legitimate concern about the inability of current theory and practice in agricultural and development economics to deal with long-term valuation of resources.

Well-known as critics of current economic thinking, Herman Daly and John Cobb, Jr. summarize their prior writings in *For The Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future* (1989). Although they agree that competitive markets and self-interest provide an efficient allocation of resources in the short term, it is obvious that the depletion caused can result in a foreclosing on the future. Daly and Cobb urge us to think more broadly about community and the common good, and present a series of policy options. In this same vein, Paul Hawken's *The Ecology of Commerce: A Declaration of Sustainability* (1993) provides an ecological analysis of business, and a future vision of how business can prosper if it moves ahead with an environmental perspective. Herman Daly's *Beyond Growth: The Economics of Sustainable Development* (1996) is focused on the environmental and social consequences of growth.

Additional community and social dimensions of agriculture and the food system are explored by Patricia Allen and colleagues (*Food for the Future*, 1993), Don Albrecht and Steve Murdock (*The Sociology of Agriculture*, 1990), and Elizabeth Bird and others (*Planting the Future*, 1995). The social implications of different farming systems — including such factors as size of farms, intensity of purchased input use, and location of markets — are enormous for both families in farming and the communities with which they interact and participate. Much of the decline of rural communities is due to the inevitable loss of people, institutions, and services with the consolidation of farms into ever larger units. Purchase of inputs from distant suppliers, and sale of low-value commodities to distant buyers further accelerated the loss of economic and social capital from these towns. Adopting the viewpoint that people involved in agriculture come first, as compared to policies and decisions that promote a cheap food system for urban residents, several of these authors address the success and quality of life for those on the farm and those in small rural communities. Such evaluation has been a part of the literature for decades, but it is only now beginning to reach those in the mainstream who can make decisions that can make a difference.

A refreshing and holistic look at the economics of whole farms is found in *Family Farming* (1988) by Marty Strange of the Center for Rural Affairs. He provides an alternative view of people's goals, and how both farm decisions and national policy can be designed to help them meet those goals.

The over-riding impacts of agriculture and food policy are woven into the descriptions of specific production practices in *Regenerating Agriculture: Policies and Practice for Sustainability and Self-Reliance*. In this well referenced and clearly written book, Jules Pretty provides numerous examples that underline the reality of national agricultural policy as a key determinant of success in the food system. We need to go beyond reducing tillage or pesticide application to truly modify our food systems in order to provide nourishment for a growing global population. Some of the answers will be found in the context of current systems.

*Putting People First: Sociological Variables in Rural Development* (1991) moves the focus from income, jobs, and infrastructure to create an understanding of the social organization, the cultural context, of projects and the people they involve. From a 1993 workshop in Nairobi, a perspective of development from the bottom up is found in *Social Aspects of Sustainable Dryland Management* (1995), a summary of development efforts in these most difficult regions for agriculture. Rural quality of life also involves farmer and family health; *Agricultural Health and Safety* (1995) looks at how economics, environment, and family issues are integrated into plans for a sustainable agricultural system.

In *Ecological Literacy* (1992), David Orr urges us to examine current crises of energy, water, wastes, and other excesses of today's society within the perspective of a crisis of human values. Only by reestablishing our own connections with the land and the marvelous complexity of the natural ecosystem can we hope to understand the over-riding importance of connections of food production decisions with their impact on the environment. Wes Jackson in *Becoming Native to This Place* (1994) further exhorts us to return to our roots, in more ways than just moving to a suburban house with a bluegrass lawn that happens to be near where we were born. He, too, describes the disconnect between humans and their food supply, between people and the natural environment, between an organism that has been yanked from the soil and the nourishment that the living earth can provide. These books describe a crisis of conscience, a separation of people from biological reality, but offer a path that we can pursue to reestablish the vital connection between humans and the ecosystem that supports them. The adventure along this path is yours.

**Charles Francis and Gabriel Hegyes**





## **Ecological Economics: The Science and Management of Sustainability**

Robert Costanza, Editor, 1991

Columbia University Press, 562 W 113 St., New York 10025. 525 p, cloth \$50.00

From our perspective, *Ecological Economics* describes the new transdisciplinary field that merges economic and environmental concerns into the same analytical realm in which the primary search is for a common currency. The book results from a workshop (24-26 May 1990) following the first bi-annual conference of the International Society for Ecological Economics (21-23 May 1990), with the theme: "The Ecological Economics of Sustainability: Making Local and Short-term Goals Consistent with Global and Long-Term Goals." The 42 authors of the 32 chapters describe, using various styles and approaches, the fundamental efforts to merge economic and ecological training and (hopefully) eventual decision making across local, regional, and global scales to breed management for sustainability. The authors emphasize problem solving across multiple scales by choosing the appropriate tools rather than forcing problems to fit tools mastered by practitioners of only one discipline. The book is intended as (i) a research agenda and policy recommendation; (ii) a textbook for graduate courses; and (iii) an academic text for researchers in many related disciplines.

The book is divided into three parts. Part 1 is a paradigm overview that describes in detail ecological economics and how it differs from both conventional economics and conventional ecology. Part 2 sketches models and analytical techniques involving such methods as incorporating natural capital and services into national income accounting. Part 3 offers specific suggestions for institutional changes necessary to implement management for sustainability and presents several case studies from the perspective of ecological economics.

The introductory chapter, "Goals, agenda and policy recommendations for ecological economics," attempts to present a consensus of the workshop. It defines the new discipline—Ecological Economics—and summarizes how it differs from "conventional approaches" in both

text and in a full-page table that compares "conventional" economics and ecology with the new Ecological Economics for eight categories. The text goes on to lay out a research agenda for achieving sustainability, giving background justification, then listing researchable questions in five major areas. These topics include the determination of the nature of sustainability; valuation of ecosystem services and natural capital; ecological economic system accounting; ecological economic modeling at local, regional, and global scales; and the study of innovative instruments for environmental management. Finally, the authors end with policy recommendations "as a starting point for further discussion."

Part 1, Chapters 2 through 19, starts with the question of whether the human species can learn sustainability and spread it to more than a small fraction of the global population. Conventional macroeconomics is described as lacking the vision necessary for innovative analysis: "True to the preanalytic vision the aggregate production is written as  $Y = f(K,L)$ , i.e., output is a function of capital and labor stocks. Resource flows (R) do not even enter!" When an economic system is viewed properly as an open subsystem of a closed finite total system, the question of optimal scale of the subsystem becomes inescapable. Chapter 4 presents paramount positions to guide ecological economics, offering "a concise roster of the default positions that should guide a truly ecological economics." Chapter 6 revisits the notion of positive feedback and the need to manage market forces to protect natural resources in the face of the demand for increasing returns. Chapters 7, 8, and 9 speak to the rights of future generations, ecosystem health, and ecological awareness, respectively. Chapters 10 and 11 discuss dealing with uncertainty in the decision making process. Chapter 10 presents a new scientific methodology for dealing with global environmental issues in the face of such uncertainty.

and 11 discuss dealing with uncertainty in the decision making process. Chapter 10 presents a new scientific methodology for dealing with global environmental issues in the face of such uncertainty. This "Second Order Science" is described as a democratization of science that promotes the inclusion of lay persons (activists, lawyers, legislators, and journalists) in the debate of environmental issues.

The modeling section, Part 2, first describes the environment as capital, and the need to include environmental degradation into national accounting (returning to the idea of sustainable economic welfare), and this theme is carried through Chapter 15. Chapters 16 and 17 then discuss the accounting of material flows through ecosystems and the notion of contributory values. Chapter 18 presents an economic-ecological model for analysis of regional development processes and resource consumption. Part 2 concludes with Chapter 19, which views resource scarcity and economic growth from a biophysical perspective.

Part 3 explores the myriad of institutional changes and economic strategies that might be implemented to ensure ecological sustainability. They discuss technical tools such as global ecological economic modeling and policy tools such as taxes, licenses, and other incentives to ensure sustainability and maintenance of environmental capital for future generations. After explaining how to educate for ecological economic awareness, they present various case studies of how sustainability was or was not achieved due to historical events. Of particular interest was Chapter 28, "Ecological Engineering: Approaches to Sustainability and Biodiversity in the U.S. and China," which presents mini-case studies and a comparison of the 30-year-old U.S. ecological engineering efforts with the 3000-year-old Chinese history. Chinese systems are described as having high species diversity—many more niches filled—due to the continuous

management made possible with a low cost of labor. "If one difference can be stated, Chinese use space (solar-based systems) for ecological engineering systems with time at less of a premium (labor is relatively inexpensive and information has a long residence time); Westerners maximize the use of time (labor costs are high and information is abundant and decays rapidly), with space at less of a premium. Our theories on ecological engineering will be truly general if they span this wide cultural difference."

In summary, this book represents another passenger on the "sustainability train" headed to pick up grant money. Due to its workshop origin, the book lacks immediate congruency. There appears, however, to be a problem-solving orientation in the writings of most contributors. This book should be interesting to all those curious about the interaction between ecology and economics, whether they be policy makers, researchers, or students. While the authors neither specifically mention nor exclude those who research food production (such as agronomists, horticulturists) in their plan, don't be surprised if agronomists at least mildly dispute the sustainability agenda proposed by these authors. Perhaps agronomists and others are alluded to under the ecology umbrella described by the authors, but the book fails to give much ink to the concept that food producers and the associated agro-ecosystem might be important to sustainability of the planet.

*Reviewed by:*

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## **For the Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future**

Herman E. Daly and John B. Cobb, Jr., 1989  
Beacon Press, Boston, MA. 534 p, paper \$18.00

Daly and Cobb call for a rethinking of economics on the basis of a new concept for *Homo economicus*, economic man, as a person-in-community rather than a person solely of self-interest. They point to “wild facts,” such as a growing hole the earth’s protective ozone shield, rising carbon dioxide levels in the atmosphere, and declining biological diversity as clear evidence of “one central underlying fact: the scale of human activity relative to the biosphere has grown too large.” As currently conceived, *Homo economicus* is not a sustainable species.

As the authors point out, in classical economic theory individuals are assumed to act so as to optimize their self-interest. This assumption is clearly validated in market transactions and in many other areas of life. However, other-regarding behaviors, such as those directed specifically to serve the common good, are labeled as “irrational.” Markets are considered to be the most efficient means of allocating use of scarce resources among competing ends—the fundamental purpose of economic activity. Acts based solely on self-interests are translated into outcomes for common good as if by an “invisible hand.” Instances of “market failure,” such as environmental externalities, are treated as exceptions to the general rule of market-based efficiency.

The authors concur that competitive markets driven by self-interest are generally the most efficient means of allocating scarce resources among competing uses. However, they contend, economic theory provides nothing useful in determining optimum scale or level of total resource use. Resources have no economic value until they have become scarce. Thus, no economic reason exists to allocate abundant natural resources until they are made scarce through depletion. No logical economic limit to expansion or scale exists, even for use of scarce resources. The

“wild facts,” Daly and Cobb argue, prove that conventional economic thinking is leading society to an unsustainable level of aggregate resource use. The common good demands an “economics of community” to guide public decisions regarding scale of resource use—not to replace, but rather to augment, market allocation of scarce resources.

The first major section of the book details shortcomings of conventional economic thinking by addressing the most pressing public issues today. A “fallacy of misplaced concreteness” results when conclusions derived from theory are applied to the real world without recognizing the degree of abstraction involved in initial theory development. The authors build a strong case that the discipline of economics has fallen prey to such fallacy.

Economic theory has its foundation in abstractions from the reality of two hundred years ago. The paradigm of an economy guided by the “invisible hand” of self-interest seemed reasonable in an “empty world” occupied by individuals and small proprietorship. But in a “full world”—where humans are clearly crowding out other species and impacting all elements of the biosphere—where multinational corporations dominate private decision making—many foundational assumptions of economic theory are no longer reasonable. Fallacies in economics arise from accepting for all times those things that seemed reasonable in past times.

Daly and Cobb conclude that “economic theory abstracts from human feelings about what happens to others and about one’s relative standing in the community, from a sense of fairness and judgments about relative value.” The economic behavior of people in the aggregate is abstracted from the economic behavior of people as isolated individuals. These abstractions lead to clear differences between



about relative value." The economic behavior of people in the aggregate is abstracted from the economic behavior of people as isolated individuals. These abstractions lead to clear differences between the behavior of *Homo economicus* and the behavior of real people in real communities. Human feelings and relationships were not deemed relevant in the past because they were seen as neither contributing to nor detracting from desirable economic performance. But, the "concreteness" of past economic abstractions clearly is crumbling under emerging realities as we approach the 21st century.

The authors see "misplaced concreteness" as an inherent flaw of disciplinary thinking in general. Thus, rather than propose a new disciplinary approach to "economics of community," they propose a search for broader understanding and wisdom in a realm beyond disciplinary thinking. In the second major section of the book the authors call for a move beyond "chrematistics," the science of manipulating property and wealth to maximize short run exchange or market value, to "oikonomia," the art of managing the whole to realize long-run values arising from things spiritual, cultural, and natural, as well as from markets. They conclude that a sustainable human society will require new thinking that transcends disciplines, explores human values, and moves beyond individualism to address interpersonal shared values of people in community. Redesigning the economic concept of 'land' is a major part of this new thinking, as is a greater appreciation for the role of biological diversity. Eventually, we will "have to live largely on the current flow of solar energy." Land, as a spatial stock resource, and living things, as means to capture, transform, and store solar energy flows for human purposes, will become central issues in oikonomia—the "economics of community."

The third major section of the book outlines a variety of public policies needed to implement

"economics of community." In general, policies proposed are based on a questionable assumption that a "sustainable" scale of aggregate economic output can be estimated with sufficient accuracy to provide a credible guide for public policy decisions. A second shortcoming of the policy section is its emphasis on national rather than global policy. Environmental sustainability is, by nature, a global issue. And today's global economy cannot be squeezed back into its national boxes. Globalization need not imply "free" trade, "open" borders, or "total" domination by multinational corporations, as the authors seem to assume.

The final section of the book deals more effectively with necessary first steps toward an "economics of community." Daly and Cobb correctly assert "the very first step toward redirection must be widespread recognition that something is wrong, that present policies do not work, that the wild facts must be taken seriously." They outline changes needed in universities, in approaches to community development, in trade policies, and in measures used to monitor levels of aggregate resource use and economic output. But they recognize that changes in public attitude are a prerequisite to meaningful changes in the rest.

The final chapter gets to the heart of the issue of change. Ultimately, concern for unknown members of future generations is neither a concern based on self-interest nor is it a concern based on collective interest of people in the present community. As the authors state: "rationality, apart from a belief in God, may indeed dictate indifference to the yet unborn." The human species is not sustainable without a widely-shared, spiritual commitment to sustaining the "Common Good."

*Reviewed by:*

*John Ikerd*

*University of Missouri, Columbia, MO*



## **The Ecology of Commerce: A Declaration Of Sustainability**

Paul Hawken, 1993

Harper Collins Publishers, 10 East 53rd St., New York, NY 10022. 250 p, paper \$13.00, cloth \$23.00

"There is no polite way to say that business is destroying the world" (Paul Hawken, *Inc.*, April, 1992)

"The business of America is business" (Calvin Coolidge, 30th President of the United States, 1923-1929)

"It strikes me that we in America understand little about what business is. Given that business and the free market have become the most dominant social force in this century and, presumably, of the one to come, I realize that this is an odd observation. Yet most of us still do not understand how business works. I think our understanding of business--what it does, its effect on society, what makes for healthy commerce--is at about the level that medicine was before Louis Pasteur" (from *The Ecology of Commerce*).

Paul Hawken is an entrepreneur and business writer. He cofounded the Smith & Hawken gardening supply company, merchandising mostly by mail. Hawken was also the founder of Erewhon, one of the first natural-foods companies in the country. He is author of *The Magic of Findhorn*, *The Next Economy*, and *Growing a Business*.

Hawken believes the global environment is being destroyed, and provides a predictable and all too familiar list of depredations: "...on the verge of a new millennium we know that we have decimated 97 percent of the ancient forests in North America; ...every day our farmers and ranchers draw out 20 billion more gallons of water from the ground than are replaced by rainfall; ...globally we lose 25 billion tons of fertile topsoil every year, the equivalent of all the wheat fields in Australia."

To this point in the book, the reader could easily be tempted to toss it aside as another demoralizing, Malthusian woe-is-me. However, those with more fortitude might just experience a moment of clarity. Hawken not only confounds the decades-old juggling act between business and environmentalists, growth and conservation, jobs and ecology, resource pricing and American global competitiveness. He takes the analysis to a new level by forcing the conclusion that titanic struggles require gigantic efforts, and post-industrial, global businesses are the only institutions with the resources and influence to reverse the decimation of the Earth's carrying capacity. In other words, there is no such thing as a trade-off between economics and ecology; rather, biological science and ecological understanding must drive economics. It is for ecologists to determine what is a sustainable commercial pursuit, and what is not. The market may be an efficient tool for setting prices, but it fails miserably in accurately calculating costs. That realization isn't useful if it comes from the political fringes. It must come from those who run corporations, who sit on their boards, who own their stocks, and who buy their products.

Hawken calls this model the restorative economy. "The economics of restoration is the opposite of industrialization because industrial economics separated production from the land, land from people, and ultimately, personal values from economic values" (*Inc.*, April, 1992). *The Ecology of Commerce* proposes three approaches for establishing the restorative economy, all based on Nature as the model: 1) Obey the "waste-equals-food" principle, eliminating waste from

industrial production; this will enforce the cyclical nature of the Earth on economic behavior and wean humanity from linear thinking. 2)

Replace carbon, finite as a resource and connected to destructive extraction and use, to sunshine and hydrogen as our economic feedstocks; this shift requires movement away from the notion of the cheapest combustible to the most wealthy and enduring producers and consumers. 3) Enforce a system of accountability by which economic behavior is measured and judged; these loops might take the form of green fees on agricultural chemicals, for example, but more importantly they should create serious disincentives for short-term exploitation.

Hawken suggests measures of increased accountability by those who would wield so much power to save the world: "If individuals were personally liable for the half billion tons of toxic chemicals and the 11,000 different organochlorines (for example, dioxins and PCBs) produced by chemical companies every year, would they still sell them? Would they market them with *élan* and *panache*? Would they ship them without foreign-language labels to Third World countries, where they end up poisoning children, workers, and watersheds? Would they not have a powerful incentive to support alternative methods of pest control and manufacturing?"

"A principle of good industrial and ecological design should be that every appliance, car, and file cabinet be assembled in such a way as to be completely reusable. When you buy a new refrigerator, the manufacturer would be responsible for reclaiming it when you are done with it, and remanufacturing and reusing it so that there is no waste. If you have 20 televisions in a truck, you are technically a toxic-waste hauler by Environmental Protection Agency standards and require a license. The one and a half ounces of mercury in every TV picture tube should belong to Sony, not you or me or our landfill. Thus, a purchase of a consumer durable is in effect a long-term rental. A license. Again, it is economical, ecological, and accountable."

"Even pesticides and solvents should be 'rented.'

Pesticides should have molecular 'markers' that indicate that the dichlorobromopropane is made by Occidental Petroleum. If it shows up in your well water, the company has to come and take it back. Simple. If Shell sells solvents, then the buyer has to return them all, imposing upon Shell the task of selling solvents only to customers who use them in closed systems that prevent them from volatilizing into the atmosphere."

"Advertisers should be accountable, too. Why not have an advertising council composed of mothers, say, that screens all advertisements directed at their children? Let them screen the ads for cereals made of 40% white sugar and decide what is an appropriate means to communicate the value of those cereals to their children. Let them ponder the fact that the Old Joe Camel campaign by RJR Nabisco has increased the use of Camels in underage smokers by 3,200% in just four years. Should not RJR be accountable to the fathers and mothers of these children?"

Hawken's account is refreshing in his unwillingness to castigate the large numbers of those who practice "business" as their livelihood, because of a relatively few extraordinarily venal and shortsighted predators at the very top of large corporations. For the most part, "business people in American business are as fine a group as one would find in any other type of institution or culture." That belief leads him to openly deconstruct the assumptions, biases, and behaviors of business; they do not actually reflect the true spirit of American people, but rather a disconnect that is perpetuated by an academy that only measures wealth with money, replaces research with modeling, and malfunctions in the hands of a management class that never meets a payroll, nor thinks to budget the capital needed for a future generation. Paul Hawken's divergent views on economics and business could stimulate a valuable debate in our university classes that deal with the future of food systems and natural resources.

*Reviewed by:*

*Gabriel Hegyes*

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## **Beyond Growth: the Economics of Sustainable Development**

Herman E. Daly, 1996

Beacon Press, 25 Beacon St, Boston, MA 02108-2892. 253 p, cloth \$27.50, paper \$15.00

Are there any economists who see beyond Adam Smith and econometric models? One such person is Herman Daly who, for example, once criticized mainstream energy analysts for viewing energy demand purely and unthinkingly as something to be accommodated, not controlled -- in effect, as an end rather than a means. "This approach is unworthy of any organism with a central nervous system, much less a cerebral cortex," Herman Daly wrote. "To those of us who also have souls it is almost incomprehensible in its inversion of ends and means." In this compelling quote, Daly spoke from both his mind and his heart. His analysis was cutting, both intellectually and morally. Unlike the emphatically secular methods of most economists, Daly's pursuit of descriptive analytic truth does not turn him into a moral agnostic. On the contrary, it allows him to found his economics quite solidly on his faith as a Christian.

In his classic *Steady-State Economics* [not reviewed here], Daly provides a different perspective. Where most chalk-dusted economics professors offer a mathematical language to describe how stars bend the space they occupy, Daly offers an elegant framework for understanding how the human economy distorts the natural world in which it operates. The difference is that Daly is working not at the physical but at the social level of analysis, where values matter.

*Beyond Growth: The Economics of Sustainable Development* is his latest book. It is a wide-ranging one, constituting, if not his collected works, then perhaps his collected thoughts. Chapter topics range from population growth among the campesinos of the Ecuadorian Amazon, to the consequences of international trade, to a Christian foundation for ecological economics. Introductions for each section and for the whole volume

partially, if sometimes awkwardly, fuse the materials together.

Through it all, Daly never shies from calling the pitches as he sees them. He commends the statement of principles issued by the U.S. President's Council on Sustainable Development in 1995 for noting the need to incorporate environmental protection into economic policy, but takes it to task for glossing over the reality that the country's consumption of natural resources must be drastically reduced if it is to restore some kind of ecological balance. And he shies not at all from attacking central tenets of the current "Washington Consensus" that free trade and capital mobility are key to speeding healthy economic development worldwide. Transnational corporations, he says, have slipped from the reins of public control. "We can either leave transitional capital free of community constraint, or create an international government capable of controlling it, or renationalize capital and put it back under the control of the national community."

Such an eclectic volume resists summarization, but one theme is clearly central, as the title suggests: the environmental and social consequences of growth. In the 1970s, the "limits to growth" debate, triggered by a book of that name, quickly polarized into two camps: for and against growth. Unfortunately, a basic question often was lost in the weighty attacks and counterattacks: Growth of what? At the time, growth in the environmental demands of an economy was typically assumed to proceed in lockstep with the dollar value of what that economy produced, so distinguishing between the two may have seemed unimportant. But oil shocks and strengthened environmental laws soon gave the lie to that simple equation. Families and businesses found ways to increase efficiency of

resource use and reduce pollution, or to rely more on products and services that were intrinsically light on the earth, such as software and education. As a result, the global economy grew more as measured in dollars than it did by many measures of physical impact, ranging from oil use to sulfur emissions. That suggested that to some unknown extent, economic growth might be compatible with environmental protection after all, as long as it is the right kind of economic growth.

Ironically, the title of *Beyond Growth* somewhat mires Daly in this well-worn and partially false debate even as he strives to move "beyond" it. The growth Daly knows we must get beyond is in the burden the global economy places on the environment and on human health. Yet most readers will not take his meaning in that way; they will assume he is attacking economic growth head on. Sustainable economic growth is not necessarily an oxymoron, as Daly himself has emphasized for the last 20 years. In general, if governments place firm environmental protection controls (such as pollution taxes) on an economy, the potential for economic growth will then depend on the future evolution of technology and human wants. It will be a process of figuring out how to produce more goods and services with the same amount of work, and the same amount of resources. The benefits of economic growth may be overrated, especially for rich consumerist societies where pricey sport utility vehicles jam the highways, and billions of tiny model cartoon characters fill children's toy boxes and dim their imaginations. But for what it is worth, such growth may be possible.

Of course population growth must eventually halt. Every additional person places extra demands on the planet's biota for food. Already, according to an estimate Daly cites, humanity has co-opted 40% of the earth's photosynthetic product for its own

use, much of that for crop and livestock production. Population growth is hardly sustainable.

Daly is completely on-target when he shifts from asking the empirical questions about whether and how economies can grow, and starts raising the moral questions about growth and the environment. He dares to ask, Why does the environment matter? Why is air pollution bad and rainforest preservation good? The answer he often hears is that we must protect the environment "for the sake of our children." But that does not satisfy him, for it only begs the question of why future generations matter -- an impossible one to answer through logic alone. To give environmental economics a firmer ethical grounding, Daly proposes a "biblical economic principle" that has as corollaries both the rightness of environmental sustainability and the need for a ceiling on economic inequality in society. He argues that the force of logic can test values for consistency with each other, but it cannot produce the values themselves. Rather, values must develop from somewhere within us. Thus before environmentalists can persuade people to follow their reasoning, we must first work to spread the values on which that reasoning is based, or to convince our audience that it already shares those values. What makes Herman Daly a standout among environmental evangelists is that he is perceptive enough to see himself as such.

*Reviewed by:*

*David Malin Roodman*

*Excerpted by Charles Francis from review published by David Malin Roodman, Senior Researcher, Worldwatch Institute, Washington, DC*

*Reprinted with permission from WorldWatch, September/October 1997, 10(5):36-38.*



## **Food for the Future: Conditions and Contradictions of Sustainability**

Patricia Allen, Editor, 1993

John Wiley & Sons, 605 Third Ave., New York 10158-0012. 328 p, paper \$39.95

*Food for the Future* is a powerful and lively critique of sustainable agriculture. In this collection of papers, fifteen contributors delve into some of the most fundamental problems and assumptions about the meaning of sustainable agriculture and its future. The book came out of a meeting organized by Patricia Allen at the University of California at Santa Cruz, where the authors discussed many of the ideas they developed for the book. However, it is more than a conference proceedings: the careful selection of participants, their interaction on the book's topics and judicious editing resulted in unusually strong coherence for a collection of papers.

Several major themes run through this book: the need to broaden sustainable agriculture to encompass more aspects of the food system than just food production; the conflict between sustaining the benefits of agriculture for those who already reap them versus securing benefits for a broader population; and the more general need to include social issues in sustainable agriculture. Supporting themes are the evaluation of political actions and systems needed to broaden the scope of sustainable agriculture to include social justice issues; historical, social and political reasons that sustainable agriculture is narrowly construed at present; and the global implications of a broad definition of sustainable agriculture that would encompass social equity and healthy food along with farm profitability and environmental quality.

Several papers stand out for me as being exceptionally thoughtful and well-organized. Frederick Buttel analyzes sustainable agriculture as a scientific knowledge claim and symbol of a social movement, thus providing insights into its development and limitations. Patricia Allen and Carolyn Sachs discuss the basic contradictions of sustainable agriculture and the issues on which it is

silent, and argue for a more equitable distribution of its benefits and inclusion of neglected issues. Michael Redclift's analysis of sustainable development and its implementation reveals many analogies with sustainable agriculture and political strategies for making it possible. Harriet Friedmann describes the need to re-embed the global food economy in regional economies and social life to ensure that sustainable agriculture is compatible with each society's needs, rather than simply incorporating the most cost-effective or efficient technologies. Katherine Clancy contributed a scholarly historical analysis of the lack of connections among food consumption, domestic hunger, and sustainable agriculture, outlining why closer connections are needed and precisely what they would require. Garth Youngberg, Neill Schaller and Kathleen Merrigan offer a succinct history of sustainable agriculture and analyze the influences of policy and public pressure.

Almost every paper in this book has thought-provoking arguments, although most made points with which I disagreed. One recurrent problem is the use of language and assumptions that may not be clear to many readers despite attempts by several authors to clarify their terms for the general reader. Another is a somewhat simplistic linkage of environmental and social degradation or improvement; an exception is Lori Ann Thrupp's "political ecology" analysis of rural development in Latin America that illustrates with cogent and concrete examples how the environmental and the social are linked. The discussions of the global implications of sustainable agriculture generally are abstract and of questionable usefulness. A few chapters include "wish lists" of changes in research or policy without substantive analysis of what is needed to implement these recommendations.

However, these minor shortcomings are outweighed by the significant strengths of the book as a whole. The book is very valuable in the way it pinpoints controversies and stimulates thought. The authors successfully identify major conflicts and contradictions in sustainable agriculture and analyze them with depth and vision. I would recommend this book widely to agricultural scientists, students, policy makers and educators as

a beginning point for discussions of the kind of agriculture we as a society want to create and how we will build it.

*Reviewed by:*

*Molly D. Anderson  
School of Nutrition, Tufts University,  
Medford, MA*



## **The Sociology of Agriculture: An Ecological Perspective**

Don E. Albrecht and Steve H. Murdock, 1990

Iowa State University Press, 2121 State Ave., Ames, IA 50010. 249 p, cloth \$27.95

Many, if not all of us, have observed the tremendous changes that have been taking place in the countryside over a number of years. Once prosperous farms are ill-kept and run down; barns and outbuildings are weatherbeaten and in disrepair; fields are overgrown with weeds, and fences appear to be all but worthless. Behind, all that we see are people whose dreams of carrying on the family tradition in farming have been dashed to pieces, whose roots have been torn up as they have been forced to leave everything to which they were born, and migrate elsewhere in search of employment and a new lifestyle. Such disruptions to people are by no means isolated; in point of fact, we more and more recognize that linkages among families in rural areas—whether of farmers or operatives in the ancillary businesses or services which support the production processes—are impacted by current events, so that the structure of society itself is changing. This is precisely the subject of the book, *The Sociology of Agriculture*.

Those of us who teach, or do research involving rural areas and people, are usually alerted to the facts and figures that describe specifically the rates at which rural life is changing. Newspaper articles, radio spots, and TV clips comment with statistics on various aspects of these changes. We might have tried to remember such information in order to use it in our own work. The sources of such information, however, are so widespread and the interpretations so varied that it is difficult to collect useful citations in contexts that are appropriate to our needs. Albrecht and Murdock have addressed our needs.

Drawing upon the expertise of hundreds of scholars cited in about 370 references, and copying or recasting available data in more than 60 tables and figures, the authors have provided a handbook of information invaluable to scholars interested in the socioeconomic

characteristics of farming and rural life. Their perspective is ecological, combining the understanding of people in the environment of the natural world of resources and living things. Thus, the idea of community is central; the static and dynamic aspects of their biospheres; the nature of their general structures; their variations from place to place; and the sequence of changes associated with community development.

Nine chapters provide an overview relative to specific topics related to the changing sociology of agriculture. Against an historical background of what was common in agriculture, the authors touch upon the effects of technological innovations, the nature of nonfarming organizations, the population structure of rural America, and relationships between agriculture and rural communities. In their final chapter, they allow themselves to speculate about this last decade of the 1900s: what do the past and present tell us about the immediate future of the structure of agriculture in the United States?

*The Sociology of Agriculture* is, indeed, a useful book. It could be a basic text for a course; it might serve as a secondary reference for courses tangentially focusing upon its specific subject. At the very least, it can be an up-to-date compendium of information easily accessible to a wide range of scholars who need reliable data on modern agriculture and rural life in the United States.

*Reviewed by:*

*Donald M. Crider*

*Penn State University, University Park, PA*

*Reprinted with permission from the Journal of Natural Resources and Life Sciences Education 21:95, 1992.*







## **Planting the Future: Developing an Agriculture That Sustains Land and Community**

Elizabeth A.R. Bird, Gordon L. Bultena, and John C. Gardner, Editors, 1995  
Iowa State University Press, Ames, Iowa 50014. 276 p, paper \$14.95

Why should you care about agriculture? *Planting the Future* provides an eloquent description of the current state of this most basic human endeavor, one that is critical to survival. Based on a series of surveys and on-farm studies in the North Central and Western states, the book recognizes the bounty of our conventional agricultural industry. More importantly for the future, there is detail on a series of critical problems in the environment, the distribution of economic benefits, and the social dislocation that is a result of consolidation of lands and heavy reliance on fossil fuel inputs. Today's productivity and cheap food in the market has hidden expenses such as federal subsidies, impacts on the environment and future potential production, and declining rural communities. Dependence on agricultural chemicals and fertilizers is seen by many growers as not only expensive, but one of the key factors in causing declines in water, soil, and food quality. Large multinational agribusiness has strong control over practices, commodities, and markets, and the majority of the profits flow directly to the food industry. Migration of people from farms to cities is one factor in the increase in poverty and homelessness, as well as the root cause of a decline for many in standard of living. The book concludes that this situation is not sustainable for the long term.

From countless interviews with sustainable farmers across the region, the following philosophical ideas seem to provide a foundation for tomorrow's food system:

- integrating agriculture and management of these lands
- creating more regional food systems with local autonomy and benefits

- decentralizing control of agriculture and farm resources to local people
- developing a higher level of self-sufficiency of farm operators
- creating an independence of farmers from chemical inputs and centralized marketing
- establishing cooperation among neighbors and stronger farm communities

The challenge is to implement these approaches to create a more sustainable agriculture, one that is environmentally sound as well as economically profitable and socially viable. The book proposes a number of policy directions as well as environmental regulations that will help the U.S. develop toward a sustainable food system.

*Planting the Future* begins by documenting the current agriculture in the region, and then focuses on results of surveys from four states: Iowa, Minnesota, North Dakota, and Montana. There is a generalized definition of sustainable agriculture, "Diversified, flexible, cost-effective, environmentally sound family farming that replaces chemical-intensive practices with on-farm resources, renewable energy, conservation, and skillful management of natural processes." There is evolving consensus that changes in the future must embrace environmental, economic, and social concerns about the impacts of agriculture. A number of practices are described that can help farmers meet these goals. One of the most attractive elements of the book is an extensive series of sidebars that give personal accounts and case studies to illustrate principles in the text. Beyond the discussion of specific practices and farming systems designs, the book explores the complex issues of the structure of agriculture and the policy environment in which it operates.

Why should you advocate change? *Planting the*

*Future* gives ample reason for a careful examination of our current agricultural production and food system. Based on hundreds of interviews and surveys of dozens of producers, the information available to the authors from farmers and ranchers provides the foundation for a new focus on the broad goals of the agricultural sector as well as for society. The book suffers at times from a somewhat academic style, yet is compelling to the reader. The practical sidebars attract immediate interest because they are stories of real people and their challenges. *Planting the Future* is highly recommended reading for anyone concerned about

food and the environment, and a valuable contribution to our planning for a sustainable human community that can survive in harmony with other species in the ecosystem.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*

*Reprinted with permission from Great Plains Research 6(2):296-297. 1996.*



## **Family Farming: a New Economic Vision**

Marty Strange, 1988

University of Nebraska Press, 324 N. 14th St., Lincoln, NE 68583. 311 p, cloth \$25.00, paper \$9.95

Few agricultural issues evoke as much passion, verbiage, or faulty reasoning as the condition of family farming. So much that has been written on the subject consists mainly of half-truths, or conveniently overlooks data that refute one's most cherished prejudices. The level of discourse is all the more distressing considering the importance of our policy on family farming -- what politicians and agricultural leaders say it is, what it actually is, and what it should be. Consequently, the infrequent exception that rises above the pack is all the more welcome.

Family Farming is very welcome. Marty Strange tackles this difficult issue with fresh insights and sharp, well-supported arguments. On one hand, he is not the supposedly disinterested type who claims to be nothing but "realistic" when offering objective-looking analyses that "prove" that the family farm -- numerically still the most important kind -- is dead, or at least dying, a conclusion sometimes accompanied by an almost audible "good riddance." Nor is he the diehard agrarian fundamentalist who doesn't feel the need to offer any kind of supporting analysis in asserting that a system based on family farms can do no wrong, or in claiming that all kinds of societal ills or moral deterioration have resulted from our turning away from that system. In saying this, I don't want to pass over Strange's fundamental sympathy for family farming, a sympathy that he sets forth clearly at the outset. But in his own words, the sympathy is "not uncritical," and he has "never felt the need to apologize for [family farms'] shortcomings."

Rather than being interested mainly in passing out white and black hats, Strange attempts to explain how and why the structure of American agriculture has evolved in the past several decades, why this has led to economic and environmental problems, and how its future development might be different. This task involves several intertwining arguments.

The first is that family farming implies more than just who owns our farms and how large they are. It also involves certain ideals and principles, especially a sense of community with other farmers, and an economic structure in which the rewards go mainly to those who run the farm, rather than those who provide the capital. It follows that the family farm system erodes not only when corporate farms replace family-owned farms, but also when some family--owned farms expand at the expense of others, or shift to a management mode more characteristic of industry than of agriculture. Strange's third major point is that a farm's survival is not determined simply by its efficiency, but also by whether it has the financial resources to weather bad times. A farm often gets bigger not necessarily because it is able to pick up the pieces when another farm goes under. Technically speaking, such a farm may still be a family farm. But Strange offers a different criterion: Does the farmer feel more pain at the loss of a neighbor than joy at the opportunity to acquire the neighbor's land?

In developing these arguments, Strange convincingly challenges several dearly held bits of conventional wisdom. He questions the common division of farms into three size categories, of which the middle is supposedly disappearing because it is too small to be efficient but too large to allow for enough off-farm income. When the boundaries between the categories are chosen differently, a very different picture emerges: A category he labels "small commercial" constitutes a substantial segment of the nation's agriculture, one with financial resiliency, although a low income level. He also refutes the simplistic solution to family farmers' problems that consists of merely raising commodity price supports, arguing instead that this will only shift the rewards of farming further toward capital rather than labor and encourages cannibalization of some farms by others. A particularly striking point is that there is a great

difference between perserving the family farming system and preserving family farms, that is preserving those family farms that happen to exist at the moment. For example, reducing the inheritance tax on farmland will make it easier for farms to remain in the families that now own them. But it will also make it harder for future would-be farmers to acquire land, in direct conflict with the traditional egalitarian ideal of readily available farming opportunities. He cautions that by locking in current ownership, focussing just on preserving existing family farms risks creating a landed gentry.

