Sustaining Transition: The Role of Public Policy in Helping Farmers Change from Conventional to Sustainable Practices

G.W. Bird
Department of Botany and Plant Pathology Michigan State University
East Lansing, Michigan, USA

Introduction

Sustainable development in agriculture is an emerging concept. As a component of this transition, the farm sector must change from .the current industrial model of conventional agriculture to sustainable practices. This will require changes in public policy. The Sustainable Agriculture Research and Education Program (SARE) of the United States Department of Agriculture has a grassroots nature which represents the diverse components of our agriculture. This report is an overview and it is divided into four parts: a brief history of agriculture, a description of the emerging concept of sustainable development, the current state of sustainable agriculture, and a set of public policy recommendations. The presentation is based on two alternative world views: the current dominant Human-Oriented/ Materialistic World View, and an alternative Ecological World View.

History and Current State of U.S. Agriculture

There is evidence that a tool revolution (about 2.4 million years ago) was followed in relatively recent times, circa 10,000 years ago, by the beginning of the agricultural revolution, an event of major significance in relation to the evolution of modern society. About 250 years ago, society entered into an “age of growth” that was initiated by the industrial revolution. In response to these events, human population density reached the 1.0 billion level in 1830. This was followed in the 20th Century by the chemotechnology, computer and biotechnology eras.

During 10,000 years of development of western civilization, a single dominant world view has emerged. It is based on the assumption that all components of the environment (air, water, soil, minerals, and all microbial, plant and animal species, including nematodes) are natural resources to be exploited for the advantage of humankind (Nebel and Wright, 1993). It assumes that natural resources are essentially infinite, and that if a resource becomes extinct, another will be substituted as an alternative. It is a “Taker” World View (Quinn, 1993), and it is supported by government policy, multinational corporations, current economic practices and the heritage of science (Daly and Cobb. 1989: Batie. 1992; Goldsmith. 1992). Although the technologies associated with this world view have resulted in significant increases in human population growth and numerous significant advances in the quality of life, there have also been consequences that were either unexpected or that have the potential for major long-term detrimental impacts on society and its biosphere. These impacts are similar throughout most sectors of society, and are not limited to agriculture.

The unexpected consequences associated with U.S. agriculture resulted in both the evolution of Integrated Pest Management (IPM) (Bird, 1989) and the more recent activities concerning the sustainability of agriculture (Bird et al., 1990). These consequences include a decrease in the number of farms, increase in farm size, high dependency on off-farm purchased inputs, increase in risk of farm failure, decrease in system diversity, decrease in biodiversity, unacceptable risks associated with environmental quality, increase in risks associated with human health, decrease in reliance on rural communities, and decrease in direct contact between the farm sector and urban-suburban communities. This has resulted in the evolution of a single dominant system of U.S. agriculture, known as the Industrial Agribusiness Farm Model, or conventional agriculture. Frequently, it is even referred to as “traditional agriculture.”

U.S. agriculture can be subdivided into three components: the market, input, and farm sectors. Between 1910 and 1990 the market sector grew 627 percent in absolute dollars, while the input sector increased 460 percent, and the farm sector declined 8 percent (Smith, 1992). The benefits of the increases in farm sector productivity have been reaped by the off-farm sectors of agriculture.

Today, approximately 85 percent of the food and fiber produced in the U.S. comes from about 15 percent or 300,000 of 2,000,000 farms. The vast majority of these enterprises are operated under the structural attributes of the 15-85 Industrial Farm Model (Table 1). It is predicted that the number of 15-85 Industrial farms in the U.S. will decline to 150,000, and then to 50,000 by the year 2,000 A.D. (Lacy et al., 1992).

Table 1. Structural Attributes of the 15-85 Industrial Farm Model (Bird and Ikerd, 1993; Strange, 1988).

- Centralized management.
- Emphasis on specialization.
- Hired worker days exceed owner on-farm work days.
- Separation of management and labor.
- Technology used to minimize labor inputs (limited education required).
- Heavy reliance on purchased inputs.
- Technology designed to minimize real-time in-field decision-making.
- Emphasis on standard farming practices.