The word "vision" is thrown around casually these days, but its use in this book's subtitle is fully justified. In contrast to those who merely try to tinker with our basic farm policies, Strange offers a set of simple but far-reaching fundamental principles to guide the farm policy in the future: That a farmer should be able to pay for farmland by farming it well; that the farmer should have to farm it well; that the farmer should have to pay for land by farming it, and by no other means; and that there should be no motive for owning farmland other than to make a living by farming it well.

But in contrast to other "visions," this book is also based on solid "on-the-ground" experience in working with real farmers, and on a realistic understanding of our political and economic system. Unlike some authors on this topic, Strange avoids setting forth a "vision" based purely on his own personal values, values that implicitly are better or more noble than those that farmers are thought to hold. Rather, his premise is that farmers really want to uphold the values of the family farm system, and that if their actions sometimes seem to have conflicted with these values, in part this was because they had no choice, or more precisely, that they believed they had no choice.

That his alternative vision for American farming is not hopelessly optimistic is supported by the record of his own institution, the Center for Rural Affairs, Walthill, Nebraska, of which he is a founding co-

director. The Center has achieved impressive results in helping farmers develop and adopt resource-conserving, low-cost production methods that enable them to bolster their income without expanding excessively rapidly and without going dangerously in debt. Strange and his colleagues have also shown that much of the movement away from a family farm system towards a more industrial, capital-intensive model has been motivated not by true efficiencies, but by government policies that distort the comparative advantages of different kinds of farms. Particularly good examples are the tax laws that favor large-scale hog confinement facilities and center pivot irrigation. In analyzing these issues, the Center has never hidden its preference for a particular kind of agriculture and its desire for far-reaching changes. But unlike some activist organizations, it does not take a public stand without first doing its homework.

This book draws heavily on this experience, and reflects the virtues that have earned the Center considerable respect, however begrudgingly bestowed, even among those on the opposite side of an issue. It is written in clear, forceful language that avoids unnecessary jargon. It is well-organized, and although its arguments are not simple, they no doubt will be easily followed even by someone with little background in American agriculture. Most important, it offers a generous helping of both pragmatism and vision, and presents well-reasoned arguments against some myths that are taking a long time to die. I expect that at the very least it will be among the few popularly oriented books on farm policy still considered well worth reading more than a year or two after publication, and I would not be surprised if it comes to be regarded as a genuine classic.

*Review by:*

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Medford, MA*



## **Regenerating Agriculture: Policies and Practice For Sustainability and Self-Reliance**

Jules N. Pretty, 1995

Joseph Henry Press, Washington, DC 20418. 320 p, cloth \$44.95, paper 24.95

As Director of the Sustainable Agriculture Program of the International Institute for Environment and Development in London, Jules Pretty has access to in-depth information on a range of current development projects. He has woven this experience into a timely and optimistic look at the potential for future food production if technologies are used wisely.

Following his overview or vision of sustainable agriculture, the author gives examples of the modernization process (Chapter 2), with examples from both the industrialized and Third Worlds, along with the costs of these advances in environmental and social terms (Chapter 3). Technologies and processes that can be used to conserve soil and water, manage pests and soil nutrition, and the importance of adoption by farmers are described in Chapter 4. Pretty provides examples of how both local groups and external partnerships are essential to the development process (Chapters 5 and 6). He concludes with three chapters on the importance of agricultural policy and how this can influence the transition to a sustainable agriculture. The book is strongly referenced. The author includes frequent side bars, tables, figures, and examples set aside in boxes that bring his development experience to support the general thesis of change toward a more sustainable future. Without minimizing the magnitude of the challenges in sustaining food production, Pretty provides a refreshing look at what is going on in the developing world and how we can build on positive examples. It is a book highly recommended for upper division undergraduate students and anyone interested in unique examples of current progress in third world countries.

Regenerative agriculture is most successful when the focus on resource conserving technologies is combined with thoughtful coordination of projects at the community level with support of government

or other organizations from outside. The author provides an expected litany of the failures of the Green Revolution, including the unequal distribution of benefits, and suggests that any strategy which depends on a singular approach is likely to lead to stagnation. This would be borne out by traditional World Bank, CGIAR, and USAID strategies that seek simplistic solutions to the global food dilemma. *Regenerating Agriculture* goes beyond the usual chronicle of problems and alternative technology solutions by challenging our predominant learning paradigms, the positivism and domination of the hard sciences. The author urges us to accept that values should be an inherent and explicit component of decision-making.

As an example of the holism needed in thinking about future systems, as well as an example of our failure to seriously consider indigenous knowledge and success, Pretty describes the rice terrace systems of Bontoc in the Republic of Philippines. Rice production of six tons per hectare is maintained by: "weeds and wild plants collected to keep the terraces clear for fear of rat infestation; soil fertility is maintained with the use of *Azolla*, pig manure composts, and the import of mountain soils; and irrigation water is managed communally. Success is a function of both the resource conserving technologies and the organized community action to make best use of them." Such specific examples throughout the book bring credibility to the arguments for a more sustainable development strategy.

The Green Revolution in its several forms has made a substantial contribution to world food supply, and in fact has bought time for us to seek solutions to human population growth and to establish a wider range of creative strategies for food production. Pretty gives us examples of both the successes and the challenges, in human economic terms, of this singular and dominant approach used over the past

five decades. He outlines the environmental and social costs of a simple, high technology strategy, and provides examples of alternatives that have worked. The national effort to reduce pesticide use in Indonesian rice production systems, while maintaining yields and increasing profits, provides a valuable lesson to those who have worked hard to transplant technologies from one region to another and have been frustrated by lack of long-term success. International development planners and agencies are beginning to learn from these successful examples.

The value of local groups and institutions is illustrated with a number of cases from Third World settings. Their goals include organization and control of water use, watershed level group decisions on how to manage soil erosion, and increasing access to credit for production inputs. The process leads to longer-term change and improvement if local users really participate in planning and management of the initiative. Further stability can be achieved by local groups banding together to effect change at the watershed, district, or national levels. An example of the successful ACCORD project in Burkina Faso that coordinates the efforts of several donor agencies and non-profit groups illustrates the power of coordinated planning and efficient use of limited funding.

Our understanding of local needs and priorities for development become disjointed. Distortion of reality can be the result of highly structured questionnaires designed for predetermined results ("Self Deception and Questionnaire Surveys") and quick field visits by development professionals ("Self Deception and Rural Development Tourism"). Pretty describes the spatial and temporal biases that are inherent in many evaluation visits, and how this skews decisions toward a small segment of the real challenges facing small farmers trying to produce food for their families and for the market. The emerging appreciation of how people can search for their own solutions through participatory research and extension projects, and how development agencies can provide support for this approach, gives hope for the future. Participatory approaches will be fostered by "Learning Organizations" that promote experimentation and diversity of programs, group activities, and careful monitoring and self-evaluation

of projects.

A well-referenced series of tables summarizes the documented impacts of resource-conserving technologies that include alternative soil amendments to supplement fertility, prevention of erosion, integrated pest management, and appropriate irrigation scheduling to save water and production costs. There are case studies from 20 communities, with a summary of the process and the results in productivity or economic return.

The over-riding importance of agricultural development policy is described in the final two chapters, with a description of how current policies often serve as disincentives to change. Switching from high-input agriculture to resource conserving practices incurs transition costs that are often related to policy. Subsidies for pesticides and irrigation water are examples of government interventions that influence decisions at the farm level, while heavy taxes on agriculture and exports have distorted the marketplace in favor of other industries. Finally, most development policies related to agriculture have ignored the long-term social and environmental costs of conventional approaches and how alternative technologies and systems can contribute to achievable and resource-efficient food systems. A series of 25 specific policies that have been used to promote sustainable agriculture are described. Although not a prescriptive approach, this list of policies provides a shopping list of creative options appropriate for the resources and societal goals in a given place and time.

*Regenerating Agriculture* is a valuable introduction to comprehensive improvement of the global food system. The author describes a range of resource conserving practices and advocates careful focus on the need for changes in agricultural policy. The book is easily read and contains numerous specific examples of success. Easily accessible to a general audience, it could be recommended for students in production sciences, nutrition, economics, or political science. Before choosing a text for any course in sustainable agriculture, instructors would be well advised to consider this recent volume.

*Reviewed by:*

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## **Putting People First: Sociological Variables In Rural Development, Second Edition**

Michael M. Cernea, Editor, 1991

The World Bank, Box 7247-8619, Philadelphia, PA 19170-8619. 600 p, \$29.95

In design, most international rural development initiatives occur for at least three broad reasons, namely to increase indigenous well-being and productivity; to reduce structural inequality between nations of the North and South and within developing areas; and to encourage a more prudent approach to the management and use of an area's natural resources. The former two reasons have received relatively little attention, largely because they deal with softer, more value-laden issues. On the other hand, the focus of most of the literature in the third area has systematically favored technological and economic discussions, with only scant attention given to the broader social issues involved. This bias has resulted in an inefficient use of both monetary and human resources and has contributed to an inability of funding agencies and project teams to reach stated goals. In an era of increasingly frugal budgets, and greater competition for limited financial support, such agencies and their staff need to make better use of their assets. This book will help them achieve this goal.

*Putting People First: Sociological Variables in Rural Development* addresses one of the major failures of the extant rural development process. It places the aim of development squarely on a people-first focus. A measure of the effectiveness of the first edition of this book is the adoption of the theme *Putting People First*, by the first Clinton-Gore administration, and another is the demand for this second expanded and revised edition. Here, a forceful argument is made for giving more careful attention to an understanding of the social organization within which all technical aspects of a rural development project are embedded. Publication of this new edition helps to vitiating the possibility that international development personnel and their academic contacts will miss this central thesis.

Not only is the volume impressive in size (in excess of 500 pages), it covers a wide range of developmental experiences. Particular examples are drawn from several broad categories of activities including irrigation, resettlement, livestock, fishery, forestry, and rural roads projects. Each broad topic contains both an overview of a particular program and a discussion of the various attempts at fostering local organizational efforts.

In an undertaking this large, it is not surprising to find a wide diversity in achievement of the stated goal. Some authors go to great pains to demonstrate the utility of a particular model or framework for organizing, classifying or somehow systematizing knowledge useful in the development process. This results in an uneven treatment of important data. Still other authors fail to provide much more than a prescription drawn largely from one or two specific experiences. The absence of a broader, synthesizing set of generalizations to cover the cumulative experience of the authors remains one drawback of this effort.

The costs of this absence and the unevenness across chapters are relatively small, however, given the paucity of quality information on the potential contributions of the social sciences to development efforts currently in the public domain. Neither sociologists nor anthropologists have been successfully integrated into most programs; not surprisingly, few of these programs have begun with a stated concern for putting people first. The theme of this book is to show not only how and where noneconomic social scientists can play important and vital roles, but to impress upon the reader the centrality of the idea that for any project to be successful, mere lip-service to the people, social organizations, and actors to be affected is not enough. Indeed, this entire volume suggests that if projects are to achieve stated goals, a reversal of the existing approach will be needed. Restricting



noneconomic social scientists to the conduct of social surveys, ethnographics, and some post-mortem analyses wastes both their resources and efforts and those associated with indigenous human capital development and utilization in fostering successes.

An increasing number of interdisciplinary and multidisciplinary development efforts are being undertaken. If they are to be successful, then the more technical scientists will need to not only embrace the anthropologists and sociologists on their team, but endorse their involvement in the organizational approach throughout. The absence of such integration, Cernea and his authors would correctly argue, will result in limited successes.

*Putting People First* may not have all the answers, but it does raise important questions about current protocols and practices for those involved in development activities. Not only should it be required reading for such individuals, and perhaps more importantly their students, but its suggestions need to be carefully implemented.

*Review by:*

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Natural Resources and Life Sciences Education  
22:190191. 1993.*



## **Social Aspects of Sustainable Dryland Management**

Daniel Stiles, Editor, 1995

John Wiley and Sons, 605 Third Ave., New York 10158-0012. 313 p, cloth \$95.00

Daniel Stiles has brought together a group of researchers devoted to furthering our understanding of desertification of arid lands. Specifically, this interdisciplinary group of authors is interested in the social aspects of dryland degradation, with a focus of development from the "bottom up." The eighteen chapters of the book originated from a workshop organized by the Desertification Control Programme Activity Center of the United Nations Environmental Programme (UNEP) entitled, "Listening to the People," held in Nairobi, Kenya from December 14 to 18, 1993. Stiles reports, "The papers and discussions of this workshop analyzed the experiences of over three decades of attempts by governments, donor agencies, and nongovernmental organizations to promote economic development in the dry lands of developing countries" (p. xi).

The first chapter provides a broad overview of the issues involved in desertification by highlighting the difficulties associated with defining and measuring degradation of dryland areas. Confusion over the meaning of desertification was put aside when the United Nations determined that, "What was of primary concern was the fact that land was degrading and producing less food and commercial output, resulting in increased hardship, poverty, and migration" (Stiles, p. 7), and "The term 'desertification' is better viewed as a political statement than as a scientific expression" (Stiles, p. 17).

In Chapter Two, Solon Barraclough presents an informative review of the key issues surrounding the social dimensions of desertification. He explains the "bottom-up approach to the social dynamics of desertification." Barraclough's descriptions of ecological refugees and the migration of labor due to drought and civil strife are vivid and insightful. He reports that there are an estimated "900 million people at risk from desertification..." (p. 63), and that, "the social issues of desertification are always to

some extent locality-specific. This is why generalizations frequently tend to be rather banal" (p. 53).

Chapters 3 through 6 provide four examples of "participatory research," or the "bottom-up" approach to rural development. These chapters include a theoretical description of participatory research and planning (Chapter 3), principles for supporting a local natural resource management institution (Chapter 4), the transfer of technology (Chapter 5), and the futility of top-down approaches to the implementation of dryland management projects (Chapter 6). The major focus of these four chapters is the need for "bottom-up, participatory approaches that attempt to support local knowledge and management systems..." (Evers, p. 95). One author concludes that, "Development must start and build on what people know. Only then will it be sustainable and result in self-reliance rather than dependency" (Ayling, p. 112). These strong views are put forth and supported in a clear and convincing manner by the researchers' contributions in this book.

Chapters 7 and 9 describe the complex relationships between population growth and land degradation, including how people use their land and resources, and how incentives guide the complex interrelationships. The next three studies (Chapters 10 through 12) describe how "listening to the people" and "indigenous knowledge" can help to curb environmental degradation.

Chapters 13 through 16 tackle gender issues in resource management. These authors provide interesting and contentious material. For example, Western ignorance of the relevance of women in pastoral and agropastoral dryland management continues to contribute to the extraordinarily weak performance of rural development interventions among the poor majority in the world's drylands (Horowitz and Jowkar, p. 213), and, "Although the

social science literature on Middle Eastern women may be rich descriptively, its dominant paradigms fall short of explaining the complexity of socio-economic changes in gender relations" (Jowkar, p. 249). The contributors to this section of the book make a convincing case that the role of women in agriculture is complex and deserving of more research effort aimed at a higher level of comprehension of the increasingly complicated role of gender in agricultural and rural development.

Chapters 17 and 18 describe government policies directed toward "good land management." Uquillas states, "...environmental policies to date have focused on repairing damages previously caused.... Environmental policy must be an integral part of economic and social development policies" (p. 285). The Editor ties together policy recommendations for land reform, land tenure, and increasing the role of participatory government by concluding that, "Most governments seem to be aware of the growing concern for community participation and decision-making power related to natural resource management. Many governments are making concrete steps to decentralize and devolve power to

regional and district-level bodies, though others are still reluctant to do this" (p. 298).

*Social Aspects of Sustainable Dryland Management* is an interesting, timely collection of studies on land degradation. The authors do not flinch from the presentation of firm beliefs and policy recommendations in participatory agricultural development "from the bottom up." Much can be gleaned about the consequences of agricultural production in dry climates on social conditions, as well as policy recommendations intended to alleviate environmental degradation. Of particular interest are the descriptions of labor migration and gender roles in the economic development process. The authors provide a clear and convincing case that both of these issues are deserving of more attention. Overall, this collection of studies provides a timely, thorough description of the current state of agricultural development issues and policy prescriptions.

*Reviewed by:*

*Andrew P. Barkley*

*Kansas State University, Manhattan, KS*

*Reprinted with permission from the NACTA Journal, Vol. 40(4):53-54, 1996.*



## **Agricultural Health and Safety: Workplace, Environment and Sustainability**

H.H. McDuffie, J.A. Dosman, K.M. Semchuk, S.A. Olenchock, A. Senthilselvan, Editors, 1995  
CRC Press, 2000 NW 24th St, Boca Raton, FL 33431. 617 p, cloth \$99.95

Integrating rural quality of life concerns with economic and environmental concerns has proven a daunting task for farmer advocates. By reviewing relevant research in the area of agricultural health and safety, this volume successfully bridges between economics, environment, and quality of life concerns. In this product of a 1992 international symposium on agricultural health and safety in Saskatchewan, the authors and editors make a compelling case to include the physical and mental well-being of rural people in the definition and objectives of sustainable agriculture.

The book's first seven chapters cover both established knowledge and new research relevant to agricultural health and safety, with a final chapter successfully integrating the first seven entitled "Sustainability and Health." The final chapter begins the difficult task of developing a case that alternatives to industrialized agriculture can promote human health and safety—that environmental health concerns have been missing from the sustainable agriculture movement and need to be reclaimed. The seven contributing authors to this chapter lay out a vision for an agriculture that "incorporates human resources [into a] system in which agriculture is fostered as an essential world resource, with appropriate marketing and distribution systems, and with individual countries producing food for their own consumption," all within the context of sustainable development. The strategy suggested in this chapter involves 1) respect and care for community life; 2) improvement in the quality of human life; 3) conservation of the vitality and diversity of the earth; 4) community empowerment to care for their own environments; among others.

The symposium clearly broke new ground in bringing together agricultural health researchers to share important discoveries in their respective fields and begin to uncover relationships between agricultural health and safety and the production practices used.

As such, the final integrating chapter represents an important first step toward linking health and sustainability, leaving room for additional analysis and policy discussion from the medical and agricultural sectors. Perhaps more importantly, the preceding seven chapters provide the reader with an invaluable research base concerning the hazards of industrialized agriculture.

The data contained in these chapters, as well as the conclusions made by the more than two hundred contributing authors and the references they list at the end of each contribution will prove useful to anyone interested in the intersection of health and agricultural production systems. This book will be of special interest to those concerned with hazards associated with hog confinement, grain production and storage, and community-oriented prevention projects. In a book rich in medical and socio-logical/anthropological detail, many of the authors also offer policy agendas to promote and reinforce rural health and safety.

The first chapter covers "Disorders of the Respiratory System." Exposures to dusts, gasses, and chemicals can result in lung damage. Studies on lung dysfunction and occupational asthma among grain elevator workers, livestock confinement operators, chemical applicators, and other populations at risk are discussed in detail. "Health Effects of Agricultural Chemicals" highlights research on how chemically-induced immunodeficiencies can lead to a variety of chronic disorders. Compared to the general population, farmers appear to contract an excess of several types of cancer including prostate, leukemia, non-Hodgkin's lymphoma, brain and multiple myeloma. Semen counts appear to be lower and other symptoms are common after chronic exposure to certain pesticides. The chapter further describes studies and research and exposure estimation methods for pesticide-related disorders.

other symptoms are common after chronic exposure to certain pesticides. The chapter further describes studies and research and exposure estimation methods for pesticide-related disorders.

“Injury, Disability and Accidental Death in Agriculture” reports on numerous farm accident surveys, agricultural injuries, populations at risk and the association between specific farming systems and injuries. This section includes grim statistics such as the fact that death and injury rates among farmers in the U.S. are nearly five times that for all other occupations. The chapter also covers some of the health promotion and accident prevention programs, including full-scale occupational health programs for farmers such as those in Sweden and Saskatchewan. “Stress and Well-Being” discusses the range of stress-inducing situations characteristic of farming, including isolation, risk-taking, established family patterns, patriarchal societal attitudes, low market prices, drought, and high interest rates, as well as other factors such as restricted mobility, family conflicts, and mental health problems. The chapter reviews research on community development approaches to empowering rural communities to cope with stress.

The fifth chapter reviews research relevant to specific populations at risk—“Migrant Workers, Seasonal Laborers, and Rural Women.” Health issues that deal with sociologic, economic and health delivery limitations are of special focus. The chapter covers efforts to develop self-help and preventative programs, including the 33 priorities for action identified by the Farmworker Women’s

Health Project and the Farmworker Justice Fund. “Cardiovascular Health in Rural Populations” reflects on the findings that some farming populations are more prone to heart disease, obesity, and hypertension, possibly reflecting lifestyle, exercise, diet and genetic considerations. “Rural Health Delivery” discusses the combined effects of a shrinking rural population base, evolving medical technologies, and difficulty recruiting and retaining medical professionals. “Industrial Hygiene and Control Technology” advocates for an integrated industrial hygiene program as essential in an Occupational Health and Safety Program for Agriculture, especially for animal confinement operations and for farm silos.

Many of the contributions in this book could be used as the basis for lively roundtable discussion about health and sustainability at the rural community and national policy levels. Many of the authors’ conclusions and recommendations are both challenging and thought-provoking. This book is an important reference for those taking a leadership role in shaping the future of agriculture, as well as for rural health providers. We can hope that another volume is in the works, continuing the effort to tie agricultural health research together into a coherent body of medical knowledge that could influence agricultural and food policy.

*Reviewed by:*

*Michelle Miller*

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**FUTURE HORIZONS:**  
**Recent Literature in Sustainable Agriculture**

## **Becoming Native to This Place**

Wes Jackson, 1994

University Press of Kentucky, Lexington, KY 40508-4008. 121 p, cloth \$21.00

## **Ecological Literacy: Education and the Transition to a Postmodern World**

David W. Orr 1992

State University New York Press, Albany, NY. 210 p, paper \$16.95

Wes Jackson's *Becoming Native to This Place* and David Orr's *Ecological Literacy* are easy, intriguing, necessary reading for most large-scale agricultural and industrialized people of the information age. However, if students in our principles of biology course for great ideas, visions and experiences at St. Philip's College, San Antonio, TX are a reliable indicator, the closed mindset, and paradigm or myth (or lack of) of many readers will provide major obstacles to what can be a weekend of open-minded communication with these books.

Perhaps a weekend-experience isn't a fair portrayal of the "average" reader's probable interaction with important books. For many, that weekend, projected out into days and weeks and years, will also include a lot of hard work and energy—it will involve thinking about what Jackson and Orr have provoked, and will involve (as it did in my case) the capturing of some of the numerous evoked personal thoughts on notepaper or electronically. On the other hand, so many people, and the busily extractive institutions and infrastructures involving these people, are so far from an education and frame of mind needed to communicate with these books, that these beautiful, articulate, wise efforts at communication will be labeled partisan and boring. It probably will take the hundreds of years suggested by Orr to make the transition to constructive postmodernism, i.e. to become native to this place.

*Ecological Literacy*, which I believe is the more necessary of the books to be read by all, begins with an introduction by D.L. Griffin and a

definition and discussion of postmodern thoughts and movements. Griffin's postmodern thought isn't antimodern, new age metaphysics, or ultramodernism, but rather it is constructive and involves a "unity of scientific, ethical, aesthetical, and religious intuitions" with support for ecology and peace and other emancipatory movements.

### Sustainability

Orr then proceeds to wrestle with the meanings and actual practice of sustainability—the goal and the process, as well as the components—and is admirably idealistic yet effectively pragmatic, and not quixotic, in this discussion. He asks us to constructively question an economic system that "is failing because it produces too much and shares too little." Jackson asks the same questions in his attempt to make peoples homecomers and native.

Orr stresses that our crises are widespread and far-reaching—from crises of energy, water, mineral, biological resilience, to those crises of human values, and the fact that we humans now use over 40% of the net primary productivity of terrestrial ecosystems. But above all, we have a "crisis of spirit." He quotes biologist Robert Sinsheimer as recommending "we forgo certain technologies [and] ... lines of inquiry where the likely application is incompatible with the maintenance of other freedoms," i.e., appropriate spirit.

Individuals/society should work at wisdom and "reflect more on what we ought to do." In Orr's appropriately idealistic view, he insinuates that wisdom involves knowing as Aldo Leopold said, that "A thing is right when it tends to preserve the

integrity, stability, and beauty of the biotic community.”

#### Education

Both Orr’s and Jackson’s books are about real education, ecological literacy, or a life-long educational process of coming home and becoming native. In Orr’s abbreviated summary essay, “What is Education For” from *Earth Ethics* (which I always keep for students and other audiences) and in *Ecological Literacy*, Orr stresses “All education is environmental education.” He quotes Aldo Leopold about “the fact that our educational and economic system is headed away from... an intense consciousness of nature. The foundation of sustainability... will be... clear awareness that our well-being is inseparable from that of nature.” And, “If education does not teach us these things... then what is education for?”

Orr reminds us of the difficulty of ecological literacy by pointing to the narrowness in even biologists and other (un)natural scientists and to the extreme paucity of broadminded naturalists. Even though there is perhaps an overload of books about nature, there is less and less opportunity for the direct experience of nature—for the development of amateur and “professional” naturalists and natives.

Both Orr (esp. Chapter VIII) and Jackson are emphasizing the importance of learning the art of living well in a place and in an educational process vs. multidisciplinary teaching, abstraction, worship of models and symbols, accumulation of information in order to be “successful” in a spiritless extractive economy. Related to this Orr points out that not having basic ecological knowledge such as:

- primary geological processes influencing our place,
- native grasses in our area,
- major plant associations in our region,

highlights the “widening gap between the growing power of our society over nature and the general ignorance about it among individuals.”

#### Coming Home and Being Native

In his third and last section about knowledge and its purpose, Orr seems to make the case fairly effectively that humans need managing, not the

planet—that God, Gaia, Evolution was doing pretty well until human populations, technologies, economies got out of control. He points out anecdotally that USDA scientists and even James Lovelock (*The Ages of Gaia*) too often go overboard with planetary management solutions involving technologies viewed through one eye.

Jackson’s work compliments Orr. In particular I think Wes Jackson does an admirable job of really bringing this planetary and human management thing home.

Like Orr, Jackson links the past with the present, and provides foundation and guidance towards conservation and development of sustainable communities (CDSC) for the future. Jackson probably would not like the CDSC-phrase; he negatively wrestles a bit with the term sustainability, but in fact doesn’t get too involved over the semantics of sustainability and focuses on home-coming and being native—i.e., ecological literacy in a holistic sense.

Jackson tries to make sense out of all by making some brief visits to paleolithic, agricultural, industrial, and conventional worlds of wisdom, knowledge, and information, and to a possible postmodern world of those who’ve come home and become native. As Jackson and Orr suggest, in my own journey of trying to make sense of this place as a “biologist” rather than a naturalist, I have come across many colleagues who are “successful” in this extractive economy and who have the facts and figures, the print, the credentials to demonstrate that “success.” Some are secure and pleased with self and accepted by society. But few are ecologically literate, spiritual or really good for community; and few are native to this place.

Few of us U.S. Americans are becoming native to this place. A recent Polish visitor in our home recently experienced a Watermelon Jubilee in a central Texas town, where watermelons aren’t even grown by local small farmers any more, but rather by large farmers in distant locations. This Polish visitor commented as he listened to the souped up lawnmower races, and it could of as well been a tractor-pull, that U.S. Americans have to have noise and lots of fossil fuel energy expense in order to have a perception of fun.

During a tour for this same Polish scientist, a local agro-industrialist (farmer) from one of our wonderful valleys at the edge of the Texas Hill Country<sup>3</sup> talked about his wonderfully majestic linear-moving sprinkler irrigation machine which uniformly delivers limited amounts of water through drop tubes, and about how much water and variable energy costs it saves, without mentioning the costs in minerals/metal and energy to build the machine, and the debt-stress to family and community. Jackson on the other hand asks, “isn’t it time we begin figuring out a way to earn a living and amuse ourselves cheaply?” He calls for a homecoming major in universities vs. the only major now really being offered—destructive, extractive upward mobility at expense of community and place. He rallies us to find our way home and “become native to this place.”

Through his six brief chapters, Jackson:

- Details problems with a reductionistic/mechanistic Galilean-Cartesian-Baconian-Newtonian worldview (as does Orr),
- Outlines efforts to more holistically mimic nature (e.g., mimic nature’s prairie with a polyculture of perennials), and
- Points out the need for homecomers to spatially and temporally account material cycling and energy flows in this place.

In these discourses, he recognizes in particular Jack Ewel (research into mimicking nature) and H.T. Odum (modeling appropriate relationships between photosynthesizers and concentrators of solar energy—and much more). Moreover, Jackson mentions the heroic efforts (he has received a MacArthur Award) to restore the infrastructure of a prairie concentrator, Matfield Green, and I particularly enjoyed his piece on the New Century (women’s) Club (ca. 1923-1964).

This book of Jackson’s is full of insightful jewels, some of which are old wisdom, some are profound thoughts, and some provocative questions:

- “The homecomer will not learn the likes of Virgil to adorn his talk, to show off, but will

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<sup>3</sup>\*Note: Via Walter Prescott Webb, David Orr alludes to a monotonous Texas and our hot, dry plains—but this can be a wonderfully beautiful, interesting and diverse region.

study Virgil for insight, for utility, as well as for pleasure.”

- “What characterizes the high-energy epoch, with the language of modern economics for justification, is a way of being that is both simple and simplifying. High energy does seem to destroy information of both the cultural and the biological varieties.”
- “The science-state alignment has been thousands of times more ecologically destructive than the church-state alliance ever was.”
- “Will we modern scientists also become frustrated trying to develop a whole view now that we have gone so long into a culture of reductionism?”
- “Some people do study the liver and its connections, but most of us simply accept it, are glad it works, and seek to keep it healthy by keeping our bodies healthy. Do we need to understand community as well as we understand the liver? In the main, all we have to do is provide the context for community to happen, and live in ways that will keep it healthy. From there... much good will naturally occur.”
- “We have been through the hypocrisy of the church, the atrocity of the nation-state that peaked with Hitler, and now we are devotees of economics, the encoded language of human behavior that directs us toward ecological bankruptcy. It is time to move more aggressively on to the fourth phase, already underway, ecology.”

I found few weaknesses in either *Ecological Literacy* or *Becoming Native to This Place*. There are a few misspellings or typographical errors in the printing of Jackson’s book that are perhaps slightly detractive. Because Orr’s book is a compilation of essays, there are some minor problems with flow and repetition, but I found this to be more of a positive aspect rather than a detractor!

For me, Wes Jackson’s *Becoming Native to This Place* reads like he talks; like an informal speech, it’s sort of like a monologue, but is really communication with place and community.

I sometimes come across my own light-weight essays from the past—which were developed after



E.J. Dyksterhuis' range ecology course in the 1960s, after exposure to H.T. Odum's work while at the University of Florida, during late-night ramblings with Miguel Angel Altieri, and after hearing Dean Haynes presentations on low-input agriculture in the 1970s. As I analyze how my own essays developed through the years I see little change in basic mindset or approach in discussing a transition toward CDSC, constructive post-modernity, ecological literacy, homecoming and becoming native—I'm the product of a relatively low-input family farm operation near a small "village" and the extractive economy.

But works like *Ecological Literacy* and *Becoming Native to This Place* do help me toward coming home and being native, and do empower me; they make me believe there is a "cadre" of folk out there of similar mind, and they give me hope. But above and beyond this I do hope that these books will reach a wide audience and begin to bring us all together as we travel home to become natives.

Though I have been exposed to many CDSC-type books which have excited me in the past (e.g.

Odum's *Environment, Power and Society*, Catton's *Overshoot*, Bunch's *Two Ears of Corn*, Worster's *Nature's Economy*, Allen's *Food for the Future*, Daly and Cobb's *For the Common Good*, Miller's *Environmental Science*), I think *Ecological Literacy* and *Becoming Native to This Place* are two of the most important books of those reviewed herein. I rank these as highest on a must-read list in spite of the fact that both Orr and Jackson use so much of Wendell Berry, who has written much poetry, essays, and books that should be read. Or perhaps it is because of this wonderful use of Berry, e.g., in discussion of the need to live poorly though not in poverty, that Orr's and Jackson's books should perhaps be read over other books.

Please read *Ecological Literacy* and *Becoming Native to This Place*. It's a few hours, and then hopefully a lifetime, very well spent!

*Reviewed by:*

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***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter VI***

***Introduction***

**Historical and Current Lessons  
About Sustainable Systems**

“Those who do not read history are doomed to repeat it” goes the familiar adage. We could reframe that in a positive way: “Those who are willing to carefully read history and place its lessons in a new context can create new vistas of reality .”

In this chapter we explore the history of grasslands (*Grassland: The History, Biology, Politics, and Promise of the American Prairie*, 1995), historical biology of native plants (*Enduring Seeds: Native American Agriculture and Wild Plant Conservation*, 1989), and the history and culture of a society in a fragile environment (*Ancient Futures: Learning from Ladakh*, 1992). Following a sizable dose of history, the chapter embarks on a tour of topical issues ranging from diversity (*Exploring the Role of Diversity in Sustainable Agriculture*, 1995, and *The Last Harvest*, 1995) to crop improvement, conservation policies, and cultivation strategies. What we consider important is the wide range of opinions among authors, a debate that continues to inform our use of new technologies, and the diverse paths people take toward developing sustainable systems.

Richard Manning (*Grassland*, 1995) suggests that one of humankind’s greatest challenges is “Remaking ourselves so that we might function as a part of nature.” North American prairies provide examples of sustainability, lessons learned from plant and animal survival in harsh and unpredictable climates, in a biome that has seen continuous birth and extinction of thousands of species. Manning laments the incredibly detailed studies of the taxonomy of systems without concurrent evaluation of how their diversity relates to function and biological processes. In *Enduring Seeds* (1989), naturalist and author Gary Nabhan tells stories about people and their crops as well as detailing the process by which we preserve these priceless investments in the future. He deplores our collective ignorance about the importance of crop germplasm resources, and how little we understand the disappearance of biodiversity — one of the unintended side effects of homogenizing monocultures of a few major crop species. Nabhan continuously relates plant diversity with social and cultural issues, as does *Making Nature, Shaping Culture: Plant Biodiversity in Global Context* (1995; not reviewed here) by Lawrence Busch and six other authors, a recent book that explores the political and economic context of germplasm preservation and the long-term costs of ignoring this invaluable resource.

Another dimension of learning is to explore other cultures and ecologies. *Ancient Futures* (1992) provides a window to a unique people in Ladakh who have functioned well for centuries in a fragile, and often inhospitable, environment high (10,000 to 18,000 feet) in the Himalayas. The balance between human population and natural resource base is described well in this treatise by a Swedish linguist; the alarming and rapid changes that have occurred since the building of

a major road and the introduction of Indian culture are both alarming and expected. No less intriguing are the ideas about land use and strategies for development in *Conservation Policies for Sustainable Hillslope Farming* (1992), and *Dryland Agricultural Strategies for Sustainability* (1990), two recent books that address the potentials for sustained food production in some of our most marginal lands. Many biological and biophysical challenges can be addressed using known technology. What is apparent is the overriding importance of political decisions, and the need for education of national policy makers on both the importance and complexity of food systems and their dependence on fragile ecologies.

We often promote diversity as a means to buffer the unexpected effects of climate and economic circumstance. In *Exploring the Role of Diversity in Sustainable Agriculture* (1995), Richard Olson and colleagues look at the importance of genetic variation within and among species at different levels of the spatial hierarchy from microorganisms to regional and global ecosystems. Answers are often not as simple as just making a system more diverse; even our ability to link taxonomic differences at any level with functional diversity is limited. In *Crop Improvement for Sustainable Agriculture* (1993), a number of authors explore the potentials of plant breeding to contribute to long-term global food production. *Ecology and Integrated Farming Systems* (1995) presents the results of a symposium in U.K. that includes biodiversity, public policy, specific production practices, and ecology of systems and landscapes. *Sustainable Agriculture in the American Midwest* (1994) presents a challenge to our current conventional agriculture, and provides a series of alternative practices and strategies that would lead to more sustainable food systems.

In *Our Sustainable Table* (1990), Robert Clark brings us a series of essays from the *Journal of Gastronomy*, ranging from practices used in food preparation to issues in the current structure of agriculture. Finally, in *The Dairy Debate* (1993), editor Bill Liebhardt presents viewpoints on the production, economic, and social dimensions of two relatively new technologies in dairying: bovine growth hormone and intensive rotational grazing. In an insightful review that describes both the technical merit of the book and the furor that arose in California with its publication, Frederick Buttel reminds us that there can be excitement beyond discovery in science, sometimes coming from vested interests of an established institution that will stand without shame in the way of rational debate about our alternatives for the future. This is a mind-expanding chapter of reviews.

**Charles Francis and Gabriel Hegyes**



## **Grassland: The History, Biology, Politics, and Promise of the American Prairie**

Richard Manning, 1995

Viking Penguin, 375 Hudson St., New York, NY 10014, 306 p, cloth, \$23.95

Manning's goal in *Grassland* is to articulate what he considers humankind's greatest task: "Remaking ourselves so that we might function as a part of nature." His goal is in stark contrast to the human domination practiced over 150 years on U.S. prairies, and even to conservationists setting aside lands for national parks—places where we could observe the scenery, "free from human meddling." Only in the current generation are we coming to fully appreciate the obvious biological truth that "the web of life holds humans." Richard Manning, a journalist and nature writer, takes us on a historical journey that includes the wildlife, the diverse plant populations, the people, and the cultures that have shaped this biome that occupies 40% of the continental U.S.

The prairie holds a lesson in sustainability. In Chapter 3, Manning explores conflicting theories about the causes of extinction of major genera of large mammals. Many types roamed the grasslands for millions of years, and climate change and lack of food was commonly accepted as the cause of their demise. However, Arizona paleontologist Paul Martin observed that over 3 million years prior to the end of the Pleistocene only 20 genera of large mammals disappeared; in contrast, during only a few hundred years at the end of the last glacial period 33 genera disappeared. This time coincides with the Clovis culture about 12,000 years ago in North America. He maintains that these animals were hunted to extinction. "If stone-pointed spears in the hands of Clovis were a technology sufficiently powerful to extinguish a band of species, what dangers adhere to our tools of today?" Massive killing of bison in the last century with the arrival of the railroad and new people stand in mute testimony to Martin's admonition. The author of *Grassland* thus weaves history into an environmental message that is relevant to us today.

The careful balance of a complex ecosystem is described in Chapter 4, where Manning describes the interrelations among climate, soils, topography, and the many inhabitants in each place. The overriding impact of the Clovis people 12,000 years ago was only matched by the continental span of the railroad in the 1800s in terms of wide extinctions of native species. Mass slaughter of bison by hunters brought in with the railroad was merely a continuation of a major change in the ecosystem that began with Native American tribes hunting by horse. The conflict between native cultures and that of later immigrants from Europe with their ranching and farming only served to accelerate the decline of a natural ecosystem in the plains. The author recounts a well researched and interesting story of how we have ignored the nature of this place in our rush to "develop" the potential for economic activity.

Manning continues to describe the development of these "vacant" lands, and points out the "battle of types of knowledge, inductive and deductive, between the wisdom of Jefferson's libraries and the received wisdom of the land in the library of plants among the Hidatsu, Arikara, and Sioux." He laments that early biologists were enumerators, who collected and counted in a true reductionist mode, rather than observing the structure and function of a complex ecosystem. The discussion is reminiscent of Wes Jackson's *Becoming Native to this Place* [review, this volume]. The overriding need to subdivide the land, "diced up in rectangular parcels so that it might be owned to create free-holders," ignored the need for a new set of abstractions that were needed for a "new agriculture and literature defined by aridity." With the exception of some land set aside as wilderness areas, national forests, and other federal lands, the majority of the plains were converted to grazing or farming lands,

setting the stage for large private land holdings or federal lands that became accessible to a limited number of entrepreneurs, the new cattle barons. We have left less than one tenth of one percent of our prairie. "The rest of it died to make Iowa safe for soybeans," said Loren Lown who works in prairie restoration. With this and other poignant quotes, the author describes both the incredible intricacies of the building of a grassland ecosystem and its destruction or annihilation by the invasion of humans.

After breaking out the prairie by plow, many farming families learned that the land west of the 100th meridian could not be tilled in the same way as the Eastern forest or tallgrass prairie lands. The land was consolidated into larger holdings, and wheat production and extensive grazing became the norm. The dust bowl of the 1930s accelerated the emigration of people from farming in the plains, and later farm crises further exacerbated the plight of smaller, diversified farm operations. Whether the extensive monoculture of wheat and corn will be sustainable remains to be seen, but Manning points out the incredible fragility of the strategy compared to the survival techniques employed by species in a diversified prairie. An industrial agriculture has replaced the "vast cultural knowledge and diverse genetic information" contained in the native grasslands. In the chapter on irrigation, the author does overstate the water drawdown in the Ogallala aquifer and fails to mention the substantial recharge that occurs each year through the Nebraska sandhills.

Noteworthy subsequent chapters deal with introduced species and the loss of biodiversity (Ch. 8), construction of roads for transport and mining and how they disrupt the ecosystem (Ch. 9), and the reintroduction of native species such as the bison back into the plains (Ch. 11). In true journalistic fashion, Manning describes the background and events surrounding the issue of returning parts of the grasslands to prior bison-grazed condition. From the economic domination of a large tract by Ted Turner and Jane Fonda to a controversial First Nation's project in Canada, the multiplication and

commercial exploitation of bison by private interests now dwarfs the preservation efforts in national parks. On a smaller scale, the Iowa Prairie Network is focused on preserving the "postage stamp sized" remnants of native prairie that still remain in that state, and these sites are used as a place to harvest seed to help restore other areas to a species mix resembling the native grassland. There is no textbook to guide these efforts. People are learning as they go along, experimenting and beginning to read the embodied information of the remaining tracts. Manning concludes with descriptions of research and education efforts such as that of Wes Jackson of The Land Institute, where an ambitious program involves scientists and students in a search for an agriculture based on the native grassland ecology.

In this treatise on grasslands, David Manning creates his own manifesto for the future, admitting that to do so represents another degree of hubris. At best, he tells a series of stories of people who are working to make a difference, people who for varied reasons are linked to the land and its history. At times the chapters appear disjointed, at times a mixture of truth and overstatement designed to challenge the reader. He summarizes with the words from a David Orr essay entitled "Education and the Ecological Design Arts" that call for a post-industrial approach to development. "Ecological design is the careful meshing of human purposes with the larger patterns and flows of the natural world, and the careful study of those patterns and flows to inform human purposes."

Manning brings together well the arguments for a new approach by humans in their relationship to grasslands of the U.S. Our challenge is to put this into the context of today's needs and the potentials of land and resource use for tomorrow. There is no doubt that the prairie will survive. Are humans smart enough to successfully define a role for themselves in that future?

*Reviewed by:*

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## **Enduring Seeds: Native American Agriculture And Wild Plant Conservation**

Gary Paul Nabhan, 1989

North Point Press, 850 Talbot Ave, Berkeley, CA 94706. 225 p, cloth \$18.95

Where there are seeds, there is hope. This summarizes Gary Paul Nabhan's optimistic view of the future despite the tragic loss of the colorful diversity that characterized Native American agricultural traditions. Spreading population as well as the modern insistence on uniformity has created a worldwide problem in preserving wild germplasm, the source of traits potentially desirable for crops in the future. However, in the many ways that people work to save seeds and reestablish traditional agricultural systems, Nabhan sees hope.

This is a book about crop breeding, yet it is also about a lot more. In this collection of essays, Nabhan tells stories about plants, people, and many kinds of change. He explains how flowering plants co-evolved with insect and mammal pollinators; argues convincingly that most food crops originated in dry tropical areas; recounts how Native American agriculture in North America was almost completely destroyed; discusses the various approaches to germplasm conservation including botanical gardens, frozen seed banks, heirloom seed growers, "biosphere reserves"; and tells stories of various crops in North America whose future is uncertain. Nabhan relates these tales in an anecdotal way, as if he were standing next to you telling you about his travels.

Nabhan values the agricultural legacy of crop genetic diversity and working with the forces of nature that persist from Native American cultures. All modern students of plant breeding are taught the importance of preserving biodiversity to maintain genetic material for breeding resistance and other desirable characteristics into crop species. However, this diversity is maintained and protected elsewhere, far from the fields. Planted seed is kept as homogeneous and free from "off types" as possible. Native American farmers built

diversity right into the cropping systems so that native farming yielded both a crop and a source of diverse germplasm for future crops.

One example is the incredible diversity of corn, both in kernel color and texture, produced by the Tepehuan Indians in Nabogame, Chihuahua, who have been farming the same area for almost 400 years. One of their agricultural techniques is to allow growth of the weedy ancestor of corn, teosinte, in their cultivated fields.

"...Teosinte was tolerated and protected," Nabhan writes, "for it invigorated their corn." Not only does this practice increase yields and improve corn quality, it provides a sanctuary for the growth of this wild plant which has interested plant breeders for decades as a progenitor of corn. Nabhan also shows how diversity in the cropping systems created food supply and habitat for many forms of wildlife.

Nabhan describes how Native Americans' spiritual beliefs and rituals played a role in their agriculture, influencing their agricultural practices as well as their seed selection techniques. In questioning a Hopi woman about her selection technique of corn seed, he asks her whether she would choose large kernels or those of a certain color or from the same location on a cob. Nabhan relates, "The elderly woman listened to my loaded questions, then snapped back at me, 'It is not a good habit to be too picky.... We have been given this corn, small seeds, fat seeds, misshapen seeds, all of them. It would show that we are not thankful for what we have received if we plant certain of our seeds and not others.'"

Though this grower expresses the selection process as coming from her spiritual beliefs, her "acceptance of heterogeneity" in selecting seed is necessary to raise a crop in the highly variable growing con-

ditions found in the deserts where most native agriculture continues today. This principle is important also for temperate region agriculture, though too often ignored by a culture that prefers homogeneity and predictability to the wild reality of nature. Nabhan points out that the practice of planting various strains of a crop in the same field is not so radical an idea nor unique to Native Americans: "Russian grain farmers, European forage growers, and Latin American manioc planters have also discovered the principle of mixtures."

Throughout his book, Nabhan weaves social and cultural issues together with scientific and biological issues. As one example, he illuminates the vital link between the stability of a people's culture and the biological diversity its agriculture supports. This relationship creates a cycle of dynamic stability, which endures because of its ability to change. Nabhan explores and amplifies this idea, originated by [rural sociologist] David Ehrenfeld, in his book. Workers in sustainable agriculture will find confirmation here of the

importance of supporting stable rural communities and may even discover a few more reasons why.

In modern society where science and religion have become so thoroughly divided, the connection between our cultural beliefs and our agricultural practices is seldom explored and barely acknowledged, though it is a significant undercurrent running beneath what we do and why. Nabhan observes: "Desertification is not recognized as evidence of negative feedback from poor practices associated with a certain belief system.... However, some currently existing cultures contend that the way one farms and cares for local resources has everything to do with the spiritual life of the community."

Nabhan's book takes a step toward examining the ethics underlying our agricultural practices, and reminds us that why we do something is just as important as how we do it.

*Reviewed by:*

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## **Ancient Futures: Learning from Ladakh**

Helena Norberg-Hodge, 1992

Sierra Club Books, 730 Polk St., San Francisco, CA 94104. 204 p, cloth \$25.00

Unfamiliar to most people in the West, Ladakh is an intriguing desert enclave high in the Himalayas bordered by Pakistan, China, and Tibet. Now part of the Indian state of Jammu and Kashmir, Ladakh was inhabited for more than a thousand years by people living in semi-isolation but in harmony with the climate and natural resource base. *Ancient Futures* describes this traditional culture, with its bioregional food system based on barley, wheat, peas, turnips, several indigenous food and forage plants, and hardy animals that can withstand the rigors of grazing at 10,000 to 18,000 feet above sea level. Most of the population's building materials, fuel, clothing, food, and other needs traditionally come from their crops, animals, and the natural environment. The culture is based on both Buddhist and Moslem traditions, and the society and local economy have been remarkably sustainable for centuries.

Norberg-Hodge is a Swedish linguist who has spent half of each of the past sixteen years in Ladakh, and is one of the few foreigners fluent in the language. She describes the region's unique traditions, its household and community autonomy, and its equilibrium with the climate and natural resource base. Ladakhi culture recognizes and teaches the fundamental connectedness and interdependence of elements of life, based on long Buddhist tradition. In the preface, the Dalai Lama endorses Norberg-Hodge's analysis of the frugality and self-reliance of Ladakh and the respect of its people for the natural environment on which they depend.

Changes in Ladakh over the past two decades now threaten this centuries-old balance. Norberg-Hodge has experienced first hand the shift from a dependence on local resources to imported fossil fuels, from natural crop production methods to chemical pesticides, and from locally produced foods to processed and imported products. This transformation has exacted a high price. Conversion to a cash

economy has undermined community interdependence and created a desire to accumulate wealth. The effect has been greatest on youth, making them dissatisfied with farming, village isolation, and traditional family values. The society now depends on outside resources, lacks family and community self-reliance, and generates waste and pollution that previously were unknown. Western-style consumerism has destroyed an ecological balance and social harmony that prevailed for centuries in this unique land.

Initiatives are underway to reverse this trend, with both local and international support. Norberg-Hodge explains that the Ladakh Project was founded to encourage "progress toward more ecological and community-based ways of living." It stresses "the urgent need to counter political and economic centralization, while encouraging a truly international perspective through increased cultural exchange" and encourages "a shift from ever-more narrow specialization toward a broad systemic perspective—an approach that emphasized relationship and context rather than isolated phenomena." Specific technologies include trombe walls (passive solar heat collectors), solar cookers and water heaters, hydraulic ram pumps, and simple greenhouses for vegetables. Norberg-Hodge comments that "these technologies make sense economically, environmentally, and culturally. By encouraging a more human-scale and de-centralized development pattern, they actively support traditional structures rather than destroying them." The project has evolved into the Ladakh Ecological Development Group that was inaugurated by Indira Gandhi in 1984 and consecrated by the Dalai Lama.

*Ancient Futures* is valuable reading for its description of a region and an agriculture little known to most Westerners. It also describes the consequences of unplanned development, with unintended ecological, economic, and social harm



accompanying industrialization and reliance on fossil fuels. Most important to people in developed countries, Ladakh provides a valuable model of how people can live in harmony with their climate, their resources, and each other. For anyone concerned about sustainable development, this book is a "must read." For undergraduates or others concerned about the future, it offers a striking

introduction to alternative thinking about development, resources and the environment.

*Reviewed by:*

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## **The Last Harvest: The Genetic Gamble that Threatens to Destroy American Agriculture**

Paul Raeburn, 1995

Simon & Schuster, 1230 Ave. of the Americas, New York, NY 10020. 269 p, cloth, \$24.00

Paul Raeburn's book is not another academic treatise about loss of biological diversity. He does outline the loss of native cultivars and wild species due to introduction of high yielding varieties and disappearance of habitat to development. It is also an interesting, readable, and factual description in human terms of the people involved in farming and in plant breeding today. It's a captivating book that will interest undergraduates in biological, environmental and agricultural sciences; it's accessible approach to a critical but complex topic could easily attract students outside the sciences.

*The Last Harvest* is an articulate and timely description of the consequences of success, defining as well the potential high costs of broadly accepted current technologies in plant breeding. Raeburn illustrates well the writing style of a practiced journalist—he is Science Editor for Associated Press. The book reminds us of other journalists turned environmental analysts: Al Gore's *Earth in the Balance*, and Greg Easterbrook's *A Moment on Earth*. These people know how to write, and how to stimulate interest in the reader!

"Billion-dollar Corn" (Chapter 1) begins with the real-life adventures of botanist Hugh Iltis, a plant explorer who traces the origin of a progenitor of modern maize (corn in the U.S.) to a few small patches of a perennial relative in the highlands of Mexico. This story sets the stage for a combination of science, exploration and discovery, with the intrigue of the search intermingled with a primer on the botany and evolution of maize. Coupled with this explanation is a description of the potential for a perennial maize crop, one that would be planted only once every several years with consequent savings in land preparation and seed cost. The search is qualified with the admonition that "given the accelerating destruction of natural habitats around the globe, it is almost

certain that many valuable food plants are disappearing.... Not only does it represent billions of dollars in losses to farmers; it could mean the difference between survival and starvation for millions of people around the world."

After describing the seminal work of Mendel in genetics and Vavilov in classification and plant distribution, the book launches into a solid critique of the current state of "Seed Banks and Seed Morgues" (Chapter 2). Raeburn first sets the stage for why genetic diversity is so critical for meeting future demands for pest tolerance, then explores the current state of preservation of germplasm in the field and in seed banks. Through in-depth interviews with people managing the banks and using the stored germplasm, the author creates a picture of neglect, lack of funding, and potential catastrophe in the future when it is likely that this material will again be needed by plant breeders. He traces the history of the official storage facilities, and describes in detail the current grassroots efforts by people outside the system who are dedicated to saving this priceless legacy.

"Green Gold" (Chapter 3) provides a record of several valuable plant introductions that led to commercial success in agriculture. Dwarf wheat and rice, pest-resistant grape rootstocks that have crossed the Atlantic and returned. Enhanced protein quality maize illustrates the value of genes to agriculture, raw materials that would have been lost without active preservation of genetic variability. The substantial loss in the U.S. maize crop due to a leaf blight in the late 1960s was solved by use of alternative germplasm and by changing the hybridization practices used for producing seed. The genetic foundation for such a catastrophe is described in Chapter 4, a clear essay on crop genetic uniformity and the basis of why we face a potential crop loss in maize and other crops.

In "One Planet, One Experiment" (Chapter 5) Raeburn discusses the current knowledge about the extent of genetic diversity around the globe and the rate at which it is being lost. We don't really know, nor are we likely to ever know, the true extent of diversity on the planet. Most estimates of the number of species keep climbing with the discovery of new habitats and the creatures, plant and animal, that dwell there. At the same time, massive extinction has occurred in several eras over geological time, and what we observe today may be a human-induced analog of what nature has done several times before, albeit more slowly.

"The Last Harvest" (Chapter 6) describes current modern farming techniques, and how this industry would be affected by various changes in global climate. The author catalogs the most essential growth factors in farming - soil, water, energy, pesticides and fertilizers - and how agriculture will react to changes in availability of these resources in the future. How will we meet the future needs for food? And can we do this and preserve a livable environment for humans? In "Hard Science, Soft Farming: A Way Out?" (Chapter 7) the research programs at the Rodale Research Center on

ecological farming are contrasted with the promises of genetic engineering, emerging technologies that show how genes can be moved around and screening crops can speed the plant breeding process.

Throughout the book, Raeburn personalizes the discussion with reports from interviews, observations from trips, and comments from visits to the places and people who are immersed in this drama. His facts are generally good, although the plant breeder will recognize a confusion of the terms "topcrossing" and "backcrossing," an example of a few noteworthy errors. These do not detract from the message. The exciting style of *The Last Harvest* will attract readers from many disciplines. It is a well-researched and documented plea for greater concern about the future. This could easily be an introductory reading assignment for a beginning class in plant breeding or crop improvement. It's also a useful refresher for those who have been away from plant breeding for some time.

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## **Conservation Policies for Sustainable Hillslope Farming**

Sitanala Arsyad, Istiqlal Amien, Ted Sheng, and William Moldenhauer, Editors, 1992  
Soil and Water Conservation Society, 7515 NE Ankeny Rd, Ankeny, IA 50021. 353 p, cloth \$30.00

*Conservation Policies for Sustainable Hillslope Farming* is based on material presented at the March 1991 workshop, with the same title. The workshop was held in Solo, Central Java, Indonesia and had 180 participants. Although the papers contained in the book are directed toward developing countries, many of the concepts are valid for other areas wishing to effect changes that will move current farming practices in the direction of sustainability.

The book will likely be of interest to government officials, educators and others who are involved in promoting sustainable agriculture. It is divided into sections that discuss policy considerations for national and regional organizations, field organizations, legislation and land tenure, institutions and forestry. The book concludes with discussion group reports.

D. W. Sanders, in the first chapter, suggests a new approach is needed "... if conservation is to be accepted and applied on a wide scale and at reasonable cost." Sanders goes on to say "This is based on promoting land use systems... that can protect from wind and water erosion, increase soil fertility, raise the soil's organic content, and maximize water penetration. ... This offers the incentive of immediate benefits to the land user in the form of higher yields and better financial returns. This point is critical because, ultimately, how a country's land is managed depends on the perceptions and actions of its many thousands of individual farmers, pastoralists, foresters, and other

land users. It is these people who have the ability to bring about fundamental changes in land use. The challenge is to create the conditions that will motivate the desired results." This is the overall theme of the book.

Concerns that often contribute to problems of sustainable land use, and that must be addressed for us to make effective change, include:

- Short term benefits
- Land tenure
- Stakeholder input
- Education and training
- Multidisciplinary approach
- Monitoring of progress
- Legislation and institutional organization
- Adequate financial resources

This book offers methods to address such challenging concerns in a straight forward and effective manner. Most chapters are easy to understand, with only one so technical that it would be hard for the average reader to get through. In addition, the book provides a very good insight into the conservation and farming methods of developing nations. It is recommended to policy makers and those involved in land use planning.

*Reviewed by:*

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## **Dryland Agriculture: Strategies for Sustainability**

R.P. Singh, J.F. Parr, and B.A. Stewart, Editors, 1990

Advances in Soil Science, Vol. 13. Springer-Verlag, 175 Fifth Ave, New York, 10010.

This book follows the series' tradition of serving the international agriculture community. Leading scientists with international experience and expertise analyze and summarize available research information on dryland agriculture and delineate important principles. The book's objectives, as stated in the first chapter, are "not only to address the current state of the art, including research needs and priorities, but also to present new perspectives and strategies to minimize the risks of dryland farming." The selection of topics reflects these objectives. A strength of the book is that the objectives of each chapter are clearly defined and the means used to achieve them clearly documented.

Sustainability of dryland agriculture is extremely important, because arid and semiarid regions have some 700 million inhabitants and cover about 40% of the world's land area, 60% of which is in developing countries. Increasingly, the food required to meet projected population increases in India and the Near East will have to come from dryland agriculture. The book discusses production restrictions imposed by the resource base, and the factors that threaten its sustainability. Increased production in many dryland areas is severely constrained by soils that are fragile, inherently low in fertility, organic matter and water-holding capacity, and susceptible to wind and water erosion.

Because of the overriding importance of water in dryland agriculture, five of 17 articles deal primarily with agroclimatology, or water use, related to agricultural production. One discusses agricultural productivity in semiarid tropics, a second analyzes farm management practices in the Sahel, and a third describes the use of crop simulation models in Australia and central Texas. Four chapters are devoted to tillage and crop residue management, including one on crop

residues in crop livestock systems and another on the effects of residue management on soil organic matter. The importance of soil and water conservation in dryland agriculture is stressed repeatedly, with two chapters dealing with control of wind and water erosion. Other topics covered include: plant disease; methods to overcome spatial variability in research studies; and nutrient cycling. A final summary chapter is concerned with strategies for increasing the productivity and stability of dryland farming systems.

Sustainability, especially long term maintenance of soil productivity, is incorporated throughout the individual chapters, and is an underlying principle in the discussions of production. Topics relevant to this theme include: soil conservation; water quality; management of soil organic matter and nutrients; tillage and management of crop residues. There also is an economic analysis of farm management practices for a specific region, the Sahel.

An inescapable conclusion from these discussions is that relationships among soils, crops, and climate must be considered carefully to correctly apply and evaluate production practices that will be sustainable. A second conclusion is that there are serious constraints on increasing agricultural production in arid and semiarid agriculture while adequately protecting the soil resource. Clearly, the potential for increased production exists, but a great deal of work is needed to achieve it while insuring agricultural sustainability for several of the world's arid and semiarid regions.

The basic principles discussed in the book are important to agriculture in general, not just dryland production in regions of low rainfall. Chapters on case studies and crop simulation models illustrate how information on climate, soils, and crops can be used to evaluate production alternatives in arid and semiarid areas; these

methods also can be applied to areas with more favorable rainfall. Although the book was written for the international agriculture community, it will be of interest to a much wider group, including people in academic institutions and agencies involved in planning agricultural development and environmental protection. It also will serve as a valuable reference for research and graduate teaching not only in the specific topics covered, but also

in the broader areas of international agricultural development and agricultural sustainability.

*Reviewed by:*

*James Swan*

*Iowa State University, Ames, IA*

*Reprinted with permission from American Journal of Alternative Agriculture. 6:190-191. 1991.*

## **Sustainable Agriculture in the American Midwest**

G. McIsaac and W. R. Edwards, Editors, 1994

University of Illinois Press, Hampden PO 4856, Baltimore, MD, 21211. 291 p, cloth \$32.95

The editors of this book have brought together the perspectives of scholars from a variety of disciplines to develop an integrated, historically informed view of natural processes and human activities in the American Midwest relevant to the sustainability of agriculture. This is no small task. The book points out the lack of sustainability of our current industrialized agriculture, shows how we got here, and calls for multidisciplinary solutions that incorporate broader values considerations. This collection should make a worthwhile addition to the growing literature on sustainable agriculture, mainly by providing some detailed reviews and interesting historical accounts. The reviews of Integrated Pest Management (chapter 8), Soil Erosion (chapter 9), and Climate (chapter 10) are particu-

larly thorough. Some of the historical accounts, notably those by Sonya Salamon (chapter 3) and John Thompson (chapter 4), are fascinating stories likely to be new to readers outside the Midwest. The scholarship throughout is generally sound and well-documented. The audience for this book will include well-read lay persons interested in sustainable agriculture and environmental issues, as well as professional academics in both the sciences and humanities.

*Reviewed by:*

*Jon Piper*

*The Land Institute, Salina, KS [currently at Bethel College, Newton, KS]*



## **Exploring the Role of Diversity In Sustainable Agriculture**

R. Olson, C. Francis & S. Kaffka, Editors, 1995  
American Society of Agronomy, 677 S Segoe Rd, Madison, WI 53711. 249 p, paper \$24.00.

Cross-fertilization of disciplines can spawn interesting conceptual breakthroughs and practical solutions to problems which seem intractable from within a single discipline. This book is an excellent example of this potential realized. The authors use multiple disciplinary perspectives to explore the practical consequences of different kinds of diversity on agricultural production processes, and on the people who farm or are affected by farming. It moves beyond a simplistic equation of greater diversity with greater stability to show functional links between the two, ways that diversity can be analyzed, and how it can be designed into agricultural systems.

The presentation of ideas is very clear and accessible, particularly consistent and well-organized for a symposium proceedings with 13 contributors from a range of disciplines. The main disciplinary approaches included are from agronomy, geography, anthropology, and ecology. The authors seldom use jargon, technical language, or mathematical functions; the book does require a basic understanding of ecology.

The editors use a spiral, similar to a cross-sectional view of a chambered nautilus, as a unifying framework throughout the book. This is an effective device to orient the reader to the spatial scale under consideration in each section, while reminding that there are interactions among the levels of analysis. The first chapter introduces the hierarchy of spatial scales which will be examined, definitions and measurement of diversity, and the relationship of diversity to functional aspects of systems. Chapters 2-8 focus on diversity at ever larger spatial scales: from soil microsites to fields, farms, landscapes, human communities, and regional agroecosystems.

The final chapter reviews key insights at different levels of analysis, and suggests that increased diversity at multiple spatial scales will make U.S. agriculture more sustainable.

One of the real strengths of this book is its inclusion of human decision-making and the effects of human diversity on agricultural environments. The chapter on social diversity and community-based environmental problem-solving is pathbreaking because of its juxtaposition with chapters considering diversity in other aspects of agricultural systems. Although the scope of this book is quite broad as is, it could have benefited from a full chapter on global agrodiversity. The elements of agroecosystems on which this book focuses are those which affect biological, economic and social diversity, almost exclusively in the U.S. Greater attention to global diversity of agroecosystems, as alternative coping responses to resource constraints, could provide another key to improving the sustainability of agricultural systems in industrialized countries.

This book is probably most useful to agricultural scientists who want an introduction to ecological and social perspectives on diversity. It would also be of interest to ecologists or social scientists seeking an introduction to the agricultural implications of diversity. It could serve as a supplementary text for an advanced-level college course in agroecology. Beyond relevant content, it illustrates some of the objectives of agroecology through its interweaving of disciplinary approaches.

*Reviewed by:*

*Molly D. Anderson  
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Medford, MA*







## **Crop Improvement for Sustainable Agriculture**

[First Review]

M. Brett Callaway and Charles A. Francis, Editors, 1993  
University of Nebraska Press, Lincoln, NE 68588-0520. 261 p, cloth \$35.00

This book represents volume 4 in the series *Our Sustainable Future*. Over the past decade, there has been increased emphasis on sustainable agriculture and, in some circles, criticism of previous plant breeding efforts for failure to address problems of sustainability. In this book, Callaway and Francis suggest that more emphasis be given to breeding objectives that encompass sustainable agricultural systems and associated cropping technologies. Several notable breeders and geneticists have contributed to this book, and many breeders, regardless of their orientation toward sustainability, will find useful information in the book.

The first four chapters are introductory. In Chapter 1, Francis and Callaway introduce the concept of crop improvement for future farming systems. This is followed by a chapter summarizing the early beginnings of agriculture, contributions from the "Green Revolution," and discussion of the need for a transition to agriculture and plant improvement that address sustainable, low-input systems. In Chapter 3, Goodman discusses choice of germ plasm for breeding for sustainable agriculture. Duvick's pragmatic discussion of the role of seed companies in plant breeding for sustainable agriculture (Chapter 4) was interesting and informative. His take-home messages were that much of what seed companies currently have on the market fill many of the needs for sustainable systems (such as adaptability, pest resistance) and that seed companies may be able to assist in testing germplasm for adaptability to sustainable systems. However, specific needs of some sustainable systems and the small current markets for sustainable agriculture will limit contributions from the major seed companies. The last seven chapters deal with breeding methods and approaches and types of plant improvement deemed important for low-input agriculture.

In Chapter 5, Francis outlines crop breeding objectives and methods for low-input agriculture, many of which are no different than those employed for traditional plant improvement. Discussed are locations and conditions for testing germplasm and the need for continual evaluation and long-term planning for successful plant improvement. Lacking in this chapter or in any of the other introductory chapters was a thorough discussion of problems involving seed increase and distribution and development of markets for new germplasm introduced for low-input agriculture.

Because breeding for insect and disease resistance has been traditionally important to plant breeders, Chapter 6, "Breeding for Resistance to Insects and Plant Pathogens," does not offer any revolutionary insights into this subject. Nonetheless, it is a thorough and well-written summary of different factors involved in pest resistance and of different approaches to achieving host-plant resistance that may be used by breeders. The succeeding chapter, "Crop Tolerance to Weeds," is one of the more original contributions to this book, to a large extent because most breeders have ignored this aspect of breeding. Callaway and Forcella cite several studies on breeding for greater varietal tolerance to weeds. They follow this with a case study of such work on soybeans, and then outline breeding strategies for obtaining greater crop tolerance to weeds.

Brewbaker's lucid discussion of tree improvement for agroforestry systems in Chapter 8 provides interesting and very enjoyable reading. Brewbaker draws on much of his own experiences to describe many of the obstacles in tree breeding and outlines pragmatic approaches for tree improvement. A good list of references is provided at the end of the chapter, but unfortunately, specific citations were not provided in the text.

Chapter 9, "Contributions of Biotechnology to Crop Improvement," provides an overview of the major cellular and molecular technologies likely to contribute to crop improvement in the near future, with an emphasis on these techniques that might have particular relevance to sustainable agricultural systems. Instructors in plant breeding courses may find this chapter a convenient synopsis for introducing some of the concepts and applications of biotechnology.

Quantitative genetics is not my cup of tea, so my first exposure to Chapter 10, "Genotype by Environmental Interaction in Crop Improvement," proved somewhat arduous. Much of the material covered will be more useful to agronomic breeders than to tree breeders or vegetable breeders working with minor crops. Nonetheless, this chapter provides a very thorough coverage of how genotype x environment interactions complicate breeding strategies for crop improvement for low-input agriculture or agriculture on marginal land. Several different statistical approaches and methods for estimating crop stability and performance in heterogeneous environments are discussed, including some useful and simple non-parametric procedures. A comprehensive list of studies is cited, making this a very useful source chapter for breeders.

Chapter 11, "Statistical Design and Analysis in Intercropping Experiments," is a good follow-up to Chapter 10, and is directly relevant to crop improvement for sustainable systems in Third World countries where small-farm agriculture involves mixed planting systems. Evaluating yield and stability of genotypes or mixed genotypes in

low-input agriculture is difficult in itself, but as pointed out by Federer, the complexity of the situation increases by an order of magnitude when introducing a second crop into the equation. This chapter is concise and well-written. It provides some experimental designs available to breeders and also describes some of the pitfalls and limitations of currently available methodology.

I do not recommend this book as a text, but some of the chapters will be useful in plant breeding courses, and it provides some excellent material for those persons involved in crop improvement for low-input agriculture or for breeders contemplating a change in breeding direction toward crop improvement for sustainability. My major criticism of the book is that many parts of the introductory chapters are poorly written and contain statements that are likely to be very controversial to many plant breeders and, as such, may discourage some readers from using the wealth of information available throughout other chapters in the book. Also, even though the focus of the book was on crop improvement for sustainable agriculture, a chapter specifically addressing the role of crop improvement in relation to sustainable cultural techniques, such as integrated pest management, biological controls, legume rotations, compost application, and drip irrigation, would have been desirable.

*Reviewed by:*

*Brent Loy*

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31(3): 484. 1996.*



## **Crop Improvement for Sustainable Agriculture**

[Second Review]

M. Brett Callaway and Charles A. Francis, Editors, 1993  
University of Nebraska Press, Lincoln, NE 68588-0520. 261 p, cloth \$35.00

*Crop Improvement for Sustainable Agriculture* has contributors representing a range of crop-related disciplines that impact the practice of sustainable agriculture. Providing a framework for examining and defining sustainable agriculture, the first chapter introduces the role of crop improvement in sustainable production systems. History of crop improvement in sustainable agriculture is presented in Chapter 2, followed by a discussion on germplasm selection in breeding programs in Chapter 3. Chapter 4 provides a perspective from the commercial seed industry. Formulation of objectives and subsequent design of crop breeding programs for sustainable agriculture are presented in Chapter 5, followed by specific applications of breeding for insect and disease resistance in Chapter 6 and tolerance to weeds in Chapter 7. Applications to tree improvement are presented in Chapter 8. Chapter 9 addresses the potential role of biotechnology in sustainable agriculture. The importance of genotype by environment interaction in crop improvement, with special reference to sustainable agricultural systems, is reviewed in Chapter 10, and, an overview of statistical design and analysis of intercropping experiments in Chapter 11.

Sustainable crop production systems will likely be characterized by reduced pesticide inputs, relatively higher energy costs, more use of crop rotations and multiple cropping systems, and new crops. The first step in any plant breeding program is to define objectives; changes in cropping systems will necessitate changes in breeding priorities. New directions will require breeders to reevaluate choice of germplasm, selection, and testing programs in light of the new priorities established by the requirements of sustainable agricultural practices. For example, breeders may be required to develop a maize genotype that is productive when grown simultaneously with a leguminous

cover crop, or a soybean genotype adapted to relay planting into growing wheat. The book provides insight and discussion into how these and other objectives might best be accomplished.

Choice of germplasm is one of the most important factors determining success in breeding programs. Developing cultivars for sustainable agriculture will likely require sources of germplasm not currently in wide use. For example, no-till planting increases the importance of early-season cold tolerance, so germplasm derived from northern European or Andean sources might provide genetic variability for this trait. Use of popular cultivars grown in areas in which low levels of nitrogen are applied may serve as a source for nitrogen-efficient cultivars in sustainable agricultural systems. However, currently grown cultivars are the result of decades of intensive breeding and selection, and will probably serve as a starting point for future gains in sustainable crop production systems. Breeders know that use of elite cultivars as parents results in a higher probability of success than when non-elite cultivars are used. An exception to this occurs when genetic variation within elite cultivars is exhausted, and breeders must seek new sources of germplasm to continue genetic advance. Need for increased genetic diversity and requirements of cultivars adaptable to sustainable crop production systems will result in greater emphasis on the identification and introduction of non-elite germplasm.

Private seed companies will play an important role in sustainable agricultural systems, but their decisions will be based on the need to remain competitive and profitable. These companies will invest resources in proportion to anticipated sales and market size. Small seed companies, efficient at meeting the needs of niche markets, may be the first to actively market products targeted for sustainable systems. These might include cultivars

from public institutions, developed for specific cropping situations. Larger companies could contribute to sustainable agriculture by conducting on-farm tests, increasing genetic diversity of breeding populations and germplasm accessions, and providing unbiased information to farmers on emerging crop production practices. Some advocates of sustainable agriculture are concerned that growing alliances between seed companies and the petrochemical and biotechnological industries will result in reduced competition and choice of products; this issue was not discussed.

Future cropping systems will likely be characterized by decreased reliance on pesticides, which will increase the importance of host-plant resistance. Host-plant resistance offers advantages of economical use by the farmer and ease of adoption with virtually no additional technology or equipment. Disadvantages include the relatively long time required to develop resistant cultivars and, in many cases, the inability to obtain a satisfactory level of resistance. Nevertheless, host-plant resistance provides an attractive alternative to use of high levels of pesticides. Crops thought to be genetically vulnerable to disease, due to widespread use of a few parental lines, would benefit from the infusion of genetic resistance from non-elite sources. Finally, durable or multiple gene resistance, less likely to be overcome by selection for virulence in pest populations, will play an important role in stabilizing pest populations.

Reduced reliance on herbicides will result in increased crop-weed competition. However, cultivars of a given species differ in their tolerance to weeds, which could be used to identify cultivars adapted to sustainable crop production systems. Tolerance to weeds could be classified as either tolerance to associated crops (multiple cropping) or tolerance to plants of the same species (single-species mixtures). A case study using soybeans is given in which traits determining competitive ability are identified, followed by the improvement of leaf expansion rate through selection. The optimal testing environment for weed tolerance should have both a wide range of application and be easily established. Questions raised include whether or not one weed species might serve as a tester for

other species. Understanding crop by weed interactions will require use of statistical methods currently used to assess the interaction of genotypes with locations and years.

The two principal ways biotechnology will contribute to sustainable agriculture will be to increase the efficiency of selection and to create new forms of genetic variation. Increasing selection efficiency will result from technologies such as marker assisted selection, in which selection is performed on molecular markers linked to economically important traits. Additionally, markers can be used to assess genetic diversity at the molecular level. New forms of genetic variation are being created using transformation and tissue culture, in which genetic material is transferred across different species. Once this new variation is incorporated into a species, it can be transferred to other cultivars using conventional breeding methods. Herbicide resistance in crop species represents one accomplishment in this area.

The inherent complexity of sustainable agricultural systems, including associations with multiple crops, genotypes, and cultural practices, implies increasingly complex genotype by environment interactions. Genotypic performance may be of interest under a wide array of crop rotations, stress conditions, and levels of inputs. One cannot assume that a genotype exhibiting stability under one cropping system will demonstrate stability under a different one. Additionally, simultaneous selection for performance and yield stability may be desirable.

The final chapter discusses the design and analysis of intercropping experiments. The author's treatment is not overly statistical, and terminology and concepts unique to analysis of multiple cropping experiments are introduced. It is noted that dependent variables such as land utilization, economic value, or nutritional value may be of primary interest. The concept of land equivalent ratio, a measure of intercropping efficiency, is introduced. Additional statistical theory for multiple cropping experiments is needed.

*Reviewed by:*

*Steve Dofing  
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## **Ecology and Integrated Farming System**

D. M Glen, MP Greaves, and H.M. Anderson, Editors, 1995  
John Wiley & Sons, 605 Third Ave., New York, NY 10158. 329 p, cloth \$95.00

This book is a compilation of the proceedings of the 13th Long Ashton International Symposium entitled, "Arable Ecosystems of the 21st Century," held at the IACR-Long Ashton Research Station, Bristol, UK, 14-16 Sept. 1993. The papers that make up this monograph focus on various aspects of integrated systems. Topics include public policies related to integrated farming; plant diversity and integrated weed management; crop-weed interactions; relationships between soils, crops, and habitat of insect pests; diversity in farming landscapes; environmentally friendly nutrient management; as well as results of ongoing integrated farming systems studies. Emphasis is on European and North American ecological studies relevant to integrated arable farming systems.