The current narrow profit margin associated with the 15-85 Industrial Farm Model Sector has mandated growth in farm size as an essential strategy for economic viability. This fosters the continued decline in the number of viable enterprises. For example, the farm sector associated with a major commodity in Michigan declined an average of ten percent per year between 1988 and 1994. During this period, however, the acreage remained constant, and 1993 generated the largest growth sales ever. Because the remaining members of the 15-85 Industrial Farm Model fully realize that this structure decreases their probability of remaining viable as a full-time profitable enterprise, it is truly a teachable moment and a time when it is realized that change is essential. While most of the operations have not yet made a decision on the nature of this mandated change, a significant number have taken drastic action. For example, one 24,000-acre enterprise is in the process of transitioning 6,000 acres to certified organic production. In this case it is being done solely for environmental compliance purposes.

It is very important to note that several of the structural attributes of the 15-85 Industrial Farm Model are relatively incompatible with the philosophy and technologies of IPM. The fact that the industrial model is designed to place emphasis on the use of technologies that minimize real-time in-field decision-making is of particular concern. This issue may be the "fundamental or root-cause" of the constraints to the adoption of IPM, and why various components of U.S. agriculture have evolved in a manner that is contrary to IPM. It is also important to note that on a continuum from a climax ecosystem to a simple or primitive ecosystem, the 15-85 Industrial Farm Model is designed to simplify the ecosystem as much as possible. Although this has contributed to increased productivity, it has also increased the vulnerability of the system to undesirable biotic and abiotic factors such as pests and soil erosion.

Another major component of the U.S. farm sector is the Part-Time Farm Model. There are currently about 1.2 million part-time farmers, representing 60 percent of the total number of farm enterprises. The off-farm income of part-time farmers exceeds the net farm income. Part-time farmers have an average negative annual net farm income of about $3,500. The farming practices of part-time farmers usually consist of a small-scale version of the 15-85 Industrial Farm Model. Practices, however, may be those of a certified organic farm, or range from organic agriculture to the industrial model. Many part-time farmers are not part-time farmers by choice. They have adopted this type of farming as a default function designed to protect a desire for an agrarian life style. The viability of the part-time farm usually depends on factors outside the farm sector, and in many cases factors outside of agriculture.

Sustainable Development

In 1984, the late Robert Rodale authored a book entitled “Our Next Frontier” (Rodale, 1984). He indicated that the first phase in the development of society relates to the discovery of natural resources, the second phase deals with learning how to use the resources for enhancement of the quality of life, and the third phase is the challenge of sustainability. During the subsequent decade, the topic of sustainable development has emerged as a major imperative for both our nation and the global society (Strange, 1988). Visions of the concept of sustainable development have been described by Meadows et al. (1992), Nebel and Wright (1993), Miller (1993), and others. To understand the concept of sustainable development, it is necessary to differentiate between the terms “growth” and “development” (Meadows et al., 1992). Growth is a quantitative phenomenon characterized by size increase through assimilation of materials. Growth has distinct limits. Development, however, is a qualitative phenomenon in which an entity realizes potential or is brought to a fuller or better state. There are no known limits to development.

Miller (1993) outlined a philosophy of sustainability based on hierarchical levels of awareness. The first-order of awareness after recognition of the unexpected consequences of the Human-Oriented/Materialistic World View is an understanding of the need to address environmental quality and pollution issues. Integrated Pest Management (IPM) is an example of a philosophy and set of technologies resulting from this first-order level of awareness. The second-order level of awareness takes into consideration the issues of over-consumption and over-population. These are essential elements of a philosophy of sustainable development. The third-order level of awareness deals with a holistic approach to “spaceship earth.” This is addressed in detail by Goldsmith in his 1992 publication entitled, “The Way: An Ecological World View.” Only after development of appropriate strategies to deal with these three levels of awareness is it possible to seriously evaluate the temporal nature of issues of sustainability in relation to decades, centuries or millennia.