Although most of the studies are oriented toward European agriculture, much of the information in this book provides a refreshing approach to examining the ecological aspects of agriculture in the USA. Researchers interested in sustainable agriculture will find the approaches of examining different aspects of land-crop-weed-pest interactions useful in developing and evaluating agricultural systems.

The editors have put the 18 papers in this book together in chapter form. Since each individual paper can stand alone, their titles, authors, and location are listed below in the order that they appear in the book:

- "Integrated Agricultural and Environmental Policies in the European Community" by A.E. Nychas of the Commission of the European Communities, Directorate General for the Environmental, Nuclear Safety and Civil Protection, Brussels, Belgium.
- "Plant Diversity in Arable Ecosystems" by R.L. Hall of the Department of Plant Sciences, University of Oxford, UK.
- "Integrated Weed Management" by G.W. Cussans of IACR-Rothamsted, Harpenden, UK.
- "Crop-Weed Interactions: Quantification and Predictions" by L.A.P. Lotz, J. Wallinga, and M.J. Kropff of the DLO-Research Institute for Agrobiology and Soil Fertility, Wageningen, the Netherlands, and the International Rice Research Institute, Manila, the Philippines.
- "Weed Control in Organic Farming Systems" by J. Rasmussen and J. Ascard of the Danish Ministry of Agriculture, Department of Weed Control and Pesticide Ecology, Slagelse, Denmark, and the Swedish University of Agricultural Sciences, Department of Agricultural Engineering, Section of Horticultural Engineering, Alnarp, Sweden.
- "Ecological Theory, Pest Problems, and Biologically Based Solutions" by D. Pimental, Department of Entomology, Cornell University, Ithaca NY.
- "Effects of Soil Management on Cereal Pests and Their Natural Enemies" by D.A. Kendall, N.E. Chinn, D.M. Glen, C.W. Wiltshire, L. Winstone, and C. Tidboald of the Department of Agricultural Sciences, University of Bristol, IACR-Long Ashton Research Station, Bristol, UK.
- "Plant/Insect Interactions in Farmland Habitats: the Utility of Seed-reducing Insects in the Suppression of Alien, Woody Weeds" by V.C. Moran of the Science Faculty, University of Cape Town, South Africa.
- "Habitat Management for Enhanced Activity of Natural Enemies of Insect Pests" by S.D. Wratten and H.F. van Emden of the Department of Entomology and Animal Ecology, Lincoln University, New Zealand, and School of Plant Sciences, University of Reading, UK.

- “Perspectives from an Experimental Study of Habitat Fragmentation in an Agroecosystem” by R.D. Hot, D.M. Debinski, J.E. Diffendorfer, M.S. Gaines, E.A. Martinko, G.R. Robinson, and G.C. Ward of the Department of Systematics and Ecology, University of Kansas.
- “Landscape Ecology of Insect Movement in Arable Ecosystems” by G. Fry of the Norwegian Institute for Nature Research, The Norwegian Agricultural University, Norway.
- “Farming Landscapes and Insects” by F. Burel and J. Baudry of the CNRS, Laboratoire d'Evolution des Systemes Naturels et Modifies, Universite de Rennes, France, and the Institut National de la Recherche Agronomique, SAD Armorique, France.
- “Spatial Aspects of Animal and Plant Distribution in Pateley Farmland Habitats” by J.N. Perry of the Farmland Ecology Group, IACR–Rothamsted, Harpenden, UK.
- “Ecological Aspects of Integrated Farming” by A. El Titi of the State Institute for Plant Protection, Stuttgart, Germany.
- “Development of Ecological Nutrient Management with Pilot Organic Farms” by H. Kloen and P. Vereijken of the DLO–Centre for Agrobiological Research, Wageningen, the Netherlands.
- “Bridging the Gap between Environmentally Acceptable and Agronomically Desirable Nutrient Supply” by A.P. Whitmore and M. Van Noordwijk of the DLO–Research Institute for Agrobiology and Soil Fertility, Haren, the Netherlands.
- “Ecological Aspects of SCARAB and TALISMAN Studies” by M. Hancock, G.K. Frampton, T. Cilgi, S.E. Jones, and D.B. Johnson of the ADAS Boxworth, Boxworth, Cambs, UK, Department of Biology, University of Southampton, UK, and the School of Biological Sciences, University of Wales, UK.
- “Less-intensive Farming and the Environment: an Integrated Farming Systems Approach for UK Arable Crop Production” by V.W.L. Jordan and J.A. Hutcheon of the Department of Agricultural Sciences, University of Bristol, IACR–Long Ashton Research Station, Bristol, UK.

Although this book could be used as a text for advanced courses in crop production or crop ecology, it would not be suitable for undergraduate courses. Because the book's orientation is to the interactions between various components of the agricultural landscape and ecology, this book will make an excellent reference for researchers in agroecology and sustainable agriculture.

*Reviewed by:*

*Larry J. Cihacek*

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*Reprinted with permission from the Journal of Natural Resources and Life Sciences Education 25:180-181. 1996.*



## Our Sustainable Table

Robert Clark, Editor, 1990

North Point Press, 850 Talbot Ave., Berkeley, CA 94706. 176 p, paper \$10.95

*Our Sustainable Table* is unlike any of the other books in this bibliography, but is, I think, one of the most inspiring. These wonderful essays originally appeared in a 1989 issue of the *Journal of Gastronomy*, and were reprinted in a more accessible volume by North Point Press. Robert Clark, the editor of the *Journal* and the volume, is one of a number of gastronomes who, along with hundreds of chefs and restaurateurs around the country, are playing a central role in presenting the benefits of eating locally and sustainably to the American public. Clark situates them as part of the "agriculture reform community," and several essays here (Clark's preface, and Alice Waters' recounting of her pioneer efforts in the early 1970s to search out the "freshest and finest" ingredients for her Berkeley restaurant) support his claim.

Yet all the other authors are verified members of the same community, and as importantly, some of the best writers around. Paul Gruchow, Gretel Ehrlich, Mark Kramer, Wendell Berry, and Will Weaver contribute literary gems on agricultural topics. Gruchow offers a memoir of his father, the self-reliant farmer; Ehrlich describes her experiences in holistic resource management. Kramer reprises part of his classic book *Three Farms* in a superb analysis of the severed relationship between farmers and the rest of the population. Wendell Berry's essay on "the pleasures of eating" is one of the best in the book, full of useful ideas and *bon mots*. Will Weaver's short story on gleaning deals with hunger, aging, and pride in a subtle and thought-provoking way.

The other essays also offer much of literary and intellectual value. Using quite different styles, Edward Behr, Anne Mendelson, and Bruce Brown respectively document and lament the demise of

farms in Vermont, apples throughout America, and salmon in the Columbia River basin. The latter two pieces are referenced and all include some useful history. Gary Nabhan's well-referenced essay is also a history, as well as a description of the connections between food and health, and the perils of the abandonment of culture.

The two final articles in the volume, by Wes Jackson and Frances Moore Lappé, address a number of issues related to our present assumptions and visions of agriculture, as well as barriers to the development of a more sustainable system. They echo more explicitly the problems identified by the other authors, and together chronicle the challenges for the "agricultural reform community." In fact, the last section of the book is a resource directory of books and organizations that, as of 1990, had begun the effort.

Many of the writers featured in this collection have authored volumes of their own and will be read in their fuller versions. But these essays stand apart in their distillation of theme and language, and can be read as much for pleasure as for education. I can't think of any volume where a few pages touch on so many parts of the total food system, and whet the appetite for more information and involvement.

I highly recommend the book for use in mainstream and alternative agriculture courses, as inspiration for those engaged in this difficult work, and for anyone in the general public who cares about good food and good writing.

*Reviewed by:*

*Kate Clancy*

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Greenbelt, MD (formerly Syracuse University)*







## **The Dairy Debate: Consequences of Bovine Growth Hormone and Rotational Grazing Technologies**

William C. Liebhardt, Editor, 1993

Sustainable Agriculture Research and Education Program  
University of California, Davis, CA 95616. 372 p, paper \$31.50

Two important recent developments in combinant bovine growth hormone dairying have been the availability of recombinant bovine growth somatotropin (rBGH, also called bovine somatotropin, or bST), and the growing attention paid by farmers and researchers to intensive rotational grazing (IRG). The former is more controversial and has been more in the news. However, the latter is very significant because it involves a major shift in how we think about the role of livestock in sustainable agricultural systems. For years many people have believed that reducing the role of livestock products in our food system would make our agricultural system more sustainable because more resources are consumed in meeting nutritional needs through livestock products than by nutritionally equivalent crop products. However, IRG, which is probably the most successful sustainable system today in rain-fed temperate areas by both economic and environmental criteria, is a livestock production system. This success has prompted a long-overdue reevaluation of the role of livestock in sustainable agriculture.

An interesting reflection on the rise of IRG is the volume *The Dairy Debate*, perhaps the first book on North American sustainable agriculture to focus exclusively on livestock. However, it is devoted more to rBGH than to IRG itself. Why so? The book is structured around a comparison of the "relative merits of [these] two distinctly different technologies being promoted for dairy farmers" (p. ix). The authors of most chapters in *The Dairy Debate* make this comparison by conceiving rBGH and IRG as alternative paths of technological change that will have collective social, economic, and environmental impacts. Given the collective nature of the decisions that will be made about using these two technologies, the authors aim to assemble a

base of data that will prompt farmers and public policymakers to grapple with the long-term social and environmental implications of rBGH and IRG.

Before commenting on the book as a whole and its individual chapters, I should note that this material became very controversial well before the book was published. Liebhardt published a two-page summary of the book in the Winter 1992 issue of *UC Davis Magazine*, the university's alumni magazine. In the article he stressed that rBGH and IRG are not merely individual technologies, but also collective social choices. He also placed considerable emphasis on problems with rBGH technology. The next issue of *UC Davis Magazine* (Spring 1993) included an article and three letters that attacked Liebhardt and his research, in a way seldom seen in an alumni magazine. Because the critics included the Dean of the College of Agriculture, the Associate Dean for Cooperative Extension, and the Chair of the Department of Animal Science, this outpouring looked like the land-grants' wagon again. This response by college officials to Liebhardt's work prompted a further round of 13 letters published in the Summer 1993 issue of the magazine. The writers of these mostly angry letters, including UC-Davis faculty members, extension specialists and agents, and farmers, either protested the treatment of Liebhardt by college notables or defended his approach.

*The Dairy Debate* consists of eight chapters and a useful six-page executive summary. It is very interdisciplinary, with its authors including a nutritionist, two veterinary scientists, three agronomists, two economists, a political scientist, and a freelance writer. But despite the diversity of the authors, the book largely has a coherent argument. Gail Feenstra, for example, marshals impressive evidence from several surveys that have

consistently revealed that consumers are likely to resist rBGH-produced milk products, which could be a significant threat to the milk market. David Kronfeld's long, technical paper emphasizes some shortcomings of rBGH and the risks it may pose to public health, such as indirectly increasing use of antibiotics required to control the higher incidence of mastitis among rBGH-treated cows. Articles by Liebhardt and by William Murphy and John Kunkel report case study results from farm-level experiences with IRG. Edward Rayburn's chapter makes the case that rBGH technology, by reinforcing confinement feeding and encouraging large-scale dairying, will compare poorly with IRG with regard to water pollution, soil erosion, and other environmental criteria. David Campbell argues that IRG is superior to rBGH in its effects on the structure of dairy production and therefore on agricultural communities.

The paper by Bees Butler and Gerry Cohn on the economics of rBGH and IRG differs considerably in tone from the rest. These economists do not come down strongly on one or another side of the "dairy debate," but instead confine their argument to demonstrating that IRG is a viable technology that economically is at least as promising as rBGH. But, the overall message of the book, summarized in the Executive Summary and Kathleen Byrnes' concluding paper, is that IRG is more sustainable, more socially just, and less risky than rBGH. This is the socially preferable collective choice.

The UC-Davis officials who felt the need to ridicule Liebhardt did, however, raise one important question in assessing *The Dairy Debate*: Is it meaningful to present the issue as a choice *between* rBGH and IRG? The alumni magazine article co-authored by the UC-Davis Associate Dean for Extension, the Chair of Dairy Science, an Extension nutritionist and, interestingly, Bees Butler, noted that Liebhardt has "offered consumers an imaginary

choice .... Rotational grazing is an alternative to confinement feeding, not to the use of bST."

Liebhardt's administrative colleagues have made a good point here. rBGH and IRG are not, strictly speaking, alternatives, in the sense that a farmer would choose one over the other to solve a particular production problem. The authors of *The Dairy Debate* would have done well to explain more precisely the ways in which rBGH and IRG do and do not represent a meaningful choice. I suspect that ultimately Liebhardt and Company are correct. Five or ten years from now we are likely to find that in practice there will be few dairy farmers who use both rBGH and IRG. That is, farmers mostly will have chosen one over the other as a way to enhance profitability or respond to environmental concerns. Also, public policymakers are now making at least an indirect choice between the two, as when dairy science departments decide to emphasize one over the other in their extension programs or in allocating their research herds and experiment station plots.

*The Dairy Debate* is a very useful overview of current data and literature on two important emerging technologies in dairying. It should be on the bookshelf of anyone interested in the future of dairying or in IRG. Even more important, it provides a glimpse of something we need much more of in the land-grant system: interdisciplinary *ex ante* assessments of emerging technologies. I particularly admire the notion by Liebhardt and associates that emerging technologies should be assessed comparatively, since juxtapositions can best help policymakers, scientists, farmers, and citizens make more informed choices.

*Reviewed by:*

*Frederick H. Buttel*

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*Reprinted with permission from the American Journal of Alternative Agriculture 9:88-89. 1994.*



***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter VII***

***Introduction***

**Lessons from Farmers and Others**

A catchy title such as *Farmer First*, or value-laden title such as *Good Farmers*, or the earthy title *The Real Dirt* tend to attract people who want down-to-earth reality and practical recommendations, just as they tend to push away the scientist who is dedicated to 'objective pursuit of the truth.' Other titles such as *Holistic Resource Management* and *Future Harvest* are compelling enough by themselves to stimulate the reader to pick them up for consideration. And who could resist such a marketing ploy as *How to Make \$100,000 Farming 25 Acres?* These are all a part of the emerging lexicon of sustainable agriculture for the 1990s. In this chapter we explore some of the books written by farmers, or for farmers, providing examples of what is emerging from the applied and highly practical end of the sustainability spectrum.

*Holistic Resource Management* (1988) is the touchstone of a new movement in the U.S., Australia, and elsewhere. Based on the pioneering work of Allan Savory, this approach to setting goals and using resources wisely to help meet those goals has spawned a new school of training materials, workshops, and farmer organizations that meet to consider common challenges and agricultural practices. Although the initial focus is on rotational grazing for ruminants, the relevant spin-offs for all types of agriculture and other enterprises are substantial. Books from the temperate zone (*Sustainable Management Practices for the Nineties*, 1992) and from the tropics and subtropics (*Good Farmers: Traditional Agricultural Resource Management in Mexico and Central America*, 1988; *Tapado: Slash/Mulch*, 1994) provide much common sense advice based on farmer experience and generations of trial, error, and discovery. *Farmer First: Farmer Innovation and Agricultural Research* (1989) by Robert Chambers and colleagues, has been widely cited as a practical resource for farming systems research and extension – a primer for participatory development. The basic thesis is that farmers know what their problems are, and often how to solve them.

Lessons from individual farmers provide the highlights for several books in this chapter. *Pastured Poultry Profits* (1993) describes in practical detail the journey of Joel Salatin and his family in Virginia toward greater involvement with marketing a specialty product, home-grown and range-fed poultry, that has now led to a ready list of buyers for other products who really form a type of cooperative consumer family. This is a group truly interested in how their food is produced, under what conditions, and for whose benefit? In addition to selling poultry and other items, Salatin has written this book, produced a video, and responds to speaking engagements across the country to describe what his family has done. No less impressive is Booker Whatley's *How to Make \$100,000 Farming 25 Acres* (1987). Well known for his association with the president of Dominos Pizza, Whatley is an accomplished communicator who generates energy

in the pages of this fascinating appeal to people who are willing to become entrepreneurs and begin to control their own futures. We can all learn from his business acumen and focus on values as well as the customer.

The Midwest cereal, soybean, hay crop, and livestock industry is well represented by alternative farmer Jim Bender of Weeping Water, Nebraska. *Future Harvest: Pesticide-Free Farming* (1994) describes Bender's highly diverse, certified organic crop/livestock operation in the hilly, rain-fed region of the Western corn belt. His management of weeds and soil fertility through rotations among more than a dozen cash, forage, and cover crops serves as an outstanding model of what can be done with a tight conservationist philosophy and careful planning. Bender's articulate description of cropping and livestock integration, as well as a comprehensive defense of the organic farming philosophy, stand in stark contrast to the mainstream farmers in his area.

In *Switching to a Sustainable System* (1988), North Dakota farmer Fred Kirschenmann discusses the potentials and complications of embracing an organic farming approach. Dick and Sharon Thompson of Boone, Iowa have been leaders in the growing arena of on-farm research. In *Alternatives in Agriculture* (1996) they describe experimental research on tillage, weed and fertility management that has brought over 25,000 people to their farm over the past decade.

Other descriptions of farmer practices and strategies are found in Carmen Fernholz' prescriptive *Sustainable Management Practices for the Nineties* (1992), along with the plea for cooperation among producers. Mike Irwin' s *From the Ground Up* (1992) tells the stories of several farmers who have been active in the sustainable Agriculture Demonstration Program in Wisconsin. *The Real Dirt: Farmers Tell About Organic and Low-Input Practices in the Northeast* (1994) comes from a Sustainable Farmers Network in that region; a description of traditional practices used historically as well as today by small farmers is found in *Tapado: Slash/Mulch* (1994, a similar perspective from Central America). Practical guidelines for farmers are summarized in *50 Ways Farmers Can Protect Their Groundwater* (1993), a publication from Illinois Cooperative Extension. Common to these books is telling the story from the farmer's point of view, often in cooperation with research or extension specialists who have learned to respect conventional wisdom. Finally, *Farming in Nature's Image* (1992) provides a creative approach to learning from nature, rather than managing or subduing her. Laura DeLind's opinion article, "Organic Farming and Social Context" (1994), provides insight on specialty crops and markets. In all these approaches, there are unique lessons to be learned.

A global perspective on how lessons at the national scale can be assembled into an initiative for development is described by Huey Johnson in *Green Plans: Greenprint for Sustainability* (1995). He brings together ideas from Netherlands, New Zealand, and Canada into a comprehensive plan for the U.S. Thus lessons can come from innovative farmers and others, as well as future-oriented governments, that are thoughtfully focused on real long-term challenges for the production of food and for a sustainable society.

**Charles Francis and Gabriel Hegyes**



## **Holistic Resource Management**

Allan Savory, 1988

Island Press, 1718 Connecticut Ave. NW, Suite 300, Washington, DC 20009. 564 p, cloth \$47.50

Allan Savory, born in Southern Rhodesia, will continue to have great impact on world wide agriculture. His background includes wildlife management, politics, and the military. He is a student of using all available resources. Savory will probably be best known for his "Holistic Resource Management Model."

The model is goal directed. Allan Savory considers what he calls ecosystem foundation blocks: succession, water cycle, mineral cycle, and energy flow. The model identifies the tools (rest, fire, grazing, animals, living organisms, technology, human creativity, money, and labor). He considers human creativity to be the most important. Each of these tools is evaluated by two guidelines: testing and management. The testing includes: whole ecosystem, weak link / gross margin analysis, cause and effect, marginal reaction, energy / wealth source and use, and society and culture. With management several things are considered: time, stock density, herd effect, population management, burning, flexibility, strategic, tactical, operational, biological plan monitor, control, replan, organizational personal growth, dollar plan, and dollar replan after monitoring.

Savory has conducted whole ranch seminars with thousands of ranchers and farmers. In order to make a greater impact on more people, especially to the young, he wrote this book to spread his knowledge. The Savory Grazing System is a grazing system that uses his goal-directed Holistic Resource Management (HRM) Model.

The Savory Grazing System pays special attention to proper stock density, animal hoof action, and rest. The system usually divides large pastures into

many small paddocks. The Savory Grazing System has contributed to what we now call Management Intensive Grazing or Short Duration Grazing. These grazing systems are usually goal-driven, also.

The grazing system has continually resulted in lower costs of production, more production per ranch unit, and greater environmental stability.

Island Press says this about the book:

"In a monumental and provocative presentation, Allan Savory addresses the question of why—despite universal efforts to halt 'desertification'—land, air, and water resources, along with many forms of plant and animal life, continue to deteriorate at an alarming rate through our planet. Conventional approaches utilizing modern technologies have failed and the health of our ecosystem has degraded."

"For more than thirty years, first in his native Zimbabwe and then in the United States, Allan Savory has worked to find a management approach that would provide the tools to meet this global environmental challenge. The result, presented here for the first time in book form, is a comprehensive planning model that treats people and the environment as a whole."

HRM is a movement. It is as close to answering the sustainable agriculture call as I know. I highly suggest anyone interested in sustainable agriculture should read and apply this book.

*Reviewed by:*

*Terry Gompert*  
*University of Nebraska, Knox County, NE*





## **Sustainable Management Practices for the Nineties**

Carmen M. Fernholz, 1992

A-Frame Press, RR #2 Box 9A, Madison, MN 56256. 100 p, paper \$15.00

Innovative Midwest farmers are among the best sources for ideas and resource-conserving practices in tomorrow's agriculture. In *Sustainable Management Practices for the Nineties*, Carmen Fernholz describes why he is a proponent of sustainable agriculture and summarizes the types of practices that will characterize his farming program for the next decade. Fernholz farms 300 acres with crops, with a 60-sow farrow to finish swine operation to add value to his basic grains. His diversified farm depends on a number of sophisticated practices that link ecology with agriculture. They are presented in a down-to-earth style that will attract other growers as well as those involved with the technical side of production.

In defining sustainable agriculture, Fernholz reviews several information sources and concludes that sustainable practices must include reduced use of non-renewable resources, greater reliance on resources already on the farm, and increased interaction between the farmer and the land. He has been closely involved with various associations in Minnesota as well as with the Rodale Institute on-farm research network.

Based on his work and presentations he has summarized some current thinking about farmers' concerns and needs:

- farmers want to be involved
- producers have experience they are willing to share
- information is greatly needed including review of older results
- communication among producers is essential
- people, too often, fail to understand how sustainable agriculture fits into today's realities

Fernholz would find little disagreement from the conventional farming community with his list in the first chapter of essential techniques for profitable and environmentally sound farming today: regular

soil tests; efficient use of on-farm resources; crop rotations; high level of management; use of innovation and technology; and diversity of enterprises and approaches. In the second chapter, he outlines a process for setting goals and quotes Marty Strange, "Sustainable agriculture is a goal, not a fixed technology, but an ever-evolving approach to farming that changes as the body of knowledge grows about ecosystems and agriculture." Fernholz suggests that evaluating management should include profiles of variable costs/acre, pesticide usage, crop performance, and energy/capitol/labor used on the farm. As an example, he suggests comparison of a farmer's own production profile with the state averages, or with a comparable "control group," that is relevant for a smaller area. He emphasizes the importance of setting realistic goals and examining where time and investment will give the greatest returns, consistent with the broader goals of the family.

The balance of the book (six chapters) deals with specific sustainable practices that Fernholz has found valuable in the management of his operation in Minnesota. He outlines the importance of soil tests and management of nitrogen to provide what is needed by the crop while not loading the field with excess that will become a problem through leaching or erosion. Soil tests and careful budgeting are key to the fertility program. Legumes are a vital component of rotations. Fernholz clearly defines the importance of weed management, and the various options available to reduce herbicide application and overall costs. Rotations, planting dates, and scouting all play a role in this process. He describes the complexities of providing adequate fertility for crops when livestock are not integral to the farm operation, as well as how to manage manure well when it is available. Cultivation in row crops as an alternative to chemical herbicides receives attention in a chapter dedicated to timely use of the rotary hoe and the cultivator.



Finally, Fernholz concludes with a chapter on the potentials of double cropping annual alfalfas with cereals interseeded in the spring (more frequently called intercropping in the technical literature). He describes the new advances in genetic materials that make innovative cropping practices possible, and the importance of on-farm research to find location specific recommendations that are most profitable and appropriate for each farmer's operation.

This book is a delightful summary of one farmer's quest for sustainability, from the sorting out of definitions to setting goals. The process leads to recognizing opportunities to reduce costs of inputs

to working with the environment to produce crops and livestock in an ecologically sound manner. This primer is recommended reading for students, producers, and people interested in the environmental dimensions of food production. It is a brief but powerful summary of how today's innovative producers are seeking viable farming practices for the future.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*



## **Farmer First: Farmer Innovation And Agricultural Research**

Robert Chambers, Arnold Pacey, and Lori Ann Thrupp, Editors, 1989

Intermediate Technology Publications, London, and The Bootstrap Press, New York, NY, 218 p, paper \$23.50

*Farmer First* is a compilation of papers written by a veritable Who's Who in small-scale agricultural development. The book is directed toward all who work in technology development in the Third World, but it would provide food for thought for professionals working in technology development in more advanced countries as well. This problem-solving approach is presented as complementary to, not a substitute for, the top-down, discipline-driven approach to technology development now common in most of the world.

The book is divided into four parts. The first is a compilation of cases showing how small-scale farmers experiment and innovate on their own. It stresses the importance of indigenous technological knowledge (ITK) for information generation by scientists and technical workers. Included is a convincing discussion by Dianne Rocheleau and others of the importance of ITK in agroforestry research because of the large number of species available and their long life cycles and the implications these have for designing formal agroforestry experiments.

Part 2 is based on the argument that many professionals assume they know what farmers want and need, but are often wrong. It describes approaches and experiences that illustrate how to help farmers participate in diagnosing problems and choosing research priorities. Roland Bunch argues that this is not a one-time process, but rather a continuing need as biophysical and socioeconomic conditions change. Louk Box makes the important point that farmers in the farmer-first approach are talked *with*, not talked *to*. Throughout this section, it is acknowledged that social scientists play a key role in developing the necessary dialogue with farmers.

Practical ways in which farmers can participate in on-farm research are the subject of Part 3. Again using case studies for illustration, methods are discussed for selecting problems to be studied, treatments (technologies) to be tested, and appropriate evaluation criteria for judging results. To enhance diffusion, most emphasis is given to group rather than individual farmer participation.

Part 4 treats the institutional changes and actions required for technological innovation that is "farmer pulled" (informal R&D) rather than "scientist pushed" (formal R&D). It is recognized that appropriate changes not only are difficult to achieve, but once achieved tend to revert to the more formal structure. "For professionals to innovate by working in the farmer-first mode demands vision and leadership on the part of those with power and responsibility... Leaders can act like normal professionals and normal bureaucrats who simplify, standardize, and stifle; or they can break out, encourage, and support, initiative and change."

The editors have attempted to arrange the book to be used as a text. However, to me it seems more useful as a reference and source of ideas. This is reason enough for it to be made widely available to its intended audience—"all concerned with agricultural research, extension and development regardless of discipline, profession or organization"—as well as university and technical school students.

*Reviewed by:*

*Peter Hildebrand*

*University of Florida, Gainesville, FL*

*Reprinted with permission from the American Journal of Alternative Agriculture 6:150, 1991.*





## **Good Farmers: Traditional Agricultural Resource Management in Mexico and Central America**

Gene C. Wilken, 1988

University of California Press, 2120 Berkeley Way, Berkeley, CA 94720. 302 p, cloth \$58.00, paper \$15.95

Gene Wilken has produced a book that is a valuable contribution to our understanding of the role that local, indigenous knowledge plays in meeting the demands for food, feed, and fiber in much of the developing world today. This information is of immediate importance. Traditional farming systems are rapidly changing in all areas of the world as economic, social and political pressures and the availability of new technologies promote the increased adoption of modern agricultural practices. Ecologically-sound, locally-adapted production based on local inputs is being replaced by an increasing dependence on costly external purchases in order to maintain productivity. Many authors have called for either the study or preservation of traditional practices, but very few authors have had the opportunity to go into the detailed, first-hand analysis shown here by Wilken. Even fewer have made this information so readily available to a broad audience.

Organized into thirteen very readable and abundantly illustrated chapters, this book reviews traditional agricultural resource management in Middle America. Examples are from his own extensive field work, mostly in Mexico and Guatemala, and emphasize sophisticated, labor-intensive methods that demonstrate the potential of traditional technology. He presents data that are both descriptive and quantitative, providing the reader with an excellent balance between a general overview and a detailed research report. Most importantly, his evaluation of each resource management system is based less on yield output data, and more on the farmers' evaluations of appropriateness for local environments, resources, and cultural preferences. Wilken's own opinion on how or why each system functions is evident, but it is refreshing to be able to see and hear his point of

view balanced (and on occasion even contradicted!) by the farmers' opinions as well.

Each chapter examines a different resource and its management. The initial focus on energy quickly points out how traditional systems are almost unique in today's agriculture with their ability to utilize the renewability of human energy. Soil resources are then examined, from intricate local classification schemes to the use of organic and inorganic amendments for soil management. The values of cover-crops, manures, and rotations are gained from their practice, rather than having to be relearned as they are in much of the developed world today. Two chapters examine the complexity of slope and soil surface management systems that have been developed by traditional farmers. Check dams, terraces, raised beds and mounds all form part of a set of practices used in Middle America. The patience with which individual farmers continuously manage such systems is truly phenomenal.

The largest section of the book is devoted to an analysis of the management of water resources. Water is deliberately managed to take full advantage of everything from intermittent rainfall to more permanent surface and subsurface systems. Both the excess and the lack of water are examined. The engineering involved in the construction of the *galeria* tunnel system in Puebla, Mexico, for example, is to be marveled, as well as the complex social structure that is needed to keep it going. It's no wonder that modern agricultural development specialists, with training that rarely includes such complexity, have had such little luck in these regions. Two final chapters focus on many of the intricacies of microclimate and space management, again revealing a considerable depth of understanding of the intricacies of environmental management to be found in traditional systems.

Wilken concludes by discussing the future of traditional agricultural resource management.

Although he stated initially that it was not his purpose with the book to dispel myths about traditional agriculture, several management strategies come away very scarred by his treatment. For example, although traditional farms have little capital equipment, the labor invested in structures for managing resources may be substantial. Labor may actually be expended to save labor. Traditional agriculture is also not purely an ecological operation. Social and economic components can be extremely complex, and the practices can be abandoned if those components change. Traditional management methods are also not just preserved anachronisms of dubious value from the past. Instead, they are agronomically and ecologically sound, based on a thorough understanding of local conditions and plant requirements, and deserve close examination by the scientific and development communities.

Wilken willingly admits that his book only examines a limited part of the world where

traditional agriculture is practiced. He also admits that he doesn't cover that region all that well, with each localized river drainage system often holding its own particular set of practices. It is important to realize that it is not the practices themselves that can be generalized. Each one is unique. And as Wilken points out, distressingly few generalizable methods, analyses, or theories exist for their study. His attempt to place the study of traditional agriculture into an interdisciplinary framework of the ecological and cultural components of resource management is an important step, and for that reason his book will be useful to a very broad audience. The fact that some traditional systems have functioned for as long as they have, with some dating well back into prehispanic times, suggests that there is much to learn from these systems that can contribute to the current search for the basis of sustainability in agriculture. Once again it seems as if the farmer is the real teacher.

*Reviewed by:*

*Stephen R. Gliessman*

*University of California, Santa Cruz, CA*



## **Tapado: Slash/Mulch: How Farmers Use It and What Researchers Know about It**

H. David Thurston, Margaret Smith, George Abawi, and Steve Kearl, Editors, 1994  
Cornell International Institute for Food, Agriculture, and Development (CIIFAD),  
Cornell Univ., Ithaca, NY 14853-5901. 302 p, paper \$8.00

What can Midwest farmers learn from traditional slash/mulch systems practiced for centuries in the humid tropics? If the stereotype stops at swinging machetes, natural drying of vegetation, and hand broadcasting seed, there is little connection. Yet, if we examine the ecological principles behind the practices people developed in response to a unique ecosystem, there are plenty of lessons. Here is a compilation of research and farmer experience on a unique agroecosystem called *tapado*.

David Thurston and colleagues have brought together the papers from a workshop held in 1992, in Costa Rica, that explored both farmer practices and recent research on the "*tapado*" system. This centuries-old cropping system in the humid tropics was developed as an alternative to the common slash and burn practices used elsewhere. In this rainfall regime, burning is difficult but cut vegetation does decay to provide nutrients and protection for the subsequent crop. Improvements to the system include planting velvet bean and other luxuriant forage and cover legumes to increase nitrogen fixation and cover crop dry matter. The system reduces erosion by providing continuous cover, and few outside inputs are needed.

Advantages of the system were summarized by Roland Bunch: large addition of organic matter to the soil; nitrogen fixed up to 150 kg/ha per year; new practices are easily introduced into the current system; and there is limited cash outlay by farmers. Although labor needs are high in field preparation, there is little need for weeding, and the system works on degraded landscapes. There are some cover crops that have nematicidal effects, and others help protect crops against specific insect problems. An advantage of not burning is

conservation of organic matter, as well as providing a source of forage for livestock. Disadvantages include the labor input in preparing fields for planting, and some farmers report more snakes and rats in the vicinity of "*tapado*" fields that are not cleared or burned. Population pressure has forced more intensive use of land, making the long fallow period unreasonable, and there is need for some assurance of land tenure to encourage farmers to not exploit fields in the short term.

Several chapters provide lists of current research, as well as improvements to this system in the future. One of the most frequent needs is for improved cultivars that adapt well to the rigors of the seed micro environment in the "*tapado*" system. In most cases, the traditional varieties are still the most productive, and improved germplasm has not found its way into these systems. It will be important to study details of the agronomic practices such as dates and rates of planting, combinations of intercropped species that are compatible, and ways to integrate livestock into the system. There is great potential for farmer to farmer learning with the "*tapado*" system, using participatory techniques that lead from diagnosis of problems to small scale experiments to demonstrations to wide adoption of new practices. The thirty chapters in this easily readable book provide an excellent summary of the current understanding of a unique cropping system, at least in the humid tropics of the Americas.

A number of ecological principles that are applied to improvement of farming systems can be gleaned from this book. High organic matter added and preserved by this system acts to suppress some harmful soil pathogens. In a broader sense, the biodiversity of the system limits several insect and

disease problems of current crops in the region. By intercepting rain and providing soil cover, the cut foliage prevents soil erosion and promotes nutrient cycling within the field. The green manure from native vegetation or introduced cover crops provides nitrogen and other nutrients for crops in the cycle, a substitute for costly fertilizers. In addition to the mulch potential of cover crops, there is forage for livestock and another route for nutrient cycling. There is both resilience and yield stability in a system that preserves soil, nutrients, and moisture. Much of the practical research to improve this system can be done on farms by farmer groups, validating the potential applications of new practices and speeding the adoption process.

What do we learn from this system? It may be useful to step away from our own environment and current cropping patterns to see what is done in a completely different context. Rather than quickly concluding that there is no relevance to our own mechanized and high-tech farming environment, we need to take a long look at how and why people develop unique systems in response to a particular environment. Then we are receptive to the messages that Thurston and colleagues provide in this useful book about the tropical system called *tapado*.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*



***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

## **Pastured Poultry Profits**

Joel Salatin, 1993

Polyface, Route 1, Box 281, Swoope, VA 24479. 330 p, paper, \$15.00

As an agricultural producer, would you like to have more control over your financial destiny? If you would like to avoid the dilution of your management decisions by those decisions made in Washington or some corporate headquarters which tend to channel profits away from production agriculture, then you need to consider reading the book *Pastured Poultry Profits* by Joel Salatin.

Salatin's model of production of pastured broilers using value-added direct marketing encompasses profitability, environmental responsibility and community involvement. The book can also be used as a recipe for persons unfamiliar with growing, processing or marketing broilers.

His procedures are based on years of experience with the development of this system. Consequently, most of the "bugs" have been eliminated from the system. For persons wanting to try this approach, it would be a good idea to adopt the concept as he describes it and only then make adaptations as you find items that may improve your individual situation.

The book contains chapters on the reasons and advantages of the pasture system over conventional housing methods, information on general management, feed rations, and building pasture structures. There is considerable description of the value-added processing procedure, and handling resulting wastes is a central focus as well.

One of the most exciting aspects of this system is how it is an asset to the environment rather than a liability. Manure is immediately and directly applied to the land in a quantity that soil biology can handle. It avoids the many problems associated with conventional animal systems that have large concentrations of animals on small land areas for long periods of time.

The concept of direct marketing at the farm, otherwise known as "relationship" marketing, is the crowning achievement of this system. Loyal customers include close neighbors as well as a substantial number from 50 to over 100 miles away. Many also purchase vegetables or other meats that Joel produces.

Joel has found a ready market due to the advantages his customers see over conventionally raised and slaughtered, store-bought broilers. Most of all they prefer the quality, taste and non-feeding of antibiotics in the ration for his broilers.

This book is a must for young persons, or persons "young at heart," who are interested in a system of production that offers more "fun" in farming along with profitability, environmental responsibility, and community enhancement.

*Reviewed by:*

*Paul Swanson*

*University of Nebraska, Adams County, NE*







***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

## **How to Make \$100,000 Farming 25 Acres**

Booker T. Whatley and Editors of *The New Farm*, 1987

Regenerative Agriculture Association, 222 Main St, Emmaus, PA 18098. 180 p, paper \$17.95

Alternative crops, specialty livestock, diversification, value-added products sold from the farm—these are the elements of a profitable, small-scale farming operation according to Booker Whatley, a successful entrepreneur from Alabama. Concerned with the viability of small farms, the author and editors outline a series of steps that the reader can follow to assure continuous cash flow by tapping into markets that are generally not considered by the mainstream farmer. The book is written in popular style and is easily understood by educators, extension specialists, and farmers who have interest in options other than those most frequently considered in our universities.

Throughout the book the emphasis is on low-cost alternatives. Careful planning of enterprises and expenditures, studying markets well before launching a new crop or product, and equipping the farm with used equipment of the right size are some of the first steps. There are guidelines about locating a new farm and how an individual can assess markets in the surroundings of an existing farm. The key to marketing according to the authors is moving around the middle person and getting products directly to the consumer, including “pick your own” operations. Even forming a client membership club is one way to lock in a more permanent family of customers.

The book is actually a collection of newly written materials and already published articles from *The New Farm* magazine. It brings together descriptions of a number of alternative approaches in crop and animal production. Consistent with other Rodale Press publications, the philosophy is on reducing chemical and fertilizer inputs whenever possible. Much of the marketing emphasis is based on providing foods and products that are free of pesticide residues, an increasing concern of today's consumer. Alternative methods of weed and insect control feasible for the small farm operator are described. The emphasis of the book, however, is on value-added products and marketing.

Practical references on how to get more information, where to locate production supplies, and what seed sources are available are sometimes hard to locate. In a series of seven appendices this book lists a number of these sources, including a comprehensive list of private, nonprofit organizations that are dedicated to helping farmers explore alternatives.

Is this a scholarly book? Certainly not in the traditional sense of university publications. Most ideas and recommendations come from farmer experience. Although this is not one of our formal sources of information in extension, all agree that many of the best ideas come initially from producers in the field. It is difficult to argue with success in today's difficult economic times! The book should be viewed as a collection of proven, practical ideas in the mold of *The Farmer's Fertilizer Handbook* (Regenerative Agriculture Association, 1985) and *Adapt 100* and *Adapt 2* (*Successful Farming Magazine*, 1986, 1987).

Is this useful in the university? The answer depends on the objectives of the course or the extension program. There is a strong need to move beyond our normal academic treatment of crop and livestock production and to look at new approaches. Certainly the emphasis on marketing provides useful ideas for both practical agricultural economics courses and extension marketing clubs. *How to Make \$100,000 Farming 25 Acres* could be a valuable supplement to academic texts normally included in reading lists for agronomic classes. It is recommended as a reference to anyone who is serious about looking at alternatives in production and marketing of a diverse range of products in creative new ways.

*Reviewed by:*

*Charles Francis  
University of Nebraska, Lincoln, NE*

*Reprinted with permission from the Journal of  
Agronomic Education 17:142-143. 1988.*





## **Future Harvest: Pesticide-free Farming**

[First Review]

Jim Bender, 1994

University of Nebraska Press, PO Box 880520, Lincoln, NE 68588-0520, 159 p, cloth \$21.00

"I have stopped using chemicals twice in my farming career. The first time was in 1975, when I took over the farming operation." A very humble but honest beginning to Jim Bender's chapter on CONVERSION in his book entitled *Future Harvest*. "The results of this attempt were unsatisfactory — even comical. . . . Now I understand the reasons for my early problems." He now recommends a gradual conversion.

This approach to making significant management changes in the way we operate our farms in the 1990s is quite prevalent throughout the book. Consequently the readability, and in most cases, the credibility of the content is very user friendly.

Certainly there are some site- and management-specific practices appropriate to the author's farming style and geographic location. However, the critical thing that Bender does to keep the reader's attention throughout the book is his general discussion about the practices that have worked for him.

And herein lies the value not only with this book but for those who may be compelled to consider implementing some of Bender's ideas. They are seeds for change for the would-be farmer who wishes to begin to make a significant management change over a period of time.

The book needs to be evaluated and studied as a total unit. The reader slowly and methodically begins to realize that not all of the logic in the author's thinking is concluded until one has put all of the ideas together like a mystery novel where the answer is revealed on the last page. It is a systems approach to farming that Bender is talking about and the whole is much bigger than the sum of its parts.

The on-going discussion among farmers, researchers, economists, chemical companies, the

government and universities to name a few, about the benefits and drawbacks to sustainable agriculture and its component systems, is not left untouched by Bender's hand either. His comparisons in Chapter 5 are interesting, and they offer some really practical thoughts for considering management changes in a system.

My experience, however, is that sooner or later a true conversion first needs to take place somewhere within the individual. Perhaps the truly serious and conscientious novice sustainable practitioner who picks up this book and thoroughly studies the final two chapters will begin to make that internal change. It may even be that the skeptic who will at least take the time to read will be moved internally by Bender's simple, straight forward logic.

One exciting aspect about this book is the fact that much of the opinion expressed in the later chapters is fast becoming less and less abrasive as more and more people, institutions and corporations can at least begin to say the "S" word, even though their understanding may be experientially, at least, much different than many of the involved veterans.

There are some instances, though, where Bender falls a bit short on ideas. For example, when talking about productivity on conventional farms as compared to organic farms he mentions the contrasting objectives that may benefit the organic farm. One is stabilizing income by selecting crops diversified not only by type, but also by susceptibility to risks, including market fluctuations.

One of the reoccurring flaws not only in this book but in much of the philosophy surrounding sustainable agriculture is this: too often many of the disciples have a tendency to lead new practitioners to believe that if we adapt these many sustainable practices we will be able to survive the economic wars that agriculture is constantly involved in.

My personal experience tells me that without an adequate and profitable return for every agricultural commodity you produce on the farm, you will never last. For some it may take a bit longer than for others, but the end is inevitable. And, if it does not come for us, it certainly will come when we are ready to hand off the system we have built. No one else will have the means to take over. One can only be so efficient and cut only so many corners.

In other words, to quote from a farmer's recent editorial to a local newspaper: "We are not farming agriculture, we are farming each other - with those having the highest equity position absorbing the land and assets of those having the least equity." I was looking for a chapter on sustainable marketing.

In several instances throughout the book Bender seems a bit critical of government programs, and right he should be, given the history of such programs. However, I think many of us do ourselves, and the sustainable movement a big disservice, if we always just "write off" these programs.

I cite the Integrated Farm Management Program of the 1990 Farm Bill as an example. Sustainable farming is creative farming, and being creative means using the tools you have to work with. The IFM was an excellent example of how we can be creative, be sustainable and at the same time have the government help us make the changes to sustainable agriculture. By working with the tools we have we can help fine-tune them.

Another underlying theme that upsets me a bit is the acceptance by a number of sustainable farmers, as well some of their detractors, that we must do with less because we cannot afford it or the technology is unnecessary because we do not farm

large tracts of land. Technology is not necessarily directed at size. There are many technological advances that have nothing to do with size except in the mind of the user, especially when it comes to agricultural engineering as relates to farm equipment. Mr. Bender, however, tends to perpetuate this idea when he says at one point in his comparison of systems chapter, for example, "One might be justified in having a planter as good as those of conventional farmers who have many more acres of row crops."

We are not being fair to sustainable agriculture when we allow ourselves to believe that this technology is somehow not good, not necessary or not sustainable. We should have access to the current technology just as everyone else does. We expect this access in our health care and in our children's education; why not in our farming occupation as well? Current technology is not developed only for conventional agriculture.

The point I am making is this: technology many times is developed to help us do a better job of husbandry, or economics, or sustainability, and not to help us farm more land.

Jim Bender has an excellent book that treats the subject of sustainable agriculture in a very common sense way. His approach is straight forward; he speaks in a language that farmers, bankers, lawyers and economists as well as the rest of us can easily understand and believe with a little thought time of our own. It is good reading for all levels of sustainable understanding.

*Reviewed by:*

*Carmen Fernholz  
A-Frame Farm, Madison, MN*



## **Future Harvest: Pesticide-free Farming**

[Second Review]

Jim Bender, 1994

University of Nebraska Press, PO Box 880520, Lincoln, NE 68588-0520. 159 p, cloth, \$21.00

This book is unique because it was written by a farmer with 20 years of practical experience who is truly passionate about seeking alternative approaches to modern, industrial-style agriculture. Jim Bender grows a wide variety of organically certified crops and raises about 100 beef cows on a 642 acre farm in eastern Nebraska. No pesticides have been used on the farm since 1980 and no synthetic fertilizers since 1987. He has had considerable success as well as some notable failures, which he candidly shares with the reader.

The book is reasonably short and is written in clear and concise language. The first two chapters give an overview of the current state of agriculture and provide the rationale for converting to a nonchemical production system. The author is not afraid to challenge conventional wisdom, and views a farm's reliance on chemicals as akin to a person's dependence on drugs. He makes an excellent argument for eliminating pesticides instead of merely reducing usage. He rejects the option of retaining herbicides as a bailout if nonchemical means fail because this "reduces the incentive to gain proficiency in strategies for avoiding postemergence herbicides" and because "the goal of being pesticide-free can by itself push a farmer to more and useful skills and knowledge than he or she would otherwise attain." He astutely points out that organic farming has been misunderstood because critics have failed to note its beneficial synergistic effects, "Because of the interrelatedness of the components of pesticide-free systems, often the actions taken to meet one objective also contribute to attaining others." For example, growing cover crops to prevent erosion and to add nitrogen also can provide forage for livestock and make cultivation easier by improving soil tilth.

Bender provides solid, practical advice for developing a conversion plan. He emphasizes that

successful conversion must take account of the structure of the entire farm, and that it begins with an aggressive, proactive approach to soil conservation, including permanent terraces and grass waterways. Livestock is a key component that he deals with in more detail in a later chapter. He encourages farmers to take advantage of some government programs, such as the Conservation Reserve Program. He also recognizes the need to communicate ideas and establish a dialogue among lenders, farm managers, and landowners if any real change is to come about.

The next two chapters extensively cover two aspects of farming that Bender believes are essential for successful chemical-free farming. Chapter 3 covers weed management, giving many examples from the author's own farm. Successful rotary hoeing, harrowing, and cultivating techniques are described in great detail. Bender has a refreshingly undogmatic approach to tillage, employing several methods to maintain maximum flexibility and to fulfill his agronomic, economic, and environmental goals with minimal tradeoffs. He also provides good information on specific weeds, in particular field bindweed (*Convolvulus arvensis L.*), which he considers a major problem on many farms.

Chapter 4 deals with the hotly debated issue of livestock. Here is where the author's passion comes through most clearly. He believes strongly that the separation of livestock and crops into concentrated feedlots and large cash grain farms is the central reason for the unhealthy state of modern agriculture. Although he concedes that it is not essential to include animals on an organic farm, he argues that without them it is much more difficult to achieve four central objectives of sustainable farming: soil conservation, elimination of pesticides, financial stability, and nutrient recycling. Bender refutes the claim that organic

farming would require too much livestock, providing statistical facts in support. He then gives a specific example of how to organize a summer dry-lot beef cow-calf operation that is compatible with the different types of land typically present on a farm and that provides adequate feed, maintains high productivity of cash grain crops, and recycles nutrients properly.

Conventional and organic farming are compared in Chapter 5, using a wide range of performance indicators. The argument for organic farming becomes very compelling when the evaluation goes beyond the simplistic measure of bushels per acre and includes soil conservation, management, and overall economic performance. The author shatters the widespread assumption that organic farming will never be accepted because conventional, chemical-based farming is easier and more convenient: "Chemical weed control creates a host of potential problems for raising row crops, [such as] ... crop rotation restrictions, ... small margin of error in application, herbicide-stressed crops, and application demands at the busy planting time." He admits that organic farming is not so easy either, but regards its challenges as solvable. Also, organic farming has an advantage that often is overlooked; it distributes the demand for labor relatively evenly throughout the year, whereas the work load on a conventional cash grain farm is heavily concentrated in the spring and fall.

In Chapter 6, "The Assault on Alternative Agriculture," Bender addresses very broad and profound issues relating to the structure of the

modern food production and delivery system. This chapter strikes at the heart of the debate over the future of agriculture. The most often cited justifications for continuing on our present agricultural course are listed: elimination of chemicals would spell calamity; the key to pesticide safety is to follow label directions; farmers have a moral obligation to feed the world; the world is filled with risks; and alternative farming requires too much livestock. Bender then convincingly rebuts these arguments. This is perhaps the most powerful chapter because it has immediate significance for all consumers. It is well referenced and it encourages the reader to become more educated about these important issues.

This excellent book should be read by anyone who cares about our environment and about how our food is produced. It speaks to a widely diverse audience. It is technically sound, but it is clearly understandable and not filled with esoteric jargon. Admittedly, the specific examples are geared toward midwestern-style grain and livestock farming; Bender is intimately familiar with these systems and can speak about them with authority. I recommend this book highly and hope that many other articulate and knowledgeable farmers will follow Bender's example and share their visions of a healthier and more optimistic agricultural future.

*Reviewed by:*

*Steve Peters*

*Rodale Institute Research Center, Kutztown, PA*



## **Switching to a Sustainable System: Strategies for Converting from Conventional/ Chemical to Sustainable/Organic Farming Systems**

Frederick Kirschenmann, 1988

Northern Plains Sustainable Agriculture Society (NPSAS), RR 1 Box 73, Windsor, ND 58424. 18 p, \$8.00

Fred Kirschenmann is currently one of the most articulate spokespersons for sustainable agriculture in the U.S. He is widely sought as a speaker and workshop participant, and his opinions taken seriously by the mainstream as well as the alternative agriculture communities. In part this is due to his successful management of a 3000-acre organic farm in North Dakota. With limited rainfall but a wealth of creativity, Fred and family implement a diversified strategy for raising crops and livestock in a fully integrated manner. He finds time to share this experience and expertise with others across the country. In this brief summary, Kirschenmann brings his ideas together with those of other members of the Northern Plains Sustainable Agriculture Society into a readable format that is accessible to all.

"This booklet is written for farmers." Fred summarizes some of the reasons why he and others have made the conversion from conventional to alternative, often non-chemical farming strategies. He cites farmer concerns about "using toxic chemicals to produce crops for food, while consumers increasingly complain about the chemical contamination and lack of nutrient value of the food sold in their supermarkets." Even a decade ago, there was farmer as well as public concern about potential contamination of groundwater as a result of input application, when farm chemicals or fertilizers end up where they are not intended to go. In summary, Kirschenmann cites the fact that many farmers have gone broke in the conscientious practice of conventional agriculture. He concludes that "Clearly, something is wrong."

Before launching into strategies for conversion of the farm to a completely non-chemical set of

practices, the author insists that this is not a panacea for all that ails the farm's current success. "Switching to a sustainable system is NOT the way for farmers to extricate themselves from immediate financial difficulty." And "Switching to a sustainable system is NOT simply removing the 'chemicals' line item from the budget." Kirschenmann explains that the process is substantially more complicated. He cites the initial financial risks, the trade offs of one type of costs for another, and the learning curve that must accompany any mega-change in strategy for farming. And Fred also warns that the well-publicized premiums paid for organic products may be deceptive in a highly volatile and unpredictable marketplace. This is a market that can easily be oversupplied.

From his considerable experience in organic farming, author Kirschenmann suggests that there are at least four advantages of sustainable agriculture:

- Diversity of crops and products reduces the need for purchased fertilizers, helps in pest protection, and buffers the farm against unpredictable weather.
- Diversity also buffers the farm against changes in prices for one or a small number of commodities and increasing prices of production inputs.
- Crops raised by sustainable practices have more tolerance to stress conditions, although those under conventional management may do better under ideal growing conditions.
- There is increased effectiveness of sustainable systems compared to gradually reduced effectiveness of conventional systems -- increasing pesticide resistance in weeds and insects, and increasing needs and costs for conventional



fertilizers are seen as limitations to current standard recommendations and practices.

Fred Kirschenmann provides a prescriptive approach to the conversion process, one that he suggests will take both time and creativity on the part of the manager. He cites the objectives used by the IFOAM (International Federation of Organic Agriculture Movements) as what need to be developed during a transition: fertility-building crop rotation, proper manure management, appropriate tillage/cultivation, and an environment that reduces pests (insects, weeds, diseases). As a sidelight, he mentions the over-riding importance of crop rotations as providing a route to reaching several of these objectives.

In agreement with other leaders in this field, Kirschenmann discusses the importance of learning how to cooperate with nature rather than depending on complete control and manipulation of the farming environment. A part of this strategy is the understanding that an individual farmer brings to the management of his or her own unique place. In spite of the availability of experience and recommendations from elsewhere, there is no one who understands the needs and the details of the individual farm as well as the one who manages it, the one who walks the fields and pastures each day, and the one who builds that experience base with each growing season. "YOU are the professional on your own farm," he states in conclusion.

In a discussion of how to develop a conversion plan, Fred gives a series of steps to consider: evaluating both the resources and weaknesses of the farm, developing a crop rotation plan, and creating a field plan for each unit. Included in resources are those we normally think about -- fields, soils, rainfall, growing season, buildings, equipment. They also include federal programs, other farmers in the area, Extension, livestock, and legumes that are not currently a part of the system. One has to be realistic about potentials for weeds, insects, stress conditions, and all the complications that must be

anticipated in planning any farming operation. The author then goes into detail on how to determine which enterprises to include, how many acres of each, and how to evaluate the output from the new strategy. Most of this is common sense, and the suggested economics are those that can be calculated without sophisticated spread sheets and forecasting or prices and costs of inputs. In fact, the sophisticated farmer can access a wide range of software as well as advice from professionals who can help in this analysis. The development of farmer-friendly programs such as PLANETOR from University of Minnesota and other packages developed by producers have become widely available in the decade since this book was written.

Useful to the farmer is a series of six rotation models used by Kirschenmann and other farmers in the NPSAS. They are longer than the common two-year rotations of corn-soybeans often found in the mainstream corn belt cropping areas. And the complexity of the rotations provides the potential for soil improvement and successful crop production without purchased fertilizers.

Fred Kirschenmann provides here a primer for sustainable agricultural production. It is primarily focused on rotations and crop production. There is little detail on the integration of animals into the system, although manure is mentioned as an important input for organic production. From recent talks given by the author, it is obvious that there has been a high degree of fine tuning of the system, especially the marketing strategy, since the publication of this book. In spite of its age, this is a useful and easily read treatise on how to begin the conversion to sustainable systems. It is highly recommended to the thoughtful farmer who is looking for alternatives.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*



## Alternatives in Agriculture

Dick Thompson, Sharon Thompson, and Rex Thompson, 1996 (and previous years)  
Thompson On-Farm Research, 2035 190th Street, Boone, IA 50036-7423, paper \$10.00

For over a decade, Iowa farmers Dick and Sharon Thompson have cooperated first with the Rodale Institute and later with the Wallace Institute to provide a written summary of research done on their farm. Located between Boone, Iowa and the university campus in nearby Ames, this 300-acre farm has become one of the most visible examples of sustainable production practices in the U.S. Thanks to their annual field days, frequent tours for visitors, and summary of research results, *Alternatives in Agriculture*, the Thompsons have become a credible source of information for farmers and for collaborating researchers in the Midwest.

As pioneers in the on-farm research process, Dick and Sharon have worked with graduate students and faculty to test innovative fertility, tillage, and pest management strategies on large, drive-through plots on their farm. When they compare several hybrids or sources of fertility, the size of experimental units is most often one equipment-width by the length of the field, at least 200 to 400 feet or more. This allows not only an ease in operation when planting, applying inputs, and harvest, it provides a striking visual comparison for the farmer-researchers and for their visitors alike. The experiment design often used in their tests is a side-by-side strip test with six or more replications, and a "paired-comparison t-test" is used to statistically compare the treatments in a given experiment. The statistically rigorous design is acceptable to both farmers and researchers, as it combines the randomized placement of treatments in a replicated pattern in the field, and also allows a practical management and potential to see if there are differences at any time during the crop cycle. Adherence to this statistical rigor has attracted both federal and state researchers to conduct precise, small plot observations within the larger treatments that the Thompsons have implemented on their farm.

Dick Thompson is one of the innovators and early adopters of ridge tillage systems in central Iowa. Convinced of the benefits of saving moisture and reducing weed populations by limiting tillage early in the season, he has compared ridge-till with conventional planting as well as a wide range of weed management options. With a good practical knowledge of soil management, Thompson has thoughtfully modified his planting and cultivation equipment so much that it is difficult to recognize from the color of paint on steel the original brand of each machine or even its component parts. With wider than average rows, permanent ridges that are scalped at planting and reformed during cultivation, and a match of all equipment including combine and grain carts to the established row pattern, he has created an integrated system of field management that is part of the annual cropping cycle. Extra cultivation with rotary hoe and crop cultivator takes the place of herbicides on a conventional farm. Cover crops, applied manure and compost, and slightly higher-than-average planting rates compensate for potential stress in this non-chemical approach to ridge till.

The Thompsons rely on long-term rotations for much of the fertility, plant protection, and soil building that is part of their system design. Their crop sequence may stretch to four or more years. Including corn, soybean, oats, and hay crops in a logical sequence provides fertility from legume years to following corn or oat crops, and manages weeds by alternating summer annuals with crops planted in early spring or with perennial hay crops. Livestock is an integral part of the farm, both to utilize the pastures, the harvested hay, and the crop residues. This is also a source of manure and compost to add nutrients to crop fields and promote improved soil structure. Dick Thompson describes how a crop/livestock operation makes

better use of family labor through the year, compared to the intensity of labor required at planting and harvest in a conventional corn-soybean farm in the same area.

In addition to the diversity of crops used in these rotations, Thompson talks about the importance of diversity in tillage strategies. He has brought back the moldboard plow to incorporate hay crops and solid manures, and uses a chisel plow in spring for control of particularly difficult weeds such as Canada thistle. This is but one example of how the Thompsons work to create a balance in all phases of the farming operation. Just as balance is achieved through use of diverse crops, incorporation of livestock with those crops, and a multiplicity of enterprises on the farm, a diversity in tillage operations is useful in the management of soils, nutrients, and residues. Cover crops have also been the focus of continuing research over years, and their potential has yet to be realized to the extent that Dick Thompson would like.

Beyond the cultural practices and integration of enterprises in the fields, the Thompsons are careful to analyze the economics of each activity as well as the whole farm. They are respected in part because the farm has open books on each experiment. Detailed records are provided on each of the rotations, and often there is a comparison with county averages and with a nearby corn-soybean rotation under conventional management. This adds credibility to their work, and places their results in the context of current Iowa agriculture. The Thompsons also extrapolate their results to the community, pointing out the importance of adding value to their commodities on the farm in a way that contributes to the local economy. In recent years they have added a strong environmental interpretation to the results. The reduction in applied pesticides and fertilizers can have important implications for the health of their farm, their water supply, and their community landscape. They conclude that these alternative systems are "being reimbursed economically, environmentally, and socially." It is hard to understand why more people are not moving more rapidly in this direction.

In their executive summary the Thompsons provide another indicator of success: the numbers of people who have been influenced by the tours, talks, and

video tapes that have come from their innovative form of "agricultural ministry." Since 1986, more than 7000 people have toured their farm; these people came from all across the U.S. and from more than 40 other countries. The Thompsons have traveled to many states and other countries, and given presentations in person to more than 25,000 interested farmers and others. There are close to three dozen Iowa farmers who now do similar replicated research each year, and there are more than 500 members of the Practical Farmers of Iowa. There is a Director of PFI who works out of the Agronomy Department at Iowa State University. The continuing involvement of the Wallace Institute of Alternative Agriculture assures that the information coming from the Thompson farm continues to receive national attention. Their record of "impact assessment" would do credit to any of us in Extension who today is struggling to validate numbers of people reached, numbers of practices adopted, and effectiveness of our outreach programs.

This is a model program for research, demonstration and outreach. It is made successful by the dedication of farm people who were searching for another route to sustainable food production, who were successful in their own search, and who are willing to continue to share that success with others. It is credible work because it is done on farm, and within the context of a commercial crop/livestock environment in Iowa. When Dick Thomson climbs into the front end loader, goes 12 feet into the air with a megaphone in hand to address two wagons loaded with 60 people, he starts with "Here's what we are doing this year. It's probably not the best system, and we will probably change again before next season. After I tell you what is here in the field, I want to know what you are doing. That way we can all learn from each other." This type of humility, interest in others, and obvious concern about progress and change is part of what has made Thompson On-Farm Research a success. The reader would be well advised to move beyond reading the written summary of research and to attend one of these field experiences.

*Review by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*



## From the Ground Up

Mike Irwin, 1992

WDATCP Sustainable Agriculture Program, PO Box 8911, Madison, WI 53708-8911. 68 p, \$8.00

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*"We are partners in a maturing relationship, in a marriage you might say, between environmental safety and farm profit."  
— Wisconsin Cash-grain Farmer*

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*From the Ground Up* is a collection of stories from farmers who participated in the Sustainable Agriculture Demonstration Program, managed by the Wisconsin Department of Agriculture, Trade and Consumer Protection. The 68-page book was first published in 1990. The 1992 version supplies an update on each farmer's activities.

Mike Irwin collected and edited the stories, which are written from the farmer's perspective. The chapters begin with a sketch of the farmer's background, family, and operation. The people represent a cross section of agriculture. Some are part-time farmers, others full-time. Some fulfilled a dream to move from the city to the country; others returned to a farming heritage. Farm sizes vary from 5 to 413 acres, with all or part of the land owned by the individual.

The farmers give an overview in two to four pages of how they farm and market. They also explain what changes they have made by experimenting. At the end of the chapters is a section called "Learning From My Field," where specific methods and suggestions are furnished. The enterprises and practices described in the book include:

- rotational grazing with dairy cows or sheep
- a commercial organic vegetable garden
- forest crops and regenerating woodlots
- specialty grain crops, such as amaranth
- cutting costs in a corn-bean rotation
- soil-balanced biological farming
- inventorying on-farm resources
- biodynamic agriculture

The number of years the farmers have been trying sustainable agriculture methods ranges from 4 to more than 40. Besides the details of production, each person also relates his or her philosophy and future goals. All spoke of a strong connection with the land. A few found that this belief gave them strength to continue even when confronted with discouraging remarks from Extension and peers. They are also active in education and outreach and conduct demonstrations, participate in farmer networks, and advise interested nonprofit organizations. In general, they are socially conscious and involved.

*From the Ground Up* is easy to read and offers insight into why farmers changed to sustainable agriculture, as well as a summary of different practices. I recommend the book to producers living in the upper Midwest and to Extension educators.

*Reviewed by:*

*Heidi Carter*

*Center for Sustainable Agricultural Systems,  
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## **The Real Dirt: Farmers Tell About Organic and Low-Input Practices in the Northeast**

Miranda Smith, Northeast Organic Farming Association, and Cooperative Extension, Editors, 1994  
Northeast Region Sustainable Ag Res. Prog., Univ. Vermont, Burlington, VT 05405. 264 p, paper \$13.95

This book, the work of many contributors, provides a broad view of northeastern organic and low-input agriculture. It is a product of the Northeast Organic and Sustainable Farmers Network, which is composed of farmers, farm organization representatives, extension agents and university researchers. The project was funded by the Low-Input Sustainable Agriculture (LISA) program, now the Sustainable Agriculture Research and Education (SARE) program. *The Real Dirt* is based on material obtained during farmer interviews. Farmers' comments are organized topically and supplemented with additional information provided by each chapter's authors.

The book nicely serves several functions: it provides an overview of how agriculture is conducted on many low-input and organic farms in New England; it provides information about a broad range of resources for farming and problem solving in New England agriculture; and it provides detailed information about strategies for dealing with many agricultural production problems, for example managing weeds (Chapter 7). The book is somewhat like a combination "yellow pages" directory and a how-to manual. I can imagine that it will appeal to many types of readers: commercial farmers who want to make the transition from conventional to organic or low-input farming; people who are thinking about getting started in farming or who are making the transition from backyard gardening to larger-scale production; and nonfarmers who are interested in the detailed realities of organic and low-input agricultural production in New England. The book makes clear that a strength of organic and low-input farmers is their willingness to share information and contribute to shared successes, remarkable characteristics for people who operate competitive small businesses.

*The Real Dirt* is divided into six major sections, covering soils, pests, crops, livestock and dairy management, farm management and marketing, and whole-farm design. Each section is composed of several chapters, most of which conclude with bibliographies and sources for obtaining the cited publications. This enhances the book's usefulness by making it easy for readers to track down original references from many diverse publishers. Each section concludes with a few pages of comments by growers, for example, about farm system components with which they have experimented and their research needs, and by researchers, including excerpts from the reviews they offered during the book review process. The comments on growers' research needs could provide the inspiration for many future cooperative research projects. The comments sections provide some of the most interesting reading of the book.

The individual chapters are written in an informative, easy-to-read manner. Specific areas within chapters are set off by headings, and the text is interspersed with black and white photographs and drawings. The four chapters in Section One introduce the concepts of low-input and organic agriculture, describe the practices of cover crops, green manures, and crop rotations, and discuss soil management and soil fertility. Section Two deals with pest management, including Integrated Pest Management (IPM) techniques, control strategies for some of the major pest problems that growers face, including insects, mites and mammals, weeds, and plant pathogens. Section Three contains four chapters on crop production: vegetables and herbs, small fruits, greenhouse crops, and tree fruits. The two chapters in Section Four deal with livestock and dairy management; one is on production, the other comprises case studies from six organic animal producers. Section Five contains three

chapters on management and marketing, including growers' diverse opinions about charging price premiums for organically grown food, while Section Six contains two chapters on integrated farming systems and the transition from conventional to organic farming.

In addition to the information assembled from farmer interviews and researcher comments, the authors have incorporated a great deal of information from other sources. For example, Chapter Four on soil fertility from amendments includes a table on characteristics of organic fertilizers adapted from a chart compiled by Necessary Trading Co.

The book concludes with several appendices: a glossary, although some technical terms are not included (greensand, for instance); profiles describing the farmer and farm history for most of the farmers who contributed to the discussions; a list of northeast organic growers associations and certification programs; a resource directory; a list of northeast regional

Cooperative Extension and IPM coordinators; a list of reviewers; and a bibliography for additional information.

Growers' comments included in this book are based on their field observations and experiences with growing conditions determined by the particulars of their own farms. Readers hoping to use this book as an authoritative field guide should be aware that the reports of field phenomena are not derived from monitored field studies. Nonetheless, readers will find that the variety of opinions and observations offered in this book make stimulating reading.

*Reviewed by:*

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*Reprinted with permission from the American  
Journal of Alternative Agriculture, 9(4):190-  
191. 1994.*



## **Let Farmers Judge: Experiences in Assessing The Sustainability of Agriculture**

Wim Hiemstra, Coen Reijntjes, and Erik van der Werf, Editors, 1992

Intermediate Technology Publications, 103 Southampton Row, London WC1B 4HH, UK. 208 p, paper, \$ \_ \_

With an overall tone pointing out the viability of low-external-input agriculture, in this collection of papers the editors and their colleagues have presented information on a wide variety of geographic areas, cropping systems, and techniques for assessment of sustainability. The introductory paper frames the rest of the text with discussion of different concepts of sustainability, whether agroecological, resource stewardship, or growth oriented, and of different parameters and methods for measurement of sustainability. The next four papers are grouped under the title 'What Criteria to Use,' and present ideas on inputs, farmer perceptions, technology adoption or adaptation, and participatory evaluation of technologies. Part III contains five papers and focuses on 'Aspects of Economic Assessment' with emphasis on methodologies and choices made by farmers. Eight papers make up the fourth section entitled 'Comparing Farming systems'. These case studies contrast low-input and high-input approaches to agriculture by giving examples of various land use and management models. The final section, 'Checklist of Criteria for Assessing Agricultural Technologies', serves as a template of questions to use for economic and social analysis of technologies with consideration of productivity, security, continuity, identity and adaptability.

This volume is a follow-up to a 1990 workshop convened around the theme of how to assess techniques for managing soil fertility. The majority of papers in this collection present some form of economic assessment and most include soil fertility and labor parameters. Examples are almost wholly from developing countries, and those mostly in the

tropics. They range from rice-fish culture in the Philippines, to soil mining in Mali, to organic coffee production in Mexico, and to intercropping in Colombia. Emphasis is placed on involving participating farmers in the assessment of technologies in order to assure realistic evaluation of the practices and understand the transfer or adaptation of the technology as it is used on-farm. As pointed out in the preface, although many farmers in developing countries are 'resource-poor' they have, in many cases, developed effective production systems that are well adapted to their farming conditions and may or may not benefit from 'modern' inputs and technologies.

The collection is thought provoking, especially through the juxtaposition of examples from the same region such as work from Yurimaguas, Peru, and Kayapo agriculture in the Amazon or the Bontoc Rice Terraces and the Sloping Agricultural Land Technology (SALT) in the Philippines. It presents a good overview of how agricultural economics is applied and of issues in assessment of sustainable agriculture. It can be useful to field personnel with specific examples from various cropping systems and methods for evaluation of technology development. The volume, above all, speaks loudly in favor of participatory planning and assessment and the effectiveness of low-external-input agricultural systems.

*Reviewed by:*

*Sarah Workman  
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Nebraska, Lincoln, NE.*







## **50 Ways Farmers Can Protect Their Groundwater**

Michael Hirschi, William Simmons, Doug Peterson, Ed Giles, 1993  
University of Illinois, Cooperative Extension, Urbana, IL 61801, 188 p, paper, \$5.00

The two major issues in *50 Ways Farmers Can Protect Their Groundwater* are how to maintain or boost profitability and at the same time reduce the risk of groundwater contamination. The introduction states that 90% of rural residents and over half of the U.S. population depend on groundwater for drinking, and a substantial number of wells tested have detectable levels of either pesticide or nitrate. In some intensive agricultural areas, the results are alarming enough to cause concern and provide a call to action: 10% of rural Illinois wells had nitrate levels above federal water standards, and 16% of Wisconsin wells had triazines (from herbicides) — nearly two-thirds of these were over the states' preventive action limits. Clearly there should be a self-interest for rural America to take notice and then move into action to remedy this preventable problem. The book provides a number of practical guidelines to initiate this process.

An initial section deals with the problems of excess application of nitrogen, and with applying nitrogen when it is most needed by the crop. In either case, the goal is to provide less opportunity for nitrogen not used by the plant to escape into the surface or groundwater environment. All of the practices described involve an intensification of management, especially the use of information to more carefully calculate and then apply only the nitrogen needed by crops. Knowing what yield to expect (yield goal) and providing only that nitrogen necessary to reach the goal can prevent having excess nitrogen in the system that is available for leaching. Careful testing of the soil and calculation of a nitrogen budget for the crop in each field is another way to apply new information to make fertilizer use more efficient and appropriate. Timing of application and use of nitrification inhibitors to limit conversion of ammonia to nitrate nitrogen are two ways to reduce the potential for loss of this soluble nutrient from the root zone where it can be used by the crop. Two farmer profiles give testimonials on

soil testing and on side dressing application of nitrogen. These practices are all well known, and it is surprising that they are still considered cutting edge by the Extension faculty who prepared this publication. All are useful in helping to reduce nitrate available for leaching or surface erosion, and it would be surprising if most knowledgeable farmers were not already aware of their importance for both economic and environmental reasons.

What is surprising is the lack of information here on rotations, cover crops, nutrient trap crops, and manure management. The last topic is discussed in one later section on livestock waste storage. Crop rotations of cereals with legumes are well known approaches to reduce nitrogen application to cereals. Although soybeans produce nitrogen through fixation, there is more of this element removed with the grain harvest than is fixed from the atmosphere. The 'nitrogen sparing' effects of having soybeans in the rotation result in the long-term application of about half the amount of nitrogen compared to continuous cereal with annual nitrogen applications. Cover crops that can fix nitrogen or at least take up this element and hold it in the living plant tissue or soil organic matter fraction should be included in this section. Also, there should be sections on the alternatives of manure application versus composting, and the benefits and drawbacks of each. There is an absence of information on soil phosphorus and the potential for loss of this element through mass flow with water on the soil surface and through the soil, even though only a small fraction of P is soluble. Much of the pollution problem in Northern lakes is due to excess phosphorus as well as unneeded nitrogen. The book would be greatly enhanced by these up-to-date dimensions of alternative approaches to comprehensive nutrient management and prevention of nutrient loss.

Major sections of the book are dedicated to

insecticides, herbicides, pesticide interactions with soils, and proper use of these chemical materials. There are good suggestions on crop scouting to determine economic thresholds of infestation, least cost approaches, and reduced chemical ways to manage insects. Integrated pest management is prominently featured in several of the specific methods. There are methods that involve tillage, crop rotation, planting and harvest dates, encouraging beneficial insects, and spot-treating infested areas. There is one recommendation for using biological insecticides. In general, the insect management section is well researched and presented. In today's climate of concern, there could have been more emphasis given to resistant crops and varieties, organic approaches, and alternative crop rotations to reduce both costs and risks to the environment and humans. Safety issues could have figured more prominently in this section.

Likewise the herbicide section deals with a range of scouting, economic thresholds, reduced rates, and crop management options that can help reduce the weed seed bank and lower costs of management. Knowing the economic thresholds can help farmers avoid the 'absolutely clean field syndrome' that is part of the current mythology of efficient farming. It is possible, especially in regions with adequate to excess rainfall, to allow some weeds of some species to coexist with the crop in the field -- in some cases there will be no yield reduction and the crop rotation will help control weeds in subsequent years. This is a well-balanced chapter, although there could have been more in-depth treatment of ridge tillage without herbicides, of allelopathic associations or rotation crops, and the many cover

crop options that are known.

Sections on pesticide selection, application, and disposal and storage on the farm round out a good treatment of safety issues, especially in the mixing and application operations. There are sections on wells and septic systems, on water testing and treatment, and on other topics such as storage tanks, hazardous waste, and chemigation. These are useful recommendations, but again could be found in any of the Extension publications put out by each state for farm clients. The accompanying farmer profiles and details on their ways to save input costs and cut down on potential for environmental damage are useful, as they personalize the use of these methods and show their application in practical situations. There is a section on where to find more information on design of facilities, get details on regulations, and learn about the wide range of workshops available in Illinois.

In general this is a useful book. There are many additional methods that have proven useful, inexpensive, and practical that are emerging from the organic community. If there is one major criticism of the book, it would be the limited treatment of these alternatives. The book appears to be a primer for conventional farmers, and aimed at a relatively low level of current understanding of what is being done by progressive mainstream growers. It is a good start, but one that could be improved and updated.