The philosophies of sustainable development presented by Meadows et al. (1992) and Nebel and Wright (1993) are very similar. Meadows et al. (1992) describe sustainable development as operating within both natural resource and social subsystems. For systems functioning in an optimal external environment, five criteria must be met for the system to be sustainable (Table 2).

Table 2. Attributes of Sustainable Development (Meadows et al., 1992).

- Renewable resources must not be used at a rate greater than the regenerative capacity of the system.
- Non-renewable resources must not be used at a rate greater than the development of substitute resources.
- System residuals must not be produced at a rate greater than the assimilation capacity of the system.
- The system must meet the Ecological World View quality of life mandates associated with rural, regional and urban human living environments.
- The system must provide for intergenerational equity.

The approach of Nebel and Wright (1993) uses four attributes or principles of sustainability that include elements of both natural and social systems (Table 3).

In his 1993 Earth Day Address, President Clinton made a major commitment to biodiversity. On June 14, 1993, he announced the appointment of the President's Council on Sustainable Development (PCSD). The Council currently consists of 12 representatives from corporate business and 12 representatives of non-profit private organizations. PCSD has adopted the following working definition of sustainable development: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World

Commission on Environment and Development, 1987).

Table 3. Attributes of Sustainable Development (Nebel and Wright, 1993).

- The foundation of the system must be based on solar energy.
- The system must make optimal use of natural cycles.
- The system must be designed to prevent over-consumption.
- The system must promote biodiversity.

Sustainable Agriculture

During the past decade a coalition of environmental advocates, organic farmers and ecologists worked with the U.S. Congress and the U.S. Department of Agriculture to obtain funding for research and education programs in alternative agriculture systems. In 1988, appropriations were approved for the Low-Input/Sustainable Agriculture Program (LISA). In 1990, the Food, Agriculture, Conservation and Trade Act (i.e., the 1990 Farm Bill) expanded the program, and today it is known as the Sustainable Agriculture Research and Education Program (SARE). A 1992 General Accounting Office Report indicated that the LISA-SARE program has served as a catalyst for building new coalitions between farmers and ranchers, and representatives of nonprofit private organizations, agribusiness, government and academia, and that this has resulted in the development of a new vision of U.S. agriculture for the twenty-first century. This mandate of building new coalitions among these groups is by far the most important aspect of the SARE program (Bird, 1992).

In the 1990 Farm Bill (Food, Agriculture, Conservation and Trade Act of 1990), Congress defined sustainable agriculture as “an integrated system of plant and animal production practices having a site specific application that will, over the long-term: satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agriculture economy depends; make the most efficient use of nonrenewable resources and integrate, where appropriate, natural biological cycles and control; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole.” Numerous individuals representing widely diverse sectors of U.S. agriculture indicate that this definition represents a long-term goal for U.S. agriculture. How to convert this goal into practical reality, however, is a major challenge (Bird et al., 1990).

The vast majority of individuals associated with conventional agriculture have extremely limited or no experience with alternative farming systems. Evidence accumulated during the past five years, however, is beginning to indicate that various alternative systems can be very productive, highly economically profitable, and at a technology level that greatly exceeds that of the current conventional system. The type of technology, however, is usually very different from that associated with our current dominant world view.

One vision of sustainable agriculture for the twenty-first century mandates an environment that would allow alternative agriculture systems to thrive. This would require specific policy and research initiatives and educational programs that were targeted for alternative systems. It should be appropriate to begin such an initiative with four alternative systems: the 15-85 Industrial Farm, the Part-Time Farm, Organic Agriculture, and a new concept of a Twenty-First Century Diversified Farm (Table 4).

For the Twenty-First Century Diversified Farm to become a reality, the farm sector will have to recapture a small portion, approximately ten percent, of the resources currently controlled by the market and input sectors. It should be possible to achieve this through on-farm and local value-added initiatives. The results would include a significant increase in the number of viable farm sector opportunities, a revitalization of rural communities, greatly enhanced environmental quality, and an overall improvement in quality of life for the farm sector and society as a whole.

Table 4. Structural Attributes of the Twenty‑ First Century Diversified Farm (Bird and Ikerd, 1993; Strange, 1988).

- The farm is owner