*Review by:*

*Charles Francis*

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## **Farming in Nature's Image: An Ecological Approach to Agriculture**

Judith D. Soule and Jon K. Piper, 1992

Island Press, 1718 Connecticut Ave NW, Suite 300 Washington, D.C., 20009. 286 p, paper \$19.95

Using natural ecosystems to guide the process of designing agriculture is perhaps a process as old as organized food production. Yet, few of us today can easily draw parallels between what we do in a mechanized production field and what was happening in that same field, in terms of ecosystem structure and function, before the arrival of human intervention. There is a growing array of agriculturists, in research and in farming and ranching, who are beginning to ask more questions of the ecosystem. What are the lessons we can learn?

*Farming in Nature's Image* grew out of the curriculum that is used and the research program at The Land Institute, a research and education center located near Salina, Kansas that studies the prairie and the potential perennial systems that could be developed there for future food production. The education program includes eight to ten young scholars each year who study the written literature as well as the language of the prairie, in hopes of increasing their appreciation and understanding of both of these important ways of knowing. The book explores the challenges of meeting food demands while preserving in some form the integrity of the ecosystem, concluding with the design of a prairielike agriculture that reflects both the research program of The Land and the accumulation of scholarship from writings of its staff and visitors to the prairie.

Soule and Piper examine the economic roots of recent problems in the agricultural sector, adding an important dimension to Wes Jackson's "New Roots for Agriculture" published more than a decade before. They discuss in Chapters 1 and 2 the ecological crises such as environmental pollution, depletion of natural resources (especially soil loss), and the degradation of ecosystems that has been the unintended result of conventional farming. Some of the consequences of soil loss and reduction in

biodiversity can be masked, in the short term, by use of additional production inputs such as fertilizers, pesticides, and improved varieties and hybrids of crops. Many of the longer term, insidious impacts of current farming practices are less easy to measure, though far more important for the sustainability of food production for the human species. They discuss the depletion of energy and water reserves, and the decline in quality of both as we exploit these non-renewable resources for short term economic gain. The authors also point out the increasing stakes in this battle to produce food, the rising number of pests that are resistant to chemical pesticides and the irreplaceable nature of topsoil, at least in terms of human lifetimes. The roots of this dilemma are based in an economic system that rewards short term profits, at the expense of a stable and sustainable ecosystem. These chapters provide a good overview of where we are today.

In chapters 3 and 4, the authors describe the ecological functions that are inherent in natural systems, and that could be emulated to some degree in managed agroecosystems. These include energy flow, nutrient and water cycles, spatial and temporal organization of ecosystems, how communities of plants and animals function and why biodiversity is important. They explain how modern agriculture ignores or overrides these principles and functions. Soule and Piper then explore how a number of potential and modified practices do build on natural system principles: integrated pest management, intercropping, rational nutrient management, and conservation tillage. They suggest how these principles can operate in several key biomes, and how these might be used to help in design of future agricultural systems: the warm desert, the temperate deciduous forest, and the tropical forest. Finally they focus on the North American prairie, where about half of the topsoil

has been lost over the past century as several generations of farmers have transplanted systems from Northern Europe and the Eastern Forest Zone into a new soil and climate regime. The characteristics of the prairie are described as a potential guide to how a future system might be organized: role of fire and grazing animals, biodiversity and flexibility of structure in response to climate variation, complementarity of species in the plant mixture. This leads to the example of a perennial mimic of the prairie, an agricultural system that could be sustained under the unpredictable and highly varied climate of the plains.

In exploring the feasibility of using the prairie as model (Chapter 5), the authors describe four basic questions addressed by research at The Land Institute: 1) Can a perennial seed crop yield as well as the more common annual crops we use today? 2) Can a polyculture of perennial species 'overyield' or produce more than the component species, and more than annual monoculture? 3) Is it possible to design a system that can sponsor its own nutrients and soil fertility? And 4) Can a system be designed to manage unwanted insect, plant pathogen, and weed species? They describe ongoing research into these issues, and present evidence that the tentative answers to the questions are positive. They indicate progress in learning how the perennial systems function and their potential for a sustainable agriculture on the plains. More recent publications from staff at the Institute provide additional evidence to support the stated hypotheses.

The book concludes with a chapter on the social and cultural dimensions of change. The authors describe some of the motivations and functions of the current research establishment, where the incentives are and how support is generated for research, and the importance of values in what

many scientists consider a 'value-free' decision making environment. This is a useful summary of the current situation in agricultural science, and adds a dimension often lacking in our exploration of new ideas and approaches to research and agricultural systems.

It would be an understatement to observe that the scientific community as a whole is less than convinced by the available evidence in the book on how to develop a new agriculture for the prairie. But this is the situation in any new scenario, in this case one based on a completely different paradigm for agricultural production, and especially one that lands as a challenge in the laps of those doing conventional research on current crop species and using time-honored designs and research principles. Doing research and education on systems that may be successful a century in the future is a real challenge; locating a continuing source of funding for such activity is even more difficult. As a member of the board of directors and close observer of the activities of The Land Institute, this reviewer finds much of value in both the book and the ongoing research at the site.

*Farming in Nature's Image* is a thought provoking treatise on how research is done, what insights could be gained from the native ecosystem in directing this research, and how the prairie could serve as model or guide for food production in this region in the future. We have used this book as one key reference in a course in agroecology, and find it valuable for students to broaden their perspective on agriculture. I highly recommend it to the thoughtful reader.

*Review by:*

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## **Organic Farming and Social Context: A Challenge for Us All**

Laura B. DeLind, 1994

Opinion Section, *American Journal of Alternative Agriculture* 9:146-147

The value of organic and low-chemical agriculture has become increasingly apparent to many small and family-scale farmers over the last decade. Such practices regenerate the soil, reduce environmental pollution, lower production costs, and produce quality foods that can be sold at a premium. Thus, for many growers, alternative farm methods appear to combine the best of two worlds—a reliable way to make a living and a responsible way to produce good food. Yet, bound as they are to the conventional, market-based production paradigm, this reliability and responsibility may be more imagined than real.

How can this be? To begin, an exclusive or premium product requires an exclusive or specialized market. One Michigan farmer, for example, chose to advertise his organic beef by claiming that he raised the same cattle in the same manner as those raised for the Queen of England's table. The implication was clear: for a price, we all can eat like queens. While this particular promotional ploy may be extreme, such a marketing strategy is not uncommon. But it offers little sustained opportunity for the smaller alternative producer. With sales dependent on a circumscribed target population, a specialty market can quickly collapse because of a change in vogue, in transportation costs, or in relationships among wholesalers or retailers. Likewise, the necessity of competing with other nontraditional farmers for a market niche and maintaining a competitive edge within it requires expanding one's production and marketing options or further differentiating one's products. Both options threaten to increase dependency or reduce flexibility by increasing the scale of operations and capital investment and by narrowing the range of processes and products that can be managed profitably. Capital efficiency again is positioned to replace ecological rationality.

Likewise, as alternative production techniques and products become more credible and economically attractive, they are adopted by large-scale commercial producers and standardized through volume contracts and vertical coordination, if not integration. As Kirschenmann et al. (1993, p. 19) have observed: "Investment bankers from America's largest firms now prowl organic trade shows eager to incorporate emerging organic manufacturers into larger food multinational or venture capital driven marketing plays." Stated differently, agribusiness has shown itself fully capable of adopting environmentally respectable, even organic, methods and products when they can be privatized or when not adopting them proves unprofitable. Given the current structure of the industry, smaller, alternative farmers will not find any long-term economic security within so-called free-market competition.

If producing organic products for specialty markets is not a reliable way to make a living, is it nevertheless a responsible way to produce good food? To answer "yes" would be to argue that what is good for the environment is good for society at large. Can we really work toward sustainability without simultaneously addressing deep and pervasive social, economic and political inequities? This is a major debate within the sustainable agriculture and sustainable development literature. It alerts us to two troubling issues that have received only limited attention in alternative agriculture in the U.S. First, why should only those individuals with deep pockets have access to good food? Second, why should good food be a "specialty item"—something relegated to a market niche—in the first place?

Certainly, a partial answer hinges on the production paradigm that many alternative producers continue to share, and are encouraged to share,

with the agriculture/food industry as a whole. Michigan's Assistant Director of Agriculture, for instance, publicly advised the state's organic producers to pursue niche markets. In this paradigm, food is a market commodity. It is viewed as a product grown to satisfy a niche within the now global marketplace. Its primary purpose is to feed capital and expand profit. Only secondarily is it grown to feed people and expand their creative capabilities. Given this orientation, human relationships are simplified to a single dimension (their potential for market-based consumption) and the value of a relationship equates with the value of a market exchange. As one Midwestern organic farmer unwittingly summarized, "Everybody needs business cards" and don't forget to "always treat friends and neighbors as potential customers."

Those who can't (or won't) interact along this purely "practical" dimension can easily be dismissed and devalued. Such a perspective makes it possible to ignore the rights of significant portions of the population — the poor, the hungry, agricultural labor, women, racial and ethnic minorities. It also dehumanizes or sanitizes what otherwise would be complex, "messy" and meaningful human and ethical considerations. As a result, it is possible to sidestep or define out of existence issues of public rights, public access, public participation and accountability. It becomes both possible and desirable to replace the "common good" with a cost-benefit analysis.

This prevalent mindset is still wedded to a system that is monocultural (in all senses of the term), and it will have the same stifling and wasteful results, whether they are obtained organically or conventionally. Within this mindset, the human experience increasingly is commoditized and torn apart, with each surviving bit molded to fit a market exchange. We can, however, envision an alternative system in which economics — production, utilization, trade — is re-embedded in culture and reintegrated into all the activities that define one's relationships to others, and one's social and physical place in the universe. The former requires us to ask, "What can I grow that will make me money?" and "How much can I charge for my product?" The latter permits us to ask, "What can I grow that will allow more people to eat better and become more directly involved in the food system?" and "How

little do I need to farm in a socially and environmentally regenerative manner?"

This second set of questions uses organic or low-input production practices and technologies to address the inequities, the exploitive relationships, and the dependencies that conventional agriculture has benefitted from but has ignored. These questions imply an agriculture reunited with its social context. As Henderson (1992, p. 35) has expressed it, "Organic agriculture can never be agribusiness as usual. The strength of the organic movement lies in its decentralization and regional orientation. The foundation of our growing system is stewardship of the land, long-term sustainable relationships with soil organisms, animals and our fellow human beings."

Proceeding from this alternative paradigm does not mean that producers must forgo being practical or making a living. Quite the contrary, as Kneen (1993) has noted, it means being paid fairly for the work that we do rather than defining what we do solely in terms of making money. It means directing more emphasis inward toward domestic food security than outward toward volume production amid expansion to export markets. This will require that producers and eaters share the risks, rewards and responsibilities of natural resource use, food production and distribution at local and regional levels. Nonproducers will need to know where their farmers are and where they are "coming from." They will need to know how farm practices affect the health of the environment and the quality of food it supports. Farmers, in turn, will need to know where there is local hunger and where it's "coming from." Likewise, they will need to know how the lack of food and resource equity affects the health of the surrounding community and the quality of life it supports.

This "connectedness" emerges as we forge new relationships not around commodity markets but around a more locally responsive food system. Diverse institutions such as community supported agriculture, producer-nonproducer cooperatives, urban gardens, farmers' markets, community land trusts, and food policy councils are components of such a system. Each gives expression to the inherent relationship between good food, good farming, and community building. And "...Community," as

Ebenreck (1992, p. 3) has so elegantly written, "...is our name for the living, heart-felt and truly sustaining, mutually empowering, networks of relationships" that are basic to our species.

We can use our knowledge of organic and alternative methods of farming as a tool to decentralize and democratize our food system. This knowledge and the philosophy that underlies it constitute the collective wisdom and energy of thousands of organic and low-input farmers and activists who, with little economic or institutional support, have challenged conventional farming. All of us who eat, not just those who raise our food, must now extend this challenge into both the social and the economic

realm of our daily lives. Otherwise, we will continue to lose the opportunities and choices that new agroenvironmental relationships can offer. They will be submerged beneath the dominant market paradigm. And that, as niche-oriented production indicates, is no alternative at all.

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#### REFERENCES

1. Ebenreck, S. 1992. A sense of place: Nature and significance of community. In *Alternative Farming Systems and Rural Communities: Exploring the Connections*. Institute for Alternative Agriculture, Greenbelt, Maryland. pp. 1-8.
2. Henderson, E. 1992. Open letter to the organic community. *Organic Food Matters* 6(Fall/Winter):5,35.
3. Kirschenmann, F., G. Kahn, and A. Ferguson. 1993. Towards a sustainable, organic food marketing system. *Organic Farmer* 4(Spring): 19-20.
4. Kneen, B. 1993. *From Land to Mouth: Understanding the Food System (A Second Helping)*. NC Press Limited, Toronto, Canada.







## **Green Plans: Greenprint for Sustainability**

Huey D. Johnson, 1995

University of Nebraska Press, 312 N. 14th St., Lincoln, NE 68588-0484, 206 p, cloth \$35.00, paper \$12.00

"No more than one or a few decades remain before the chance to avert the threats we now confront will be lost, and the prospects for humanity immeasurably diminished. A new ethic is required, a new attitude toward discharging our responsibility, for caring for ourselves and for the earth. This ethic must motivate a great movement, convincing reluctant leaders and reluctant peoples themselves to effect needed change." This 1993 statement from the Union of Concerned Scientists is quoted by David Brower in the Foreword to *Green Plans*, a remarkable strategy for developing a resource efficient and sustainable future. All the reader's courage and imagination are needed to embrace the magnitude of these plans, involving a massive call to action for all sectors of society.

While Secretary of Resources for the State of California, author Huey Johnson started a voyage toward his "Green Century Project," a grand vision made up of 100-year plans for all parts of the system. Most recently Johnson has gathered ideas from other parts of the world where people are already solving the largest challenges: over-exploitation of natural resources; pollution of air and water; loss of productive farmland; and lack of cooperation and coordination. He says we've been unsuccessful because the problems have been tackled one at a time. Johnson advocates a bold plan to "adopt large-scale, comprehensive, integrated plans that are designed to solve *the problem* in its entirety." Enlisting the support of industry, government, and environmental groups, Johnson's Resource Renewal Institute has pursued this vision with creativity and vigor.

*Greenprint for Sustainability* is built on the principles of government guidance but local control. Johnson insists that our major roadblock has been lack of planning and cooperation among major players, and that everyone must be involved

from the start in seeking collaborative agendas and win-win solutions. He points out shortcomings of narrow plans based on a single popular issue: rain-forests, toxic wastes, or wilderness preservation. He urges us to address each issue as part of a larger plan rather than as piecemeal efforts that move forward in isolation. Johnson's thesis is that comprehensive plans take into account the relationships among issues, and that we cannot solve individual challenges because of the intricacies of the complex interactions that make a system work. This in itself is a recognition of the complex reality of ecology and the natural world on which we depend. The author points out that solutions need to be comprehensive as well as integrated, and must take into account the relationships between natural and human systems. Special attention must be paid to the creation and implementation of environmental policies.

Some existing models have been successful. Johnson cites the experience of developing the "Investing for Prosperity" program in California, an ambitious plan to restore and improve the state's natural resources. Through a coalition of labor unions, corporations, government, and environmental groups they were able to design a more sustainable energy strategy starting with the principles of conservation and stewardship. The author branched out to study the green plans of three countries: Netherlands, New Zealand, and Canada. These form the heart of the book, and provide the foundation for his *Green Plans* for the U.S. He describes their plans as "comprehensive, ecosystem-based initiatives designed to save the forest, not just the trees." Most importantly, in each case the government has pulled its own agencies together as well as brought in industry, environmental groups, and citizens to frame long-term objectives and strategies.

Netherlands' National Environmental Policy Plan (NEPP) was based on the work of hundreds of people visioning for the future, and then implementing a comprehensive strategy to make that future work. Central to the plan were thoughtful management, organization of each industrial sector into associations to work out their own agendas for change, substantial government investment, and a 25-year time frame (one generation). The slogan used was "each generation cleans up." Johnson cites the strong political support for the plan, which was formally announced in a Christmas message from Queen Beatrix and quickly gained wide support. The government also instituted a 50-year program based on 'backcasting' or asking what needs to be done today to achieve a sustainable economy by the year 2040. Where should government spend money today to reach tomorrow's goals? The groups came together to reach consensus on eight principles, mostly on pollution and the environment, on which strategies are based. They realized that different issues must be dealt with at different scales, and careful monitoring guidelines were set up within the involved groups. Important to the plans are appropriate technology and a strong information base. The plans are unique to this country and its vision, and to the cramped nature of their society with many people and limited land.

New Zealand's Resource Management Act (RMA) was designed to refocus government policies on natural resources and in the long term to provide a high quality of life for citizens. Sheep monoculture and overgrazing, eroded lands, disappearance of forests and wildlife, and over exploitation of fish are all indicators of environmental decline. Support for an eco-sustainability strategy came from Federated Farmers, nonprofit environmental groups, and some sectors of industry. Implementation of plans was delegated to the regional and district levels, although these had to correspond to national standards for sustainable management. Monitoring of the process was separated from enforcement of the RMA, a key strategy to promote cooperation. "New Zealand 2010" is a new program that will go beyond the present RMA; it weaves environmental into economic and social policy, establishes new laws, and sharpens policy among other goals. The country is well on its way

to meeting these objectives.

Canada's Green Plan was developed in part in response to the Brundtland Report, and involves respect for nature, the close economy-environment relationship, efficient resource use, shared responsibility, informed decision making, and adopting an integrated, ecosystem approach. The action agenda includes at least 36 major initiatives to create a healthier environment, including substantial investment by the federal government in the process. The program is moving ahead.

Huey Johnson used these models to inform a greenprint for the U.S. He sees a changing attitude by business toward the environment, partly in response to heightened public awareness. There are commissions at the federal level doing studies of sustainable development, and individual states working on their own plans on the state or watershed basin levels. There is still need for a larger federal financial commitment, and for educating the public about resource conservation issues. Johnson admits to the difficulty in building consensus in a country as large and diverse as the U.S., but insists that we have few alternatives to getting serious about developing a green and sustainable future. This is an intriguing book. It does not pretend to be an academic treatise, but it does provide end notes to each chapter and a useful list of references. The book prompted the filming of an hour-long public television special on *Green Plans*. Its call to action is consistent with other recent new programs; the concept of sustainable development was described in practical terms and real world examples in the recent Educational Television series *Planet Neighborhood*, where options for a green planet were shown in alternative housing, transportation, manufacturing, and design of buildings and cities. As one of the editors of the series in which this book appeared (*Our Sustainable Future*, University of Nebraska Press), I could be considered a non-objective reviewer. The reader will have to explore *Green Plans: Greenprint for Sustainability* and decide if, in fact, this is the best direction for the future.

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***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter VIII***

***Introduction***

**Soil Quality and Health**

Nothing is more basic to long term survival of the human species than the availability of fertile soils to maintain plant and animal production. Yet, soil has been mined by erosion, constant cultivation, and extraction of available nutrients. The productive "A" horizon that contains most organic matter, available nutrients, and essential living soil microorganisms is virtually gone in many areas of long cultivation: hills bordering the Mediterranean, coastal rainfed slopes in Central Chile, the mountainous regions of Haiti and Madagascar. Even in the fertile Corn Belt and Great Plains of the Central U.S., about half of the topsoil has disappeared in just one hundred years "under the plow." These depredations are clearly not sustainable.

Depending on rainfall, temperature, prevailing vegetation, and parent materials, soils may form at a rate of 1-2 mm per year or about the thickness of a penny. The "T-value" is commonly used in the U.S. to represent the rate of soil formation, and this averages about 5 tons/acre per year. If soil loss due to wind or water erosion plus any nutrients removed by the crop, or otherwise exported from the field, exceeds this rate, the system is non-sustainable in the long term. In this chapter are reviews of several recent books that demonstrate how the tragedy of soil loss can be reversed, and how we can build and sustain this vital resource for the future.

Fred Magdoff's *Building Soils for Better Crops: Organic Matter Management* (1993) describes the important role soil organic matter plays in fertility, tilth, and water holding capacity. He further details the buffering capacity that organic matter provides and the relationship between healthy plants and healthy soils. Magdoff goes beyond the taxonomic diversity of organisms to explore the management options of cover crops, manure and compost, and tillage and how they fit together in a rational production system. Rattan Lal and Fran Pierce broaden the discussion of cultural practices in *Soil Management for Sustainability* (1991). Bringing together manuscripts from a workshop in Alberta, Canada they focus on basic soil processes, management at the field and farm scale, as well as policy issues. The importance lies in their coverage of key topics across several levels of spatial hierarchy, a key to systems thinking in agriculture.

The unique potentials of *Agroforestry for Soil Conservation* (1989) are summarized by Anthony Young. The importance of agroforestry, land use patterns, and specific cultural practices is described primarily in the context of tropical regions, although there are some examples from the temperate zone. Details include agroforestry impacts on organic matter, plant nutrients, role of

Further treatment of soil management issues in the tropics is found in Woomer and Swift's *An Ecosystem Approach to Soil Management: The Biological Management of Tropical Soil Fertility* (1994). The complexity of the living soil system must be better understood in order for us to successfully manage agricultural lands for crop and forage production. The soil ecosystem approach is relatively new, as scientists push back the frontiers of knowledge about a part of the field system that is not easily observed or understood. Woomer and Swift go beyond the descriptions of soil microorganism taxonomy and field management of crops to put the topics in a socio-economic context that contributes to a better understanding of how this information contributed to sustainable agriculture.

A practical set of ideas and recommendations primarily for organic agriculture producers is *The Soul of Soil: A Guide to Ecological Soil Management* (1995) by Grace Gershuny and Joseph Smillie. Their experience on organic farms as producers has provided a rich background on which to base this guide to soil management. The linkage to *soul* suggests the philosophical setting within which the discussion takes place, and there is a forward by Fred Kirschenmann, an organic farmer from North Dakota.

This same discussion has recently permeated parts of the scientific and academic communities. An example is *Defining Soil Quality for a Sustainable Environment* (1994), edited by John Doran and others and published by the Soil Science Society of America, a highly mainstream organization. Based on papers from a symposium in 1992, this book describes the emerging discussion of soil quality, including how both scientists and farmers describe this phenomenon. The editors define soil quality as "the capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health." They stress the need for interdisciplinarity in teams and holistic focus of research. Although a number of key soil indicators are frequently used to describe the condition of a specific field or farm, the editors rightly describe the important step of sorting out these many indicators and deciding which are most important in a given field situation. They emphasize the need to understand soil quality as a dynamic property or set of properties that change with weather, management decisions, and choice of cropping patterns. Overall, this section of the compendium helps tighten our focus on soil health and its role in sustainable food systems.

**Charles Francis and Gabriel Hegyes**



## **Building Soils for Better Crops: Organic Matter Management**

Fred Magdoff, 1993

University of Nebraska Press, PO Box 880520, Lincoln, NE 68588-0520. 176 p. cloth \$22.95

Agriculturalists through the years have been well educated about the benefits of soil organic matter for natural soil properties that are important for productivity and environmental functions. Few, if any, of these effects are negative; most enhance crop production and environmental quality, often at little cost to the producer. Yet, modern conventional agriculture has taken a course that has tended not to maximize the benefits of organic matter, and instead chosen a management strategy that relies heavily on increasing artificial inputs. Fred Magdoff points out that these systems are not likely to be sustainable because of adverse side effects, particularly to the environment. His book makes the case for organic matter management as a better approach for farming sustainability. Scientifically, this makes good sense as a way toward helping solve many problems related to today's agriculture.

In the preface, Magdoff explains that although much has been written about soil organic matter, there is a void in the literature on organic matter management. The strengths of this book are its scientific basis, its relevance to modern day agriculture, and its presentation style, which can be understood by most practitioners who work with the soil.

People often forget or do not fully realize the many roles played by soil organic matter that are crucial to a well functioning agriculture and environment. These include enhancing soil tilth, detoxifying wastes, regulating carbon and water cycles, and serving as a reservoir for various plant nutrients and as a buffer against pH change. The book also emphasizes the connection between healthy plants and a healthy soil made possible by a good supply of organic matter.

Part 1 consists of four chapters that describe the components of organic matter: the living portion; the nonliving but largely undecomposed materials; and the well-decomposed part of soil organic matter commonly called humus. Chapter 2 makes clear the diversity of organisms in a healthy living soil and the tight interaction that exists among the different types and species. The key in management is to produce the proper conditions by returning adequate amounts of organic materials to enable the various soil animals and flora to restore and maintain the soil's fertility and improve its physical properties.

Part 2, with seven chapters, gets to the heart of soil organic matter management and regulation. Several strategies are discussed, including controlling soil erosion, growing sod crops in the rotation, and regularly applying materials to the soil, such as manures, composts, and crop residues. There is a good discussion of the appropriate use of animal manures, composts, cover crops, and crop rotations in fertility management. All have their merits, and as Magdoff points out, must be considered from the standpoint of site specific applications. Reduced tillage, discussed in Chapter 9, is highly effective for soil organic management because it not only promotes residue retention and slows organic matter decomposition, but also controls soil erosion. In "putting it all together" (Chapter 12) the author places the decisions on integrating practices for building and maintaining organic matter back into the hands of the land-user because of the great range of conditions that exist in the real world.

The last two chapters discuss organic matter dynamics and chemical properties. Mathematical approaches that are useful for approximating organic matter dynamics range from a simplified

equilibrium model to a first order rate model that includes an equilibrium term. These models can be used to evaluate how practices change the organic matter content before equilibrium has been reached and at equilibrium. Some very useful information is also presented on the limitations of using organic matter content and nitrogen content to indicate nitrogen availability to plants.

The chapter on chemistry of organic matter relates the characteristics of humic materials to their chemical composition and explains the variable charge and pH buffering capacity of soil organic matter. The influence of soil organic matter on cation exchange capacity and the effect of liming on pH are especially important in managing the fertility of some soils.

This book does not present in-depth information on organic matter concepts and management practices. That was not its intended purpose. It does a remarkably good job of presenting some fairly complex concepts about soil organic matter in a language that can be understood by gardeners, farmers, and others who work with agricultural soils, and it provides information that is of immediate practical use. The book title very appropriately reflects its contents.

*Reviewed by:*

*Robert I. Papendick  
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Journal. Alternative Agriculture. 8:140. 1993*



## **Soil Management for Sustainability**

Rattan Lal and Fran J. Pierce, Editors, 1991

Soil and Water Conservation Society, 7515 NE Ankeny Rd., Ankeny, IA, 50021. 189 p., paper \$15.00

*Soil Management for Sustainability* is a collection of manuscripts presented at a workshop on this subject held in Alberta, Canada in August 1987.

The workshop, organized by the World Association of Soil and Water Conservation and sponsored by the Soil and Water Conservation Society, Soil Science Society of America, and Soil Conservation Service was established as a tribute to Dr. William E. Larson, a pioneer in promoting the concept of managing soil resources to sustain agricultural productivity and environmental quality. The manuscripts highlight research contributions made by Dr. Larson throughout his distinguished 40-year career and were prepared by former students and colleagues with expertise in the various aspects of his work.

The chapters of this book are organized loosely into three sections. The section on basic processes generally focuses on soil processes at a micro-scale. The section on management options is focused on the field to the farm scale; the section on policy issues and priorities transcend these scales.

Introduction and Conclusion chapters set the context and attempt to provide continuity to the work. Chapters on basic processes cover soil structure, aggregate stability, soil compaction mechanisms, and erosion processes, as well as prediction tools. Chapters on management options describe various forms of conservation tillage, application of wastewater sludge to agricultural land, farming by soils, and basic concepts of sustainable agriculture. Chapters on policy issues and priorities discuss the philosophy of sustainable agriculture, government policy and how it can help or hinder sustainable agriculture, and research needs for sustainable soil management. This group

of chapters includes one containing an interview with Dr. Larson, during which he discusses many of these topics.

*Soil Management for Sustainability* provides insights from a diverse cross section of academic disciplines, something Dr. Larson encouraged throughout his career. It is apparent, however, that not all of the authors are used to communicating outside their own disciplines; an individual reader might not appreciate all chapters with equal enthusiasm. Readers well versed in sustainable agricultural systems could find the chapter on modeling aggregate soil stability difficult to follow. Conversely, those well versed in soil physics might find the chapter on national surveys of conservation tillage and cropping systems difficult to follow. The editors make a noble attempt to bridge the disciplinary gaps with an integrating introduction and summary. Though they fall somewhat short of this goal, the attempt is nevertheless encouraging. An interdisciplinary approach is absolutely necessary to address the complex issues facing the world in the twenty-first century.

In one respect the book is very successful. It provides a wonderful tribute to Dr. Larson, who was a pioneer in the concept of sustainable soil management and an avid proponent of interdisciplinary thinking. The single concept that appears in all chapters is a respect for Dr. Larson and his many contributions to the agronomic sciences. Dr. Larson should be proud.

*Reviewed by:*

*Stefanie Aschmann*

*USDA - NRCS, Watershed Science Institute,  
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## **Agroforestry for Soil Conservation**

Anthony Young, 1989

CAB International, International Council for Research in Agroforestry, Wallingford,  
Oxon OX10 8DE, United Kingdom. 276 p. paper \$27.95

This book presents the results of an International Council for Research in Agroforestry (ICRAF) review of the potential of agroforestry for soil conservation, treated in its wider sense to include both control of erosion and maintenance of fertility. It is intended primarily for research scientists engaged in agroforestry research and provides an extensive reference section. A second intended audience consists of those concerned with planning agroforestry development in national and international development organizations and aid agencies. With the intended audiences, the book serves as an excellent reference and would provide strong supplemental reading material for the classroom. Upper level-undergraduate and graduate students interested in agroforestry would find this book useful as a source of new ideas and methodologies and as a reference.

A possible limitation is an emphasis on the tropical regions; however, there are examples and suggested applications for other climatic zones. A second potential limitation is the book does not take into account availability of soil water which can be a limiting factor for plant establishment and growth.

The objectives of *Agroforestry for Soil Conservation* are: 1) To summarize the present state of knowledge on agroforestry in soil conservation, including both known capacity and apparent potential; and, 2) To indicate needs for research if this potential is to be filled. To meet these objectives, the book is organized into four parts. Part I, "Soil Conservation and Agroforestry," lays the groundwork for the text and includes previous reviews of soil conservation in agroforestry and basic definitions. Soil conservation, sustainable land use, and the range of agroforestry practices are also discussed in Part I.

Part II, "Agroforestry for Control of Soil Erosion," is based on the premise that erosion control is a prerequisite for other forms of conservation. Topics covered in this part include: trends in soil conservation research and policy, barrier and cover approaches to erosion control, and agroforestry practices for erosion control. The discussions concerning the various practices for erosion control are excellent and present descriptions, examples, drawings and photographs of existing systems that have been successful.

Part III, "Agroforestry for Maintenance of Soil Fertility," details methodologies where erosion is not a serious problem or where it has been brought under control. In these cases, soil conservation consists of preventing physical, chemical, and biological degradation of the soil. The role and potential of agroforestry for this is the basis for Part III. Subjects included in this section include: soil fertility and degradation, effects of trees on soils, soil organic matter, plant nutrients, soil properties and processes, the role of roots, agroforestry practices for soil fertility, and a listing of trees and shrubs for soil improvement.

The fourth part, "Agroforestry for Soil Conservation," includes modeling soil changes under agroforestry, research needs, and a conclusion section. The modeling section involves an in-depth discussion of a computer model that integrates and predicts erosion control and fertility maintenance. A summary follows the main text and provides a quick walk through the book and summary of results.

*Agroforestry for Soil Conservation* is well-written in a logical sequence with many useful tables, illustrations, and photographs. This text expands the current level of knowledge and understanding of the potential for agroforestry and indicates

additional research needs. It would serve as a strong reference book for anyone involved in agroforestry.

*Reviewed by:*

*Thomas L. Schmidt*

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*Reprinted with permission from the Journal of  
Agronomic Education 20:57-58. 1991.*



## **An Ecosystem Approach to Soil Management: The Biological Management of Tropical Soil Fertility**

P.L. Woomer and M. J. Swift, Editors, 1994  
John Wiley & Sons. 605 Third Ave, New York, NY 10158. 243 p. Cloth \$135.00

Although Hans Jenny proposed the idea in the 1940's, only recently have soil scientists willingly accepted the idea that soil is a complex system of interacting living and nonliving components, and that this complexity needs to form the basis for sustainable management of soils in agricultural settings. Woomer and Swift's book sets a standard for any future work on soil ecosystems, and in fact provides guidance for applying an ecosystem approach to agricultural research. In what is described as a report on the first five years of research by scientists of the Tropical Soil Biology and Fertility Programme (TSBF), it becomes obvious that this book is more than a report. It contains 9 multi-author chapters, combining the work of 33 contributors, but does not suffer the problems that such compendiums commonly incur. It has an organization and flow that truly meet the goals: to provide a book that could serve as a basic text for research in sustainable soil management. In my opinion, the editors are remarkably successful.

TSBF is sponsored as a component project of the International Union of Biological Sciences (IUBS) program The Decade of the Tropics and of the Man and the Biosphere (MAB) program of UNESCO, and hosted by UNESCO offices in Nairobi, Kenya. It has the unique aspect of being a voluntary participatory international research program with members committed to the concept that the fertility of tropical soils is controlled by biological processes and can be managed by their manipulation. Participating scientists represent a broad global network that focuses attention on potential for the biological management of tropical soils.

The book is organized around four main research themes of the TSBF: soil organic matter management; nutrient use efficiencies; manipulation of the soil water regime; and potential for using soil fauna for soil fertility improvement. Key introductory

and closing chapters set an overall context of sustainable agriculture. An agroecological approach to soils is integrated with the socio-economic implications of implementing research results. It is this larger context that makes this book so valuable for anyone involved with the sustainability of land use.

The first chapter effectively sets the stage. Titled "Soil fertility research in response to the demand for sustainability," it describes the ecosystem-level perspective that establishes a systems-and-process paradigm, an approach particularly useful for placing research results in an applied context with hope of adoption by the farmers who manage soil resources. Soil fertility itself is presented as a component of sustainable agriculture, but in order to do this, the authors present an excellent discussion of the concept of sustainability and why it has become an important paradigm for research in agriculture. In an up-to-date and concise review, the multiple authors of this chapter describe the changes in thinking about agriculture that have created the demand for sustainability. This chapter is convincing reading for anyone who may harbor doubts that sustainable agriculture needs to become the mainstream approach for agricultural research.

Chapter 2, "Soil biological processes in tropical ecosystems," might be considered the best chapter in the book. It should be required reading for anyone who wants to understand what agroecology and an ecosystem approach to agricultural research is about. The description of ecosystem structure and function, especially as applied to tropical ecosystems, is excellent, and sets the stage for a description of the key ecosystem processes upon which the biological management of soil fertility is based. Furthermore, the understanding of agroecosystem management builds on the knowledge of natural ecosystem processes, where both simi-

larities and differences between natural and managed ecosystems are important. Throughout the chapter, comparative data from actual TSBF sites are used for analysis, leading to more specific discussions of research results in the rest of the book.

The next four chapters form what might be the actual TSBF report. The four themes of the program are each covered in great detail, with results from the member organizations forming the central aspect of each chapter. These results are complemented by comprehensive literature reviews of work done principally in other tropical regions, but with some reference to temperate regions when information from the tropics is weak or lacking. For all four themes, sustainability and ecosystem process is the unifying approach, allowing the reader to integrate these different components of tropical soil fertility. In addition, each chapter describes management options that might be implemented as a result of knowledge gained to this point in the TSBF program, as well as providing recommendations for future work.

Chapter 7 describes how simulation modeling can be used to organize information about agroecosystem process. System component flow diagrams provide a mathematical basis for analyzing the dynamics of soil organic matter decomposition as related to plant production. Using data from the TSBF projects, comparisons between observed and simulated models for changes in soil organic matter provide a useful critique of the strengths and weaknesses of models, the kinds of data needed to make models work better, and adjustments in the models for the future. The unique data set from the TSBF projects provides an interesting test case for the modeling approach.

As a case study of the TSBF approach for studying biological management of soil fertility at the farm level, chapter 8 is an interesting comparative analysis of a traditional agroecosystem in north-eastern India. The chapter focuses on the patterns and processes involved in soil fertility changes and nutrient budgets under different cultivation practices, and compares the advantages and

disadvantages of those practices as alternatives for maintaining soil fertility under low external-input conditions in a particular socio-economic context. The importance of working directly with farmers and local farming knowledge is clearly presented.

The final chapter of the book is a useful discussion of the current thinking about ways to implement changes in farming practices that are based on research results. By returning to the original goal of the TSBF program as a way of introducing the chapter ("to determine the management options for improving tropical soil fertility through the manipulation of biological processes"), a discussion of an evolving approach to on-farm research provides an excellent framework for considering the "real-world" aspects of changing and improving farming practices. This chapter, and the book in general, has special application for small farm systems in the tropics, but the general approach of how to work more effectively with the farmer's own decision-making process and at the farmer's scale provides a basis for reviewing current farming system approaches to implementation and change. An interesting and potentially applicable way of integrating system and process closes the chapter, and leaves the reader with challenging ideas of how to employ an agroecosystem model of complex interactions and feedbacks that builds on the farmer's own decision making process. A brief Ugandan example provides a tantalizing case study of such an approach, but as stated elsewhere in the book, since demonstrating sustainability takes considerable time, we will have to wait for the next report of the TSBF in order to examine the broader success of their approach. If this book is an indication, the next installment will make a major contribution in demonstrating how to fully integrate soil biological processes with those of human decision making in relation to all components of the agroecosystem.

*Reviewed by:*

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## **The Soul of Soil: A Guide to Ecological Soil Management, Third Edition**

Grace Gershuny and Joseph Smillie, 1995  
agAccess, P.O. Box 2008, Davis, CA 95617. 174 p. paper \$16.95

*The Soul of Soil* is an easy-reading guide to soils and soil management directed at agricultural practitioners interested in sustainable farming and particularly that group of farmers producing *organic* products. The authors dedicate this work to "all life on Earth and all soil lovers." This edition is a recent update of a book first published in 1983 by the University of Vermont Extension Service as an outgrowth of a Masters Degree program in Extension Education by the senior author. The authors bring many years experience in organic agriculture as practitioners, authors, and organizers of organic certification programs. This book is an excellent reference for the lay person in that it reduces technical concepts into readily understandable topics. The authors' use of tables and figures readily and appropriately supports the text. Their use of summary boxes to explain technical concepts and topics adds to the understandability of the book.

The Forward written by Fredrick Kirschenmann introduces the book by providing a philosophical setting by discussing the *soul* of the soil. In his brief treatise, he proposes the significance of a holistic approach to soil fertility and soil management and its relationship with soil quality and soil health. He discusses recent joining of ethicists with soil scientists to look to the nature of agriculture in the future and how humans are or will be affected by current and future soil management practices. Kirschenmann suggests that a reconnection to the soil is a reconnection to ourselves and to the limits that we as a people face. He concludes with the concept that good soil husbandry may require the development of rituals of consent as practiced by the Native Americans in order for us to recognize the life that the soil holds and to provide our connection to loving the soil again.

The book itself consists of five chapters of varying length that cover a range of topics from defining the concept of ecological agriculture through a basic description of the soil system, monitoring and managing the soil, and marketing certified organic products. Chapter 1 is a relatively brief chapter presenting the concepts of organic, regenerative, sustainable, and low-input agriculture. The authors then present their concept of ecological agriculture, or agroecology. They objectively point out the controversies that plague the methodologies of ecological agriculture. They conclude the chapter with four definitions of ecological agriculture drawn from the Organic Farmers' Association Council, Organic Trade Association, USDA, and the Earth Summit Alternative Nongovernmental Sustainable Agriculture Treaty.

Chapter 2, entitled "Understanding the Soil System," presents an overview of basic soil factors and processes. The authors break this chapter down into four topics, which are entitled "Organic Matter & Humus;" "Physical Factors: Soil Structure & Tilth;" "Chemical Factors: Nutrient Cycles & Balances;" and "Biological Factors: Life In & On the Soil."

Effective use of figures and tables is made to help define soil properties and processes in a manner that is understandable to the reader. Informational boxes are used well to present topics such as "Benefits of Humus," "Cation Exchange Capacity," "Colloids," and "Bacteria and Breathing" to name a few. In my opinion, this 2nd chapter is the most valuable in the book because it describes soil properties, processes, and functions in an agricultural sense that is readily understandable to the reader. If this book is purchased for the sole purpose of the information that this chapter contains, then the price of this book is money well spent.

Chapter 3, "Observing & Evaluating Your Soil," discusses skills and tools that are useful in monitoring crop growth and production on the farm. The authors cover the importance of maintaining records on crop growth, productivity, and appearance. Observations made during planting, cultivating, pruning, fertilizing, and harvesting, also tell a story of the soil. Table 9 presents a list of weeds as indicators of soil conditions, physical, and chemical properties. The authors also give simple techniques to estimate soil moisture, drainage, structure, compaction, erosion, bulk density, and other soil properties. Interestingly, the authors devote all or part of 12 pages of the 27 in this chapter to discussing soil testing, fertilizer recommendations, and test interpretation. The last two pages of this chapter cover the value of tissue analysis and also discuss the measurement of the plant's nutrient status by measuring the sugar content in cell sap with a refractometer. Although I am not aware of any wide usage of a refractometer in general crop production, it is an interesting approach to consider for certain crops where plant sugar content is of interest.

"Soil Management Practices" is the topic of Chapter 4. This chapter deals with managing soils in an organic matter. However, these principles are also well adapted to conventional farming systems. One of the areas that interested me is the discussion of using animal manures, compost and composting, waste recycling, and use of various raw materials. The authors adequately address the importance of considering the carbon/nitrogen ratio of materials used in composting and the impact on the composting process. A section of this chapter also covers green manures and other soil-improving crops and rotation. A discussion of plant nutrients,

natural resources of nutrients, and their application finishes the chapter.

The final chapter, Chapter 5, entitled "The Marketplace & Organic Certification," although brief, gives an overview of the organic certification process and some of the current criteria governing that process. The authors recognize that certain synthetically-derived fertilizer materials such as superphosphate and urea "may be the most ecologically sound approach to correcting a soil problem." They note that clear-cut answers do not yet exist as to what materials are the most ecologically friendly. Whatever practice is most sound, the authors point out the importance of maintaining good records, farm plans, and connections with ecologically aware consumer groups. This book also has an appendix that contains a glossary of soil-related terms (Appendix A); a list of organizations and periodicals of ecological agriculture groups (Appendix B); a bibliography (Appendix C); and a list of texts and references (Appendix D).

The book would not be appropriate for a course text. However, due to its ease of reading and simple explanations of soil processes, it would be useful as a reference for extension personnel, vocational agriculture teachers, practitioners of organic and sustainable farming and gardening, as well as anyone interested in ecologically based agriculture.

*Reviewed by:*

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Life Sci. Educ. 25:91. 1996*



## **Defining Soil Quality for a Sustainable Environment**

J.W. Doran, D.C. Coleman, D.F. Bezdick, and B.A. Stewart, Editors, 1994  
Soil Sci. Soc. Amer. Spec. Pub. 35. American Society of Agronomy, 677 South Segoe Road,  
Madison, WI 53711-1086. 244 p. paper \$30.00.

In the past few years there has been a heightened interest in understanding and defining soil quality. As we can see the results of continuing soil degradation in more runoff, water pollution, and reduced crop yields, there is increasing recognition that we need both a generally accepted definition of soil quality and methods for estimating it. This book contains 8 full length chapters plus 10 short chapters that summarize presentations on this subject from a symposium at the 1992 national meetings of the American Society of Agronomy.

The book contains a wealth of information and ideas. It offers a good discussion of the definition of soil quality and its descriptive aspects, and proposes several approaches for assessing it using quantitative measurements. Two interesting chapters describe a process for finding out what farmers considered a good quality soil. Farmers mainly use descriptive properties, such as look, feel, and smell, in describing what they consider high quality soils. Farmers in Wisconsin said that such soils were "deeper, darker, easier to plow, worked up more easily in spring, sponged up and held more water, dried out sooner, broke down corn stalks more rapidly in the fall, had higher organic matter and less erosion, had greater numbers and more species of worms, and had a recognizably sweet, fresh-air smell." Times have really changed when scientists actually consult farmers about such an issue!

After discussing several alternatives, the authors of Chapter I offer this definition of soil quality: "The capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health." Other definitions are given elsewhere in the book; although we may quibble about the wording, the more difficult issue is how to assess a particular soil's ability to do all these things. The approach must be holistic and interdisciplinary. Also, for any assessment system to

be useful at the farm level, the needed measurements cannot be too numerous, complicated, or time consuming. Moreover, in different situations we may have different concerns, such as crop yield and quality, water partitioning between runoff and infiltration, or maintaining a strong environmental buffer, so that different measurements may be needed under different circumstances.

Another problem arises when we try to develop a unified way to compare the quality of different soils or to understand changes caused by management: how much weight should we give to each measured or estimated parameter in coming up with an overall number to represent the health or quality of the soil? Several hard-to-prove assumptions are needed, which are easily subject to biases, when we seek to combine measurements as different as pH, bulk density, aggregate stability, water infiltration rate, and biological indicators. A further obstacle is that some of the proposed measurements may vary significantly under normal changes caused by temperature and rainfall, so that the choice of when to make the measurements can be important.

Two general approaches are taken to the assessment of soil quality. One is comparative, with measurements made either on different soils or on similar soils under different management systems. The other is dynamic, with measurements made over time on the same site to assess changes in soil quality. The minimum data set (MDS) suggested in the chapter on the dynamic approach includes the following ten soil attributes: nutrient availability; total organic C; labile organic C; texture; plant-available water capacity; structure; strength; maximum rooting depth; pH; and electrical conductivity. Some of these, such as nutrient availability and pH, are routine and simple, but the time and costs for obtaining this entire proposed MDS suggests that for the foreseeable future, only scientists will be able to use this system. The



authors suggest that instead of measuring all parameters, various correlations can be used. For example, bulk density can be estimated from organic matter and clay content.

The book offers considerable discussion of the biological indicators of soil quality, including chapters on microbial, faunal, and enzyme activities. There are short chapters on biologically active soil organic compounds (mainly in connection with C and N mineralization) and on using microbial biomass as an indicator of soil quality.

For all the useful and stimulating discussion in this book, it is clear that because the chemistry,

biology, and physics of soils are so complex—and become even more so when we consider their interactions—we are far from having a generally accepted method for defining soil quality. This is not an argument to forget the issue. Rather, it means there is a lot of exciting work ahead. By bringing together current thinking and research on this issue, the book takes a very worthwhile first step in what will have to be a long journey.

*Reviewed by:*

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***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter IX***

***Introduction***

**Living with Crop Pests**

A major philosophical break from our past mentality about crop pests -- weeds, insects, pathogens, nematodes -- has been the shift in emphasis from "control" to "management." With the advances in integrated pest management, a strategy that is focused on multiple alternatives and potential impacts on both profit and the environment, have come innovative approaches to dealing with the perennial challenge of protecting crops from loss to undesired species. The approach has produced other off-shoots, such as integrated nutrient management and integrated crop management. All these initiatives represent a move toward more holistic thinking in agricultural systems design and practice. Although a few detractors -- mostly supporters of organic, non-chemical practices -- look with scorn at what they call "integrated pesticide management," there is general consensus that IPM reduces pesticide applications and is a great improvement as an approach to living with pests.

A strong historical foundation undergirds the presentation of *Sustainable Practices for Plant Disease Management in Traditional Farming Systems* (1991) by David Thurston. Based on an exhaustive literature review during a sabbatic year in Spain reading ancient library materials, the author provides a rich context from Biblical and Roman times as well as from his extensive field work in Latin America with limited resource farmers. Here is a strong message for those designing current strategies in pest management -- learn from the past, and learn from other agroecosystems across a spectrum of technology levels. Professor Thurston exhorts us to learn the lessons of history, where many successful practices have been used over centuries, but may be quickly abandoned when challenged with the allure of overly simple new chemically-based technologies. Many of our future practices, he contends, will be based on this broad historical and geographic appreciation of a wider range of options.

*Food, Crop Pests and the Environment: the Need and Potential for Biologically Intensive Pest Management* (1992) is a government report edited by Frank Zalom and William Fry and published by the American Phytopathological Society. It is a landmark publication because of its roots in the establishment. It goes beyond describing the efficient use of pesticides to suggest that many times the best approach will be to substitute other controls for chemicals. Although the reviewer is less than complementary about the book's organization, he praises its vision toward the future of an intensive use of IPM and how the obstacles to application of the strategy can be overcome.

Miguel Altieri's *Biodiversity and Pest Management in Agroecosystems* (1994) reviews the recent literature that provides a foundation for biological control of pests. The emphasis here is on insect pests, with some strong research reports on insect-weed-crop interactions. There is less information on weed management,

and limited reference to plant pathogens and nematodes. Altieri focuses on the interactions among system components, a key attribute of systems function that is critical to understanding management options.

Charles Benbrook's report on case studies of organic farmers in the U. S. illustrates how innovative, non-chemical practices can be used on farms from 25 to 500 acres in size. There is no question that organic farming can be viable. In *Healthy Food, Healthy Farms: Pest Management in the Public Interest* (1995), Benbrook describes how somewhat lower yields on these farms are easily offset by lower production costs; the results are profits from 113 to 135% higher than conventional farm returns in the same states. As the author points out, these are "excellent farm managers, and the methods which have made them successful may not be applicable by less sophisticated growers."

These reports represent a small fraction of the growing body of literature on integrated pest management and alternatives to chemical pesticides. This major trend in U.S. and global agriculture is bound to have a major influence on both resource use and environmental impacts of crop production in the future.

**Charles Francis and Gabriel Hegyes**



## **Sustainable Practices for Plant Disease Management in Traditional Farming Systems**

H. David Thurston, 1991

Westview Press, 5500 Central Avenue, Boulder, CO 80301. 300 p. cloth \$45.00

In the critical race to provide sufficient food for an ever expanding global population, most scientists and many farmers have abandoned traditional farming practices and systems to increase land and labor use efficiency. Resulting systems, exemplified by the Green Revolution technologies used in rice and wheat production, largely ignore many of the time-honored principles of pest management that have evolved with farmers over centuries. *In Sustainable Practices for Plant Disease Management in Traditional Farming Systems*, David Thurston catalogs and reviews what is being lost in the process.

Following an introduction on the reasons why we have followed this path, Thurston evaluates and contrasts the sustainability, labor requirement, and external inputs needed for a number of diverse management practices. He further contrasts traditional with modern systems in terms of biological productivity, yield stability, sustainability, and social equity. He is one of the few authors to attempt to measure, even in a qualitative way, the current success or yield of several traditional systems in terms of land, capital, labor, and external input use. The introductory chapter is an excellent juxtaposition of traditional systems and the dilemmas that face experts in development. What is the best route to sustainable food production?

After a valuable review of historical uses of traditional and primarily organic pesticides that have been used on crops, the author launches into an exhaustive review of ways that cultural practices have been used to manage plant pathogens. He carefully draws the distinction between "control," or a complete elimination of pathogens, and "management," a lower cost and more ecologically sound strategy.

Professor Thurston dedicates one early chapter to biological control and a concluding chapter to genetic diversity and plant resistance to pathogens—valuable strategies but ones that have been reviewed elsewhere. He allocates 20 chapters to cultural practices that have been used by farmers over centuries to manage plant diseases with limited external inputs. Use of pathogen-free planting materials is one obvious approach developed and used by many farmers, often applied without full understanding of why a certain selection procedure works in the field and almost always without much knowledge of the disease-causing organism. Crop density and spacing, depth of planting, tillage systems, and time of planting are among the practices that are under farmers' control. Such activities as crop rotation, residue management, fallow periods, slash and burn methods, mulching, and use of large amounts of organic matter can impact disease incidence. Physical organization of systems using terraces, raised beds, periodic flooding, combination of species, and use of shade are all given prominence in special chapters.

Written in part while the author was on sabbatic leave in Spain, this exhaustive literature review of 867 citations reflects good scholarship and careful evaluation of sources. References include many to original works and historical reviews of Biblical, Roman, Arab, Moorish, and Spanish literature. Fluent in Spanish, the author used original sources from Spanish libraries. He admits bias due to his own lack of familiarity with sources in languages other than English and Spanish, and does lean heavily on Mediterranean and Latin American examples. There is no doubt useful literature from Asia and Africa that would add to this treasure house of information.

Nevertheless, Thurston has provided a thorough,

scholarly, and practical guide to the literature on traditional methods for diverse management. His discussion at the end of each chapter should be read for a general introduction to traditional agriculture. The recommendations provide a good summary and reference section to locate information in key chapters. In addition to the general index, Thurston provides disease and pathogen indices for the readers' convenience. In all, this is a valuable book for anyone interested in agricultural development.

We can only hope for similar volumes on the management of insects and weed problems.

*Reviewed by:*

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## **Food, Crop Pests, and the Environment: The Need and Potential for Biologically Intensive Pest Management**

Frank G. Zalom and William E. Fry, Editors, 1992

American Phytopathological Society Press, 3340 Pilot Knob Road, St. Paul, MN 55121. 179 p. paper \$34.00

This government report, developed by committees, is based on information gathered through surveys. Its organization as a whole is poor, and the writing in individual chapters is mediocre at best. However, the existence of the book is significant in its implications for future directions in mainstream pest control in America. Furthermore, many interesting statements scattered throughout the text are well worth reading.

The merits of the book are twofold. First, it gives official sanction to the view that IPM methods in the future will need to do much more than use pesticides efficiently; its central premise is that for many pest problems, Integrated Pest Management schemes for crops will have to substitute other controls for chemicals. The book assesses the potential for such substitutions both for methods that have been developed already (such as biological control, plant breeding, cultural control, and genetic manipulations), and for those that are under study. It does this for several classes of pests, including arthropods, weeds and plant diseases, for crops such as soybeans, corn, cotton, tree fruits and vegetables. In some chapters, such as the one on cotton, the possible future form of such "biologically intensive IPM" is made tangible for the reader through a verbal portrait, describing the features that might make up such a system. In other chapters, such as the one on tree fruits, a more detailed approach is taken, with a pest-by-pest tabular listing of future alternative controls. Of the two, I found the former livelier and more likely to engage the imagination. Unfortunately, most of the book cannot be described as either lively or engaging of the imagination. Thus it loses an important opportunity to promote biologically intensive pest control by helping readers visualize

the pieces of such a system. Nevertheless, the report points us toward biologically intensive IPM systems and gives details on many of the barriers that must be removed to implement it.

The second merit of the book lies in the many important statements that describe where the path to biologically intensive IPM lies, and what obstacles stand in the way. Some of these are about problems specific to the crops under discussion; others deal with general problems that affect IPM in all crops. I found that the vegetable chapter made good use of examples, and escaped somewhat from the excessively general statements that are common throughout the book.

The book also makes many important statements on broad issues. I particularly liked the following:

- A major challenge for the future will be the management of entire pest populations on an area-wide basis.
- The predominant role of [Cooperative Extension] IPM Specialists will be to train the Crop Practitioner Doctors.
- Pesticide Applicator Training programs conducted by CE should be restructured to include or even emphasize biologically intensive IPM methods.
- Resources directed to "chemical systems" commonly exceed \$40 million for the registration of a single pesticide. This level of funding is not available for all biological control research nationally.
- [We should] develop a plant health prescription policy to dissociate chemical sales from the recommendations of materials.

- [We need] new or modified control action thresholds which incorporate population levels of beneficial organisms.
- The price of pesticides could be increased to reflect their expense in terms of regulatory expense and social and environmental costs.

For the sufficiently persistent reader, many such interesting and significant statements can be dug from the text. They deserve to be developed in a thoughtful, comprehensive way. Regrettably, few are, which brings us to the book's defects.

The book suffers from poor overall organization, inadequate development of subjects within chapters, and bad writing in many sections. It consists of an introductory chapter, four chapters covering specific crops, and a summation chapter. This may seem a reasonable organization, but it severely detracts from the logical treatment of the book's subject. Many of the issues addressed are generic, rather than crop specific. Consequently, with chapters defined by crops rather than issues, many broad issues are raised over and over in two, three, or even four chapters. This duplication is disorienting, and detracts from the discussion of the main points of the book. The chapter structure is not dictated by the logic of the subject matter, but rather is a result of how information was collected (surveys of commodity specialists).

Within chapters, material in many sections is presented as short, independent statements set off by "bullets." These lists greatly detract from the book because they have replaced the normal task of writing, in which ideas are organized around a

series of major and minor points developed with logic and examples. In many sections, no such development is even attempted. Rather, lists are presented, grouped into sections by broad topic. The order of items within lists apparently was not considered important, and many items could have been left out or replaced by others without significantly influencing the text. The affect is numbing. Instead of paragraphs that make points and guide and persuade the reader, we are confronted with unsorted piles of ideas. This is unfortunate, since many of the ideas are good, and deserve to be developed and expounded more fully. Unfortunately, often this was not done.

The third area in which the book needs improvement is writing. Some chapters are marginally better than others, but much of the book reads like spoken rather than written language, with grammatical errors, poor phrasing, and poor usage, such as "impact" and "interface" as verbs.

Despite these faults, the book draws together, albeit loosely, many significant ideas about the road towards biologically intensive IPM. As an organized banquet it fails, but as a smorgasbord, it serves richly.

*Reviewed by:*

*Roy G. Van Driesche*

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*Reprinted with permission from the American Journal of Alternative Agriculture. 7:94-95. 1992.*



## **Biodiversity and Pest Management in Agroecosystems**

Miguel A. Altieri, 1994

Haworth Press, 10 Alice St, Binghamton, NY 13904-1580, 185 p, cloth \$49.95

The complex biological structuring of natural ecosystems is in high degree responsible for their stability over time. In *Biodiversity and Pest Management in Agroecosystems*, Miguel Altieri has summarized much of the recent literature on how this structuring can be applied in agriculture. Although the title implies a broad treatment of crop pests, the primary emphasis is on insect management. This will not disturb most readers, since "pests" is commonly used as a term synonymous with 'insect pest.' For those in academia, of course, "pests" refer to insects as well as pathogens, nematodes, weeds, invertebrates, and vertebrates that damage crops.

The author broadens the discussion beyond insects and pest protection to include wider impacts of biodiversity, especially in reference to systems for developing world subsistence farmers: "Maintenance and/or enhancement of biodiversity in traditional agroecosystems represents a strategy that ensures diverse diets and income sources, stable production, minimum risk, intensive production with limited resources, and maximum returns under low levels of technology.... The correct spatial and temporal assemblage of crops, trees, animals, soil ... enhances the interactions that sponsor yields dependent on internal sources and recycling of nutrients and organic matter, and on trophic relationships among plants, insects, or pathogens, which enhanced biological pest control." The first two chapters in fact provide a good introduction to the concepts of agroecosystems, diversity, and the complexity of agricultural production. They could be recommended as background reading in a range of departments in lower division survey courses.

Altieri describes with examples and references four hypotheses for mechanisms involved in lower pest (insect) populations in biodiverse plant mixtures:

associational resistance (presents difficulties to insects in finding appropriate hosts), natural enemies (more predators and parasites in polycultures), resource concentration (spatial dispersion of preferred food sources), and plant apparency (mixtures of species present less obvious habitat for harmful insects). In a complex insect-crop-soil-climate system there are undoubtedly situations where each of these theories may apply, and the insect/cropping system interactions no doubt reflect some combination of these functional explanations.

How weed-insect interactions may be manipulated as part of a pest management strategy is explored in detail. Weeds are important alternate hosts for insects in sites near cropped fields, but they also offer respite and breeding sites for natural enemies of insect pests. Exactly how the diversity of crops and weeds influence crop loss is not well understood, as there are factors of species richness, plant architecture, and size of patch or field to consider. These interactions and processes are essential to building an understanding that can lead to viable crop production system design. The author presents the experimental evidence that is beginning to enrich this understanding, and how weed management has worked to advantage in a few specific systems.

Altieri has researched and written widely on the topic of insect management in tropical polyculture systems, and has applied this experience to establishing and researching weedy field borders in temperate California agriculture. He surveys both tropical and temperate research results on insect reproduction and predator activity in monoculture and multiple species systems, and describes the range of conclusions that are sometimes conflicting on the practical importance of diversity. He concludes that there is over-riding evidence that



diversity of crop/weed mixtures is beneficial in most situations with regard to insect pest damage. Three specific cases for maize, cassava, and living mulches are given as examples to support his conclusions. He further concludes that much more research is essential to understand the complexity of multiple crop species/insect interactions and how these can be managed.

More research has been conducted on orchard and vineyard systems with permanent cover crops, in part because these perennial systems are closer in many respects than annual crop monocultures to natural ecosystems. Those California orchards I grew up with that were clean cultivated through the 1950s and 1960s are now often found with permanent cover crops. Apple and pecan orchards are presented as cases illustrating the principles of biological control in a diverse cropping environment. Tree or vine plantings can provide a relatively permanent crop island that creates a harbor for both beneficial and harmful pests. The challenge is to manage their balance to the grower's advantage. The unique characteristics of field boundaries and hedgerows are described as rich areas where insects can be managed as well.

The book concludes with elements of design for

“self-sustaining, low-input, diversified, and energy efficient agricultural systems,” integrating the principles of diversity at the field and the landscape levels. Theoretical principles and practical examples are presented, along with two case studies from Michigan and Chile to illustrate the process of system design.

Miguel Altieri has provided a valuable overview of the importance of diversity in design of systems, principally for insect management. Over 200 references are included to lead the serious reader into greater depth in the literature. The author points out that not all diversity results in lower insect prevalence, but he takes a strong stand on behalf of this ecological principle in constructing future systems. *Biodiversity and Pest Management in Agroecosystems* is easy to read and full of research results and practical examples. It should be on the shelf or accessible to any thoughtful researcher or extension specialist interested in design of future systems.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*



## **Healthy Food, Healthy Farms: Pest Management in the Public Interest**

Charles M. Benbrook, 1995

National Campaign for Pesticide Policy Reform. Washington, D.C. 44 p. US \$10.00

This short report presents case studies of seven U.S. organic farms in a very readable format. Although the growers' yields ranged on average from 79% to 96% of conventional yields, production expenses were sufficiently lower to result in net incomes ranging 113% to 135% higher than conventional net incomes in their respective states (this figure is the average range across eight case study farms, although full case studies are available only for seven farms). The following farms are included:

Farm (State)	Farm size	Crops/Livestock
Anderson Family Farm (TX)	500 acres	cotton
Olson Farm (SD)	550 acres	buckwheat, corn, soybeans, sunflowers, wheat, oats, edible beans
Alba Ranch (KS)	400 acres	small grains, red clover, corn, soybeans, sorghum
Porter Farms (NY)	400 acres	corn, spring barley, winter wheat, alfalfa, red clover, mixed vegetables
Larson Farm (NE)	160 acres	beef cattle, corn, soybeans, oats
Buxman Farm (CA)	55 acres	peaches, plums
Molino Creek Farming Collective (CA)	25 acres	mixed vegetables and fruits

In comparison to the case studies of organic farms published in NRC's 1989 *Alternative Agriculture* and

other case studies produced by regional organic farming groups, this report is much more detailed and easy to use, if one's purpose is to extract comparative data. Data were collected and tabulated to show the range of yields, total costs and net income on all farms in comparison to conventional figures; reduction in pesticides applied (in lbs active ingredient per acre); and use of non-chemical pest management practices. Case studies provide information on customary pesticide use in the relevant state on the major crops grown on each case study farm. There are several good quotes from the growers which highlight what they believe to be "secrets of success" and the most significant barriers they have encountered.

This report has the same shortcomings that any collection of case studies has: the growers were selected because they are excellent farm managers, and the methods which have made them successful may not be applicable by less sophisticated growers, even in the same geographic regions and with the same crops. The report certainly demonstrates (once again) that organic farming can be viable. Perhaps this point needs to be made repeatedly: it is easy to point to the lack of federal research dollars going in to organic farming research—even under the Sustainable Agriculture Research and Education Program—as a result of misconceptions about organic farming. However, I think the evidence of organic farming's strong potential in a multitude of circumstances has been available for decades now. Agricultural scientists who don't "see it" won't be convinced by yet another collection of case studies, no matter how competently they were developed.

*Reviewed by:*

*Molly Anderson*

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***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

***Chapter X***

***Introduction***

**Many Ways of Learning and Knowing**

*“Human reason, in one sphere of its cognition, is called upon to consider questions, which it cannot decline, as they are presented by its own nature, but which it cannot answer, as they transcend every faculty of the mind.”*— Immanuel Kant, *Preface to the First Edition, Critique of Pure Reason*

The literature on adult education describes many ways by which we perceive the world and the different ways we construct its intricacies and interconnections. In the design of future learning environments, it is important to plan activities that integrate new information with our previous life experiences. Learning style is also important to consider: some of us are visual learners, some tactile; some of us learn from lectures or movies, others from reading, or from tours in the field. Some learn best from history.

One dimension of learning that we consider important involves the critical use of language, and expanding our concept of development to include the qualitative changes needed to achieve a better quality of life. As scientists we are compelled to classify and measure, to put meaning into numbers, and to use them to better understand the human situation. In this context, we present a series of reviews that illustrate multiple ways of knowing. The emerging literature on sustainable development is too voluminous for us to pretend to even sample it adequately. Thus the reviews should be considered as examples of what is currently available.

Sustainable agriculture is a philosophy, goal, and set of practices that is one part of a larger sphere of concern converging around the term *sustainable development*. It could be argued that this notion is an oxymoron, especially if “development” is defined only in terms of growth, a clearly non-sustainable activity in a world of scarcity.

*A Sustainable World* (1995), edited by Thaddeus Trzyna, brings together perspectives on the meaning of sustainable development and the measures that are employed in assessing progress. In *Envisioning a Sustainable Society* (1989), Lester Milbrath summarizes the values that drive human decisions, and scenarios about ways to emerge from where we are today. Tyler Miller demonstrates the potentials of effective teaching materials in *Living in the Environment* (1996), an exceptionally well written and illustrated textbook that is updated every two years. Miller’s book is representative of the new generation of teaching materials available for secondary and college level education: current, relevant, well researched and presented, and accessible at different levels of understanding. A sample of texts from Delmar Publishers, perhaps representative of what is available for high school students, was reviewed for their relevance to sustainability. We found these texts sorely lacking in up-to-date perspective or

information that will help students make the connection between agricultural practices and sustainable systems.

*Ecological Literacy: Education and the Transition to a Postmodern World* (1992) by David Orr explores the crisis of industrial societies, and how their impacts have influenced our biophysical environment. He calls for educational reform, one step toward the transition to sustainability. Orr's philosophy on educational changes is expanded in *Earth in Mind: On Education, Environment, and the Human Prospect* (1994). He exhorts us to move education to a higher plane, to reduce the time spent on training for positions in today's commercial economy, and to take a longer-term view of human potential and development.

*Everyone a Teacher, Everyone a Learner* (1995) condenses the educational handbook from North Central Region professional development workshops. According to this theme, all adult learners bring important skills and experiences to each teaching situation. Our challenge as educators is to draw out these potentials to further communication, and to effectively use the multiple ways of knowing that are present in any group. From the 1996 workshops, *Shared Leadership, Shared Responsibility* developed the theme that we all take ownership of the learning process, further expanding our ways of knowing.

In a departure from mainstream science, we review four fiction works that approach ecology, food production, and sustainability from other perspectives. Hank Wesselman's *Spirit Walker* (1995) unfolds a tale set in Hawaii of today and the future. *Woman on the Edge of Time* (1976), a feminist classic by Marge Piercy, also uses time warps to give us a view of present society's dilemmas from the vantage point of the year 2042. Jean Raspail's *The Camp of the Saints* (1973) foresees an invasion of the First World by the Third, a process that is in fact under way today, albeit in a less dramatic fashion. Daniel Quinn's widely acclaimed *Ishmael* (1993) is becoming a popular alternative text in English, environmental science, philosophy, and development studies. In each case, we are drawn to consider today's excesses in the broader spatial context of the globe, and the temporal context of the future. Few people are left unchanged by exposure to these alternative ways of knowing.

We are moved to recount the story of a Native American chief who was called to the witness stand and asked if he would swear to tell the truth, the whole truth, and nothing but the truth (so help you God). He responded "No," and the judge asked why? The chief knew within himself that he was not sure if he could ever know the absolute truth. Further, he was not convinced that anyone could know the whole truth. He said, "I can only tell you what I know." In a quest for some semblance of "truth" we seek many sources, read and digest the works of authors we respect and others we don't, and build from this foundation a better sense of what we know. To this goal we present several different ways of learning, and ultimately ways of knowing how to perceive, to articulate, and to practice sustainability.

**Charles Francis and Gabriel Hegyes**



## **A Sustainable World: Defining and Measuring Sustainable Development**

Thaddeus C. Trzyna, Editor, 1995

IUCN - TheWorld Conserv. Union, Intl. Ctr. for Environ. & Public Policy, Sacramento, CA 95818  
272 p, \$28.00

In the years following the Brundtland report "Our Common Future" (1987) and the Rio conference report "Agenda 21" (1992) the term 'sustainable' has become part of the daily development vocabulary. If anything, the word suffers from overuse and soon loses impact and meaning. Editor Ted Trzyna brings us a series of papers that attempt to help us regain perspective on meanings, on measuring change or progress, and on indicators that are being used to describe development. As chair of the IUCN Commission on Environmental Strategy and Planning and faculty member at the Claremont Graduate School, Trzyna has first hand experience with leaders around the world and has found a general confusion in the interpretation of sustainability. Some claim this approach lacks a concrete body of theory, others that it means all things to all people, and still others that sustainable development is itself an oxymoron. In fourteen chapters, "Sustainable World" attempts to clarify the situation. Although not focused specifically on agriculture, the arguments often describe the long term need for and use of land, natural resources, and capital to produce food for an increasing human population. Thus the book is relevant to our compendium.

According to David Munro, development can be sustainable only if it can continue, or its benefits maintained, indefinitely. There can be nothing inherent in the process or activity that would limit the time that process can endure. He cites a need for ecological sustainability, in order to provide clean air and water, food and the materials necessary for other human activities. No less important is social sustainability, the "relationship between development and current social norms." And economic sustainability, the relationship between benefits and all costs in the system,

including those that often do not enter into the accounting. In contrast, Stephen Viederman argues that sustainability is not a technical problem to be solved, but rather a "vision of the future that provides us with a road map and helps to focus our attention on a set of values and ethical and moral principles by which to guide our actions" both as individuals and as societies. He points out that much of the rhetoric around this topic has been driven by the writings and language of the northern elite, a culture that even in science has tended to undervalue indigenous and experiential knowledge. Viederman concludes that a new paradigm called issue-driven science will stress pragmatism, acceptance of uncertainty as given, focus on data quality rather than completeness, concern for equity and for future generations, and emphasis on processes, dynamics, heterogeneity, and discontinuity. Social issues will become highly relevant, even in the sphere of science.

Denis Goulet attempts to shift our thinking from traditional economic measures to what he calls authentic development, one that includes social equity or access to essential goods for all, the qualitative enrichment of human life, and the growth of public wealth to enhance the common good. He challenges conventional measures of growth, and calls for study of the redistribution of wealth, the meeting of basic human needs, and the building on traditional values. Goulet recognizes economic, social, political, cultural, and ecological components in any in-depth definition or approach to development. The four chapters on definition deal with our struggle to agree on common terms, how to achieve goals, and then how to measure progress.

The next major section has four chapters that explore the measurement process. John O'Connor

describes the indicators currently used by the World Bank and by the World Resources Institute in their publications. In a sense, people are looking for indices of progress, a type of report card that could be used to measure whether desirable change is taking place. There are difficulties in finding common units with which to measure change, beyond the commonly accepted monetization of activities. Realizing that progress toward sustainability is complex, there is an effort to develop a sustainability matrix that includes both socioeconomic indicators and environmental components such as state of the ozone layer, biodiversity, natural resources, and human carrying capacity. It is obvious that different indicators deserve different weighting, depending on priorities and urgency of the issue, and these may be country and site specific. A European sustainability index project is described in a chapter by Tjeerd Deelstra, and a matrix of how people relate to the ecosystem and how this relates to strategies for sustainable development is presented in a chapter by Nancy MacPherson. All these measurement techniques are useful in helping us to focus on a wider range of variables and indicators; most of them bring in social and ecological dimensions, a requisite of any rational systems for the future. Their shortcomings are inherent in the complexity of the indicators, lack of agreement on how to quantify them, and inability of many agencies to deal with measurement of anything but the traditional economic factors. Because of the importance of values, opinions, and other conventionally non-qualifiable variables, it will be difficult to arrive at agreement on how to measure sustainable development.

The last six chapters deal with details on sustainability indicators. A major challenge is to improve our understanding of ecosystem functions and how they are influenced by the changes we

introduce as we expand human activities. A common mistake in agriculture and forestry has been the estimation, based on empirical research, of the maximum potential productivity of a particular crop or forest product. This misleading approach has rarely considered the importance of ecosystem integrity nor the long-term potential productivity of these same systems. A series of specific examples of indicators used in Latin America, Africa, and the South Pacific provides a range of ideas on how to measure sustainability. The System of National Accounts of the United Nations is an approach that combines conventional indicators of income, production of goods and services, and other economic activity, while ignoring the long-term environmental or social implications of those same activities. More comprehensive measures are needed, and this book points out the needs as well as the shortcomings of current systems. One limitation not discussed is our unceasing quest for generalizable indicators or approaches to solve any dilemma. As we are learning in the study of site specific farming, one solution does not often fit all situations. The importance of location and context specificity is just one of the complexities we will need to deal with as sustainability becomes more a part of the development agenda. This book provides a comprehensive look at our current understanding of how to measure progress in reaching sustainable human systems, and more importantly raises stimulating questions about how we should approach the measurement of complex social and environmental dimensions of development.

Reviewed by:

*Charles Francis*  
*University of Nebraska, Lincoln, NE*



## **Envisioning a Sustainable Society: Learning Our Way Out**

Lester W. Milbrath, 1989

State University of New York Press, State University Plaza, Albany, NY 12246. 403 p. \$19.95

In a patient and visionary manner, "Envisioning a Sustainable Society" asks people of our modern civilization to question the premises on which we base our daily lives! This is no small task, but Lester Milbrath carefully lays the jigsaw puzzle pieces on the table and shows why each component cannot contribute to a beautiful product because it has been carelessly created. He teaches that transforming the misshapen pieces into a worthy vision is possible but requires highly conscious decision-making. Although real problems that we face in sustaining ourselves and the earth are acknowledged in the book, the emphasis is on raising our societal awareness to a point where we can actively form our societies to be sustainable.

The author has used this book in manuscript form in a number of upper division college courses which gives it a thorough and purposefully linear approach. One chapter builds on the next, but it hardly resembles a typical textbook. It delves into a variety of disciplines such as economics, sociology, politics, philosophy, science, and technology, while not requiring a sophisticated background in any of them to be readable and thought-provoking. Milbrath hopes to stimulate readers "to see their civilization in a new light and with new lenses. That is the first step in learning our way out." Relevant literature is cited throughout the text.

The book is organized into three parts: a look at our current state of the world and the values and forces that have (or have not) guided us to this point, an exciting exploration of sustainability through actual visions of human activities fitting harmoniously with natural systems; and finally, scenarios on how to make the imperative transition from modern to sustainable society.

In Part I, Milbrath surveys the relatively recent emergence of humans on the planet and our

incredible knack for "success." We have been driven to improve our health, food, wealth, and comfort, being so good at it that we are actually pressuring the earth's capacity for the first time. He then goes beyond the obvious physical parameters to explore the values and beliefs that shape our society. Actively analyzing values to provide guidance is imperative, as is recognizing that science is not really an objective process. The author states that "adhering to the myth of a value-free science is one of the most dangerous characteristics of modern thought." It is a helpful tool, but must be thoughtfully managed within the context of society's values. Qualities of a rich and sustainable system are presented through a discussion of a core set of values.

The second section of the book furthers the vision of a sustainable society by designing human systems to merge with natural systems. Important components of this marriage include relating harmoniously with ecosystems, regenerative food production, quality of life and importance of fulfilling work, the role of technology and science, politics and power struggles, and the need for diverse nations to work together. Milbrath proposes adding "a learning structure to governments that would have a Council for Long-Range Societal Guidance as a key new institution." This structure would serve to review the possible impacts of new technologies and policies on society and the environment.

Part III begins with the author's vision of what we might expect "if we continue on our present expansionist path and treat our environmental problems mainly as technical problems." Learning and changing in that kind of serious crisis mode is less productive than would be possible with some planning in place.



The final section calls us to transform a most important relationship, our relationship with nature. Milbrath notes that a society that learns and is able to adapt to change is more likely to withstand pressures over the long haul. "It is paradoxical that the stability of a society may rest on the ease with which it is able to change." He reviews processes and barriers to change, and elucidates our common learning modes for societal

learning. While these tools are available, progress might be slow. Meanwhile, the author encourages us to prepare for the inevitable learning cycles with our own self-inventories, and our relationships with nature.

*Reviewed by:*

*Jeana Myers*

*Partners in Agriculture Project, Durham, NC*



## **Living in the Environment: Principles, Connections, and Solutions, Ninth Edition**

G. Tyler Miller, Jr., 1996

Wadsworth Publ. Co., 10 Davis Dr., Belmont, CA 94002, 727 p, cloth \$74.65

Anyone who has not opened a recent college-level text on ecology and natural resources should spend some time grazing through *Living in the Environment!* Many of us are concerned about discipline-specific undergraduate courses, narrow research projects, and lack of integration of scientific principles with practical challenges. In Miller's excellent text, there is more than enough to fill our rumens with more than facts about how functional integration occurs. Here we learn about the process of bringing elements together, the relationships between biology and physical natural resources, and between the ecosystem and human health. If two words were used to describe the approach and the potential consequences, they would be connectedness and sustainability.

Miller's overview includes a catalog of environmental problems and their causes. And the breadth of potential solutions is shown in contrasting essays by Julian Simon (*There is No Environmental Crisis*) and the Ehrlichs (*Simple Simon Environmental Analysis*). An essay by Lester Brown chronicles the rise of awareness about environmental issues that is driving our current research and development agenda. Throughout the text, Miller brings in recognized experts and their opinions to supplement the technical treatment of environmental science. Technical principles include systems models, matter and energy, ecosystems, climate, and population ecology, as well as the dynamic relationships among them. Human population growth, biodiversity, global warming, and energy are described in separate sections, along with how they both affect and constrain our quest for a healthy biosphere. Various dimensions of human health, relationships with air and water pollution, and hazardous wastes are discussed. Finally, the impacts of resource use and environmental conservation on food production for

humans and for sustaining ecosystems are explored, in biological, economic, and social terms. Alternative future scenarios are presented, along with what is needed to create a sustainable society. To continue the grazing metaphor, we are herded through chapters in a rotational pattern to new concepts and connections, but the fences allow us to keep in view the areas already grazed, and to which we will return.

Just as a grass/legume pasture provides biodiversity, biological complementation, and a more balanced diet to ruminants, Miller's mix of text, graphics, photos, and short guest essays keep our attention through this 727-page text. Appendices include a comprehensive list of publications and organizations working in this area. Mapping concepts (some call these mind maps) are described that help students make connections among key systems elements and elaborate on the most important interactions. Three pages of action steps are provided for those motivated to go beyond an academic course. Further readings, a comprehensive glossary, and useful index complete the treatment. Just as walking through the gate into a fresh pasture creates a degree of excitement, opening this book to any page provides enough forage to draw in the reader.

Lest the instructor be concerned about students only major output being the belching of too much methane or generation of solid waste on a midterm or final exam, Miller provides numerous and viable alternatives. Each chapter concludes with a series of questions to stimulate critical thinking. These could be used in recitation sections, study circles, or other non-traditional learning environments. Also, specific project ideas are listed for each major chapter topic, another way to stimulate involvement and integration of materials with student's past experience. I would highly recommend this as

a text for undergraduates and an accessible reference for advanced high school students or anyone with a prior fundamental understanding of biology. Tyler Miller is a highly prolific writer, with four other textbooks on environment and natural resources, who lives in a school bus that has

been converted to an energy efficient house called Eco-Lair in a forest in North Carolina.

*Reviewed by:*

*Chuck Francis*

*University of Nebraska, Lincoln, NE*



***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

**Environmental Science for Agriculture  
And the Life Sciences**

William G. Camp and Ray L. Donahue, 1994, cloth \$34.50

**Managing Our Natural Resources, Third Edition**

William G. Camp and Thomas B. Daugherty, 1997, cloth \$31.75

**Wildlife and Natural Resource Management**

Kevin H. Deal, 1998, cloth \$29.75

**Ecology of Fish and Wildlife**

DeVere Burton, 1995, cloth \$29.00

Delmar Publishers, 3 Columbus Circle, Box 15015, Albany, NY 12212-5015

These high school (or perhaps lower division college) texts provide a window on some of the new learning environments that are being created in natural resources, ecology, and environmental science classes. It is evident from the choice and organization of topics that greater emphasis is evolving toward systems approaches, integration of disciplines, and focus on longer-term issues such as sustainability. Agriculture and food production systems are beginning to receive more attention, as the obvious links between management of agroecosystems and the natural environment are brought to the discussion. A brief description of each of these texts describes their treatment of agriculture and attention to sustainability.

*Environmental Science for Agriculture and the Life Sciences:* This text deals with a range of topics in ecology, resource management, forest and crop production, and environmental problems of human exploitation of the earth's resources. The authors open with a statement of goals for the book, designed to answer 'How the environment works, how we humans relate to it, and what we need to do today and in the future to have a sustainable and livable world order.'

They point out a clear distinction between 'environmentalism' and 'environmental science' -- and clearly identify with the latter. In a later

section they urge the reader to distinguish between what is technically accurate (science) and what is morally right (philosophy). In spite of this moralizing, the authors do deal with challenges of the commons, development versus preservation of resources, and ownership of resources. Ecological terms and principles are described, along with various biomes around the globe. In describing farming practices and alternative technologies, there is attention to what causes groundwater contamination, soil erosion, and salinity, and how we are faced with multiple demands on resources. There is a negative assessment of federal LISA programs (program replaced by SARE several years ago), and a statement that "organic farming systems ... are based on less science, less technology, ... and fewer corporate farms." There is mention of sustainable production, and the need for "responsible environmentalism," but the general tone of the book favors business as usual and downplays the importance of serious dialog about key issues. There is a virtual absence of thinking about the systems nature of food production, and how this can be improved.

*Managing Our Natural Resources:* With a brief description of what natural resources are, this text provides an overview of conservation and different concepts of management. Similar to the previous

book, the authors place importance on carefully defining the difference between environmentalism and science -- it is clear which they consider the more rational. The former is "based on emotion, values, beliefs, and politics" while the latter is independent of the value judgements about good and bad that mark the activist community. There is a major section devoted to erosion (three chapters), and appropriate attention to land-use planning. Water, fisheries, forests, metals and minerals, and wildlife are all considered in terms of their habitat, health, and potential future within the current economic context. Sustained yield is seen as an appropriate goal for design of management strategies. In spite of a generally main stream bias, the authors do mention the "tyranny of geography" that has resulted in very inequitable distribution of fertile land, fresh water, and mineral resources. They also bring up the challenges of private ownership, and talk about the finite resources in a closed ecosystem. But it would be difficult to stimulate a lively discussion showing two sides of very many current environmental issues based on this book.

*Wildlife & Natural Resource Management:* After an introduction citing the history of wildlife management concerns in the U.S., there are sections on importance and conservation of resources. Chapters deal with habitat for wildlife and how human habitation has impacted wild areas. Others focus on hunting, modern management methods, and endangered species. About two-thirds of the book is dedicated to identification of mammal, bird, reptile, amphibian, and other species. There is a comprehensive index, and logical organization. There is an emphasis on taxonomy of creatures, and little about where they live and how they interact with the environment. Although conservation is mentioned as important, there is little systematic association of the natural world with that of agriculture, nor explanation of how and why human competition for space is closely related to the demise of many species.

*Ecology of Fish and Wildlife:* After an introduction on ecology, the author embarks on a discussion of the relationships between ecology and agriculture,

and clearly identifies the impacts of changes in land use patterns on natural habitat and species diversity and numbers. Biomes of North America and their key wildlife resources are described, and this is followed by sections on the ecology of mammals, birds, and fish, reptiles and amphibians. When the book concludes with chapters on management, there is a clear focus on multiple uses of resources, conservation of soil, water and air quality, and the multiple human needs that are met through wise use of natural resources. Agriculture, medicine, and recreation are given some treatment, along with such topics as "the outdoor sportsman's code of ethics." But as an example, only a single page is dedicated to agriculture, and this to the process of domestication and how we have arrived at some of the principle species that contribute to food supply.

In general, one could work through these texts in a series of high school courses and come out with an appreciation of ecology and the environment. A student would be exposed, at least superficially, to some of the challenges that such issues as overpopulation, inequity of resource distribution, and short-term thinking will pose to long-term availability of natural resources. There is virtually no attention given to long-term economics of resource use, to the critical nature of land use planning at this point in time, and to the interconnectedness of countries and their piece of the environment. An overview of this small sample of textbooks for the high school market leaves one with strong concerns for what is reaching young minds, and with questions about how teachers in today's society can possibly introduce and discuss controversial issues. There is little of the flavor of Worldwatch Institute about resource concerns. When activist organizations are described, it is often in the context of emotionalism, value-laden, or political agendas. We owe the next generation more alternatives, and a broader perspective than what is found in these types of texts.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*



## **Ecological Literacy: Education and the Transition To a Postmodern World**

David W. Orr, 1992

State University of New York Press, State University Plaza, Albany, NY 12246  
210 p, paper, \$14.95, cloth, \$29.50

A book dealing with education pertinent to environmental problems is timely. A recent national survey of college students conducted by the University of California at Los Angeles reported that the environment is the primary concern of incoming freshmen; many universities have responded to this interest by setting up environmental studies curricula. Yet little attention has been given to how interrelations of agriculture and environmental deterioration should be addressed at the college level. A recent review of the federal Sustainable Agriculture Research and Education program (NRC, 1991) said almost nothing about education. It was not even clear whether the education component of this program refers to farmers, other working adults, or students in Colleges of Agriculture or other university settings.

*Ecological Literacy* is a wide-ranging collection of essays by an author with considerable experience in environmental education. Orr co-founded the Meadowcreek Project, an innovative non-profit environmental education organization in Fox, Arkansas, and now is Professor of Environmental Studies at Oberlin College.

The book is organized into three sections: The Issue of Sustainability; Education; and What Knowledge? For What Purposes? The first section defines the breadth of the "crisis of sustainability." It reviews criticism of industrialized societies and literature about detrimental human effects on the biophysical environment. The second section explores ramifications of Orr's belief that "educational institutions are potential leverage points for the transition to sustainability" (p. 84). He argues that sustainability requires changes in the content and process of education, and a "recovery of civic competence" (p. 84). One chapter in this section is an exhaustive syllabus of almost every imaginable

topic related to living well and responsibly. The third section deals with a few specific "pathologies of knowledge" (p. 156) that arise from misdirected generation of knowledge. The three examples Orr examines are the assumption that we can manage our planet, the failure of social sciences to contribute to understanding and resolving the crisis of sustainability, and a proposal for a high technology perennial-based agricultural system from two U.S. Department of Agriculture researchers (Rogoff and Rawlins, 1987). The final chapter includes several alternative visions of the future of U.S. agriculture that contrast with the proposal Orr trounces.

Ecological Literacy is mainly about problems of modern (or perhaps more precisely, "postmodern") industrialized societies, and how education could contribute to solutions. It is related only peripherally to ecology, as most ecologists would understand the term. Orr's syllabus for ecological literacy includes readings by very few professional ecologists, and "ecological literacy" seems to be a misnomer for the concept he promotes. It has more to do with what Orr wants ecology to be than what it is. For instance: "The form and structure of any conversation with the natural world is that of the discipline of ecology as a restorative process and healing art," (p. 91).

Orr pleads for greater understanding of environmental and political issues, and the interconnections between these topics and technical issues, to produce citizens who take their stewardship responsibilities seriously. He tries to link a staggering array of social problems—from terrorism to anomie—with ecological literacy. These connections are the weakest part of the book; they depend too much on idealism and emotional appeal.

I agree with much of Orr's assessment of what is wrong with modern society, but I am unconvinced that his prescription matches the ailments. To me, the basic question for "ecological literacy" is whether greater awareness of social and environmental problems will lead people to be willing to pay the costs of fixing those problems and to forego the benefits of consumerism. This book is a cornucopia of alternatives that could ameliorate the crisis of sustainability, but the jury is still out on what will induce people to choose these kinds of options. Orr's arguments for a rich experiential humanistic education are persuasive, but I think the likely consequences are overstated. (Orr, too, acknowledges that education is only one of several influences on behavior).

The first section of this book adds little to its overall message. Here Orr details the evils of modern society, but they have already been described by the authors listed in his syllabus. Unfortunately, ideas that were plausible in the original sometimes seem fatuous second-hand, when quoted without explanation. For example, it is unclear what Wendell Berry meant by writing that good solutions generically "have wide margins" and "exist in proof" (p. 62). Likewise, the reader might wonder how to use recommendations such as "design should be co-evolutionary" and "design should follow a sacred ecology" (p. 33, quoted from John and Nancy Todd). Perhaps because Orr is trying to cover too much ground, his analyses sometimes seem simplistically distilled into "good guys" versus bad guys, and his solutions sometimes are superficial. He claims that designers of "resilient systems" follow "old precepts such as: KISS (keep it simple stupid); "If it ain't broke, don't fix it"; "You don't put all your eggs in one basket"; and, If anything can go wrong, it will, so plan accordingly!" (p. 34). No one can argue with common sense; but if such cliches were sufficient to fix the problems we encounter as a society, we wouldn't be in the mess we're in.

Orr's arguments for an education that equips

students to solve genuine problems are passionate and pithy, and he often cuts to the quick of what is wrong with our present-day approach to education. He asks important questions, and wrestles with the answers. His writing often is inspired and capable of catalyzing creativity, but it sometimes verges on cheerleading. His indictment of the social sciences is searing, and his defense of strong democracy with active public involvement by informed citizens is eloquent. But what does it mean to "reinvent politics at the ecosystem level" (p. 70)?

I think many college students will be enthusiastic about the kind of curriculum Orr proposes (although probably not the size of his reading list)! The concept of ecological literacy deals with issues that affect their lives and futures, and it goes beyond problems to their possible solutions. Orr wants to nourish the wisdom in students that impels them to plumb the limits of solutions, as they seek appropriate answers to important questions, but these limits are not tested consistently in his book. "Alternative" cant should be scrutinized as diligently as conventional cant, yet only the latter gets drubbed in *Ecological Literacy*.

#### References

1. National Research Council. 1991. *Sustainable Agriculture Research and Education in the field: A Proceedings*. National Academy Press, Washington, DC.
2. Rogoff, Martin H., and Stephen I. Rawlins. 1987. Food security: A technological alternative *Bioscience* 37(11):800-807.

#### *Reviewed by:*

*Molly D. Anderson*  
*School of Nutrition, Tufts University, Medford, MA*

*Reprinted by permission: Amer. J. Alternative Agric. 7:93-94.*



## **Earth In Mind: On Education, Environment, And the Human Prospect**

David W. Orr, 1994

Island Press, 1718 Connecticut Ave NW, Suite 300, Washington D.C. 20009

213 p, paper \$16.95, cloth \$29.95

David Orr might be pleased to know that I accidentally dropped my copy of his book in the Niobrara River. And he would be pleased because the crinkled pages and frayed cover prove that I read the book outside, which is where a lot more education should take place if you agree with Orr.

*Earth In Mind* both logically and emotionally argues the position that organized education as practiced for several hundred years is often destructive to the earth and ultimately to us humans. Students are not taught long-term ethics or cooperation, not taught that they are indeed dependent upon and responsible for the healthy functioning of the earth and their own societies, not taught how to design livelihoods and societies which respect and even revere the earth, other humans, and other organisms. Instead, students are taught to consume, to compete, and finally, to destroy. "Education...has become an adjunct to the commercial economy...[it] has lacked the courage to ask itself what kind of world its graduates will inherit and what kind of world they will be prepared to build." Orr challenges us to change our educational systems, our education, and eventually our lives.

The book is composed of a series of essays written over three years. The unifying theme is that "environmental crisis originates with the inability to think about ecological patterns, systems of causation, and the long-term effects of human actions." The educational content and methods that Orr proposes would give students what he terms "ecological design intelligence," or the capacity to understand, respect, and act within the constraints of ecological systems.

In Part I, "The Problem of Education," Orr argues that capital interests and big business have taken

over education, perhaps particularly in America, but probably everywhere. Our educational system does not forewarn us of ecological or social problems or even help us to solve them; rather, our education teaches us that we can patch up problems with technological fixes or materialistic economic growth. "...Education is no guarantee of decency, prudence, or wisdom." We are educated in facts and progress, but not with values. And so, Orr protests, our current education is flawed, and dangerous. But why should we change?

"First Principles," Part II, is a moving set of essays in which Orr explores values and morals which could lead us to teach and learn ecological design intelligence. Among these is the recognition that humans are human at least in part because we can have the capacity and deliberate will to "nurture and shelter life." Humans are capable of loving places and nature and most of us really long to do so; but all too often we do not know how. Or we are taught not to value life other than our own – or perhaps we are even taught not to value our own lives, judging by the fact that our actions regularly destroy the places that we live. Orr argues that education should produce people who are willing and able to put time and effort into creating and maintaining human communities where physical needs are met through industry and agriculture which does value and shelter life.

How can an educator or an administrator turn out students who can do this? In Part III, "Rethinking Education," Orr suggests concrete changes which could be implemented in educational institutions. These changes would encourage students to think about systems; to evaluate, from the perspective of ecological reality, the long-term reasonableness of human actions; to use their incredible human creativity; and to ask critical questions for society.



But Orr's practical suggestions are not easy to implement. Change the standard measures of educational quality to include accounts of how institutions and their graduates affect the biotic world. Get students outside whenever possible, and sometimes when it is not possible. Make students examine their values. Teach economics, for example, in congruence with physics, biology, and chemistry. Create tenure requirements which force people to have the ability to think broadly about how their disciplines benefit the rest of society. Change the very architecture of academic buildings and the use of campus grounds so that academic institutions could be used as teaching tools for ecological awareness. Incorporate agriculture into liberal arts curricula, to bring people back in touch with soil, water, and sunlight on a basic level. Teach students to ask why as well as how. None of these changes, or any others suggested in Part III of *Earth in Mind*, would be easy, particularly because such education would probably not prepare students to succeed in a global marketplace economy.

But the effort might be worth it if through education we could achieve the sort of society which the essays in Part IV, "Destinations," describe: People lovingly and carefully living in places for which they had true affection and with which they had true history. Some characteristics of such desirable communities, in Orr's view, would be "more parks and fewer shopping malls, more readers and fewer television watchers, more teachers and fewer lawyers, more celebrations and less hurry..." Orr does not seem to feel the need to prepare students for the global economy; he would really rather have students change the economy altogether. "We have tried utopia and we can no longer afford it."

The "Destinations" essays might sound like simple and annoying nostalgia for a time which probably never did exist except that Orr firmly states that people would have to exercise intention, thought, knowledge, and wisdom – all disciplines which require us to know exactly what we are doing and why – in order to create and maintain communities like this. Orr says, "This is not a simpleminded return to a mythical past, but a patient and disciplined effort to learn...the arts of inhabitation."

Again, Orr's practical suggestions for achieving these Destinations are not easy. He speaks of redefining our economic system to count the true costs of our lives. He suggests, among other things, purposeful regional planning; development projects which render rural communities self-reliant; creating "green" cities; restoring wild place for animals; creating a solar-powered economy. All of this is desirable and probably achievable, but not easy.

David Orr has an enormous, compelling vision. It is no wonder that the details to achieve the vision are not as clearly spelled out as I might have liked; and after all, a clear secondary theme of the book is that people need to think for themselves! I found myself wondering what I would do in my own classroom and in my own house to help myself and others to live more intelligently. I might just take my students on a field trip to the Niobrara River, for starters.

*Reviewed by*

*Victoria Mundy*

*University of Nebraska, Lincoln, NE (currently  
University of Kentucky, Lexington, KY)*



***FUTURE HORIZONS:  
Recent Literature in Sustainable Agriculture***

## **Everyone a Teacher, Everyone a Learner**

Heidi Carter and Chuck Francis, Editors, 1995

Extension and Education Materials for Sustainable Agriculture, Volume 4.  
North Central Sustainable Agriculture Research and Education Program,  
Center for Sustainable Agricultural Systems, University of Nebraska-Lincoln  
Lincoln, NE 68583-0949. 246 p, paper \$10.00

If you're the kind of person who needs order—follows recipes precisely, keeps your shoes in matched pairs, leaves your desktop clear and organized at the end of every work day—then I'll tell you right off. Don't even open this book.

On the other hand, if you can tolerate—maybe even enjoy—a little chaos, you'll find plenty of valuable information in *Everyone a Teacher, Everyone a Learner*, a volume of sustainable agriculture literature and training materials collected by the North Central Region SARE Training Program.

Editors Heidi Carter and Charles Francis, of the University of Nebraska, have assembled, as they describe it, "a smorgasbord" of ideas and methods for teaching agricultural professionals about sustainable agriculture. And like every good potluck dinner I've attended, the buffet in *Everyone a Teacher, Everyone a Learner*, offers some pretty unusual combinations.

Here's a sampling of what you'll find in the 246 pages tucked between its bright-green, comb-bound covers: letters of support from the USDA officials, scholarly articles, outlines for problem-solving activities, Extension checklists, and annotated bibliographies.

The voices in this book are diverse. Academic. Practical. Bureaucratic. Boring. Inspiring. And they're all mixed together. For example, just a few pages from a community college tip-sheet offering some all-too-obvious "attributes" of adult learners—"they may be easily distracted from study by other adult responsibilities which compete for time." Rural sociologist Cornelia Flora offers a provocative, scholarly discussion of social issues related to agriculture, communities

and new technologies: "social capital can be envisioned as one component of our total resource base that includes human, financial, manufactured and environmental capital as well."

The volume shares a title with—and, best as I can tell from its front matter, was evidently compiled for—two 1995 training workshops. And as you leaf through the pages, you get the feeling of those meetings—keynote addresses, concurrent workshops, panel discussions, debate over coffee and donuts during breaks. I'll bet, from the materials in the volume, participants left the training with a fresh perspective and new ideas to try out. That's what conferences and workshops are for.

I do wish though, that Carter and Francis took their titles as editors a little more seriously—editors do edit, after all. More organization, a more strongly articulated framework for bringing all these ideas together in a single volume would certainly have strengthened the book's usefulness. And yet, it's precisely the unevenness, the unpredictability of the mix that makes this book such a fertile place for sustainable agriculture training ideas.

In the "Editor's introduction"—perhaps "Editors Warning," would have been a more accurate heading—Carter and Francis outline their approach and how they hope people will make use of this collection. I'll let them speak for themselves.

"*Everyone a Teacher, Everyone a Learner* is a theme that invites participation. The workshop and handbook title conveys the message that every person in an adult learning environment brings a special set of experiences and a certain wisdom to the activities... The handbook does not tell you how to set up a training program, nor does it give a

narrow recommendation about what methods to use ... The training needed (for each audience) will be unique in some ways. We look forward to learning about your experiences and invite you to send us examples."

*Reviewed by:*

*Beth Holtzman*

*University of Vermont, Burlington, VT*

## **Shared Leadership, Shared Responsibility**

Heidi Carter and Chuck Francis, Editors, 1995

Extension and Education Materials for Sustainable Agriculture, Volume 4.

North Central Sustainable Agriculture Research and Education Program,

Center for Sustainable Agricultural Systems, University of Nebraska-Lincoln

Lincoln, NE 68583-0949. 246 p, paper \$10.00

The book "Shared Leadership, Shared Responsibility" is a reference publication containing hard to find information on a number of topics relevant to sustainable agriculture. The purpose of the book is to provide both updates on timely issues such as the implications of the 1996 Farm Bill on sustainable agriculture and process issues such as leadership and holistic management.

The information collected on holistic management, whole farm planning, entrepreneurship and farmer networks are more a sampler than in-depth information. The book's value lies in its use as a reference for the agriculturist's bookshelf on process topics not found in production agriculture publications.

The book provides relevant sources and succinct summaries on concepts that are at the core of social and economic pillars of sustainable agriculture.

The book goes beyond its initial purpose of being a resource material for a formal training session because a researcher or educator need not attend the training to use this material. This reviewer has accessed the book a half dozen times since the training in June, 1996.

*Reviewed by:*

*Rich Pirog*

*Iowa State University, Ames, IA*



## **Spiritwalker: My Journeys Through The Visionary Gateway**

Hank Wesselman, 1995

Bantam Books, 1540 Broadway, New York, NY 10036-4094. 400 p, cloth \$21.95, paper \$13.95

"I am about to tell you a most unusual story, a chronicle of something that happened to me while I was living on the flank of an active volcano on the island of Hawaii." Blending an interesting mix of anthropology, Carlos Castaneda, ecology, shamanism, mysticism, science, futurology, and science fiction, Wesselman weaves an unexpected and yet compelling adventure of the present/future.

Wesselman is an anthropologist. He begins having dreams, of withdrawing from his body, like the mystics of Asia. Through his research Wesselman discovers he is unquestionably leaving his body and penetrating the senses and awareness of some tribal person, Nainoa and he lives 5000 years in the future!

The rest of the book warps between the future and the present—Nainoa in the future, of Hawaiian ancestry who has migrated because of global warming and rising oceans, now living on the Western coast of North American, and Wesselman in the present, trying to understand the images and the ecology he is seeing when he "walks."

Nainoa is a Hawaiian, kahuna mystic. He travels with Wesselman in his consciousness. Nainoa is sent by his tribe to scout and learn about the other side of the mountains, moving away from the wetness of his oceanside home to the dry and secluded interior. We soon discover that this trip will show us what once was the U.S., where no earlier traveler has ever returned. As the story is disclosed to both the reader and Wesselman, we learn about the changes that Nainoa sees on his journey: greenhouse effects, overpopulation, and AIDS apparently combine to end our Western Civilization as we know it.

Nainoa's people, relatives of the Hawaiians, are hunter-gathers, living close to the earth. They have

a profound and enduring spirituality with nature. On the trip, Nainoa shows us how he relates to his environment in his everyday life. Further on his journey, he meets another tribal group who also live close to the earth. Nainoa, Wesselman, and the reader join this group and learn how they survive in a drier area, in what must be central Oregon or Washington.

Is this true? Does it matter? Has Wesselman given us a book of fiction or non-fiction? Who objects?

For the reader taken into a stimulating story and on an appealing and creative adventure, a new world is presented. It certainly mirrors aspects of the current and known planet but it glimmers with the unknown and unusual, and therefore, the dangerous. We encounter plants and animals we don't know in this location—iguanas, monkeys, jaguars. Artifacts from the previous civilizations give us only hints at what may have happened—frames and shells of buildings, rubbish of roads overgrown with vegetation. We see, feel, and live in a possible environment of 5000 years into the future.

Wesselman gives us an excellent feeling of the rainforests; and he makes us thirsty in the savannas. He weaves enough of reality into his writing that he takes you into a fantastic constructed reality. Full of notes to people like Joseph Campbell and Shunryu Suzuki, the book is appropriately referenced. In fact, each chapter has its own series of notes and bibliographic materials.

Given all this, *Spiritwalker* makes for interesting reading and allows the reader a very provocative glimpse into an alternate future.

*Reviewed by:*

*Jim King*  
*University of Nebraska, Lincoln, NE*





## **Woman on the Edge of Time**

Marge Piercy, 1976

Alfred A. Knopf, New York (currently Fawcett Book Group, 1997) paper \$12.00

How would our society today be viewed by another culture some 100 years in the future? Marge Piercy takes us on this journey, through the mind of a brilliant but downtrodden woman who is in and out of mental hospitals because of her poverty and hopeless personal life. She visualizes a feasible future, one that works in harmony with the environment rather than opposing it, and meets human needs while not sacrificing other species or the ecosystem. Our current overuse of natural resources, pollution of atmosphere and waters, and excessive consumption is seen in retrospect as highly unsustainable by a people who had identified and overcome these problems. In a utopian and environmentally benign future culture that lives in harmony with other species, carefully controls human population, and is non-extractive in its use of low-tech solutions to meet human needs, the inhabitants of this continent would look back in amazement at the primitive attitudes and unconcerned behaviors of today's society.

Author Piercy is convincing in her portrayal of how difficult it is to be poor, female, Chicana, and suspected of insanity. Consuelo (Connie) Ramos was once a bright, beautiful and successful college woman, but is now ill, maltreated and then deserted by partner and family, and finally suspected of child abuse. In a gripping story of how Connie deals with this impossible situation, the author takes her on a series of time warps into the 21st Century to the egalitarian society of Mattapoissett, a world where people respect each other and have overcome the many ills of today's discriminatory and wasteful cultures. Yet even in this future utopia, their culture is threatened by others on the planet who have taken a different course. Herein lies both a striking contrast and a message for sustainability.

Given the hopeless situation in which we find Connie in the mental hospital, it is not difficult for

the reader to imagine her need to escape. The author takes her (and us) to a society where all the ills of her current situation have been resolved. There is a high degree of racial and gender equality and respect. People are respected for who they are, and accepted for what they do. Three parents, plus in fact the whole village, raise each child. Houses are built to last, clothes are worn for decades and shared in the village, recycling is the norm. Everyone gardens and many are closely involved in food preservation and preparation. People are in touch with their natural environment. Despite their dominance of the region, the humans in this society operate in balance with other species. It is difficult to envision a more sustainable alternative. Yet this utopia has its boundaries.

Just as the oppressive real world of the hospital awaits in the reaches of Connie's mind, there are real oppressors beyond the borders of Mattapoissett in the next century. Details of that other culture are left to the reader's imagination, but it is a small leap to recognize its characteristics as those of a culture extrapolated from our own. This dark alternative is a continuing challenge to utopia, one that parallels Connie's return to reality, the present, and the hopelessness in the mental ward.

In this brilliantly conceived and suspensefully written social statement, Marge Piercy goes beyond a predictable litany of what is wrong with current society. Through the device of a time warp, she offers positive and achievable alternatives. Much is left to the reader's imagination, and very likely the meanings will be different for each person who accepts this adventure. Piercy provides us with a "novel" approach to improving major flaws in today's culture, and outlines one creative approach to envisioning a sustainable society for tomorrow.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*





## The Camp of the Saints

Jean Raspail, 1973

Editions Robert Laffont, S.A., Paris

The Social Contract Press, 316 ½ East Mitchell St, Suite 4, Petosky, MI 49770

316 p, paper, \$12.95

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*...aground some fifty yards out, [lay] the incredible fleet from the other side of the globe.... He pressed his eye to the glass, and the first things he saw were arms... those arms raised high in the air, waving and shaking together, all outstretched toward the nearby shore. Scraggy branches, brown and black, quickened by a breath of hope. All bare, those fleshless Gandhi-arms... thirty thousand creatures on a single ship!* – THE CAMP OF THE SAINTS

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Most Americans are somewhat parochial. When they envision the future, it is mostly from the perspective of their own country. They believe that interactions with the rest of the world, based largely on trade, will be generally positive and supportive of our continued high quality of life. Presumably, the global economy will help the less developed world to raise their living standards, but imbalances in wealth are not an overriding concern.

What Americans don't consider is that the more than four billion residents of the less developed world have their own concepts of beneficial interactions with the West. In *The*

*Camp of the Saints*, Jean Raspail offers an allegory of the meeting of East and West in which the prime movers are not the suit-wearing, cell phone-wielding brokers of the new global economy, but the poor.

Triggered by famine and broken promises of Western aid, one million of India's poorest commandeer the merchant ships in Calcutta's harbor, and force the fleet to undertake a brutal voyage around Africa, into the Mediterranean and to the shores of southern France. The focus of the book is on the reaction of

the Western nations to the threat of this impending "invasion" by a force armed only with their need and their opponents' guilt. And what a pathetic picture of the West does Raspail paint! Wealthy, soft, riven by internal dissension, the nations of Europe are paralyzed. Troops are deployed to the coasts, but many desert. Leftist journalists drive south in their BMWs, exhorting the proletariat to welcome their brothers and overthrow the capitalist rulers. The Pope stresses obligations to the poor. Suggestions to turn back the ships are branded as racist or xenophobic. Most people's response is limited to hoping that the problem goes away.

What makes Raspail's vision so compelling and disturbing is not that mass migrations could happen, but that they are happening. Albanian freighters, decks packed with refugees, cross to Italy despite attempts by the Italian navy to turn them back. Russians and East Europeans move west looking for work while Algeria is known as France's Mexico. One of every five births in Germany is to a Turkish woman. One of every nine Salvadorians lives in the United States.

On the cover of the 1995 reprint of *The Camp of the Saints* is a photo of the freighter *Golden Venture* aground in New York harbor in 1993. Her cargo included 300 illegal Chinese immigrants. She had sailed further than Raspail's fleet. Illegal immigration to the United States exceeds 300,000 annually, and more than 5 million people reside here illegally. Almost one million people immigrate legally to the United States each year.

The demographic implications of these migrations are sobering. U.S. population will double by the year 2050 to more than half a billion. The ecological, economic, and social impacts will be severe. Meanwhile, world population increases by 90 million per year, 90% of the increase coming in the less developed nations. Pressures to migrate steadily increase.



The denouement to Raspail's story is apocalyptic. The landing of the fleet precipitates wholesale abandonment of southern France, and the eventual acceptance of unlimited immigration by all Western nations. The West capitulates and relinquishes its sovereignty. The colonial era is reversed.

*The Camp of the Saints* is provocative, stimulating, and leaves no room for complacency. The issues it raises need to be addressed and cannot be ignored. Do we have the guts to deal with questions of carrying capacity, overconsumption, equitable distribution of resources, and national sovereignty? Or are we too soft and decadent to face harsh realities? One thing is certain — people will tend to migrate from poverty to wealth, and the current differences in wealth are

extreme. Just how extreme was unintentionally illustrated by an article about *The Camp of the Saints* in the December 1994 issue of *The Atlantic Monthly*. Interspersed among reports of Third World poverty and degradation are advertisements for the Acura Legend Sedan LS, cashmere sweaters, Grand Marnier Liqueur, Apple computers, the Lincoln Mark VIII sedan, and Waterman pens. I wonder how many other readers found this juxtaposition both obscene and unsustainable?

*Review by:*

*Richard Olson*

*University of Nebraska - Lincoln*



## **Ishmael**

Daniel Quinn, 1993

Bantam Books, 1540 Broadway, New York, NY 10036-4094. paper \$11.95, cloth \$20.00

How is it possible to briefly and adequately review a book whose express purpose is to give new direction to humankind? And if that direction is likely the only one that will allow the human species to survive, the urgency for a reviewer is magnified. The only way to do justice to such a book is to stimulate others to read the story of the Teacher and her only successful pupil.

In the Personals section of a London newspaper is an ad that reads, "TEACHER seeks pupil. Must have an earnest desire to save the world. Apply in person." In answering this ad, a skeptic begins his journey through an extended, telepathic dialog with an extremely intelligent and perceptive gorilla. During this journey he learns a new interpretation of the history of humankind. He learns of the departure of our species from the sustainable hunting and gathering cultures that predominated for three million years, those that Ishmael calls the "Leavers," to a new path that led to settlement and the first agricultural revolution. Thus began the emergence of the dominant "Takers" who viewed the world as a place to control. And in exercising this control, Ishmael observes that people are "captives of a civilizational system that more or less compels you to go on destroying the world in order to live. Many of you ... would be glad to release the world from captivity, ... (but) they're unable to find the bars of the cage." Ishmael is an outcast not because she is not human nor because she is kept in a cage, but undoubtedly because of her unorthodox interpretations of history and pessimistic view of the future of humankind.

Teacher describes the arrogance of the Takers as based on the Judeo-Christian myth of the creation of man, as the apex of evolution the world was made for man, and that humans own the world for their own good. Their goal is to conquer the world, its climate, land, and all other species. Unfortunately, this approach to creating paradise is

spoiled by stupidity, greed, destructiveness, and short-sightedness. Some of the consequences of the Taker mentality, according to Ishmael, have been cruelty, mental illness, crime, and drug addiction. He points out that after three million years of relatively balanced coexistence with other species, the Takers in a mere 500 generations have managed to foul their nest, disrupt the balance, and establish a pattern that will lead to their demise.

The culture of Takers rejects the laws that govern all other species. According to the prevailing mythology, humans are by definition a biological exception, and thus can invoke their domination to enforce this uniqueness. Most humans have an unwavering dependence on prophets—Moses, Buddha, Jesus—although they have no certain knowledge about how they ought to live. In fact, their world of thought generally ends at the borders of their particular culture. Humans have not learned that they are an integral part of the community of life, that they are not alone on this planet on which they depend completely.

The Taker culture does three things that are not done by any other species. They exterminate their competitors. Humans also systematically destroy their competitors' food to make way for their own. Finally, they strive to deny competitors access to all food in the world, since they own the supply. In this culture of dominance is embedded the destruction of balance, including the loss of biodiversity and the essence of sustainable biological systems. Are there solutions to this quandary?

The author provides us with solutions through the Teacher, as she guides the pupil through a unique dialectic trip that leads to realization that things are not as they appear. Of special interest to educators is the metacognition of the learning environment, a process of discovery that is applicable to our university and other adult learning situations. A

serious reader must go beyond the delight in a book well conceived and written, and take to heart the message of the Teacher. Early in the book we are challenged with the inquiry on a sign near the cage: "With man gone, will there be hope for gorilla?" We must imagine what is on the reverse of the sign:

an obvious truth that is only revealed at the end of the journey.

*Reviewed by:*

*Charles Francis*

*University of Nebraska, Lincoln, NE*



**FUTURE HORIZONS:**  
*Recent Literature In Sustainable Agriculture*

**APPENDIX**

Journal of Sustainable Agriculture Subscription Information

**Editors' Note:**

Several journals have graciously agreed to allow reviews to be reprinted in this compendium. We provide here information on how to subscribe to those journals, with current subscription rates and addresses. Please contact the offices of these publishers or professional organizations if you have questions about the details of subscribing to their publications.

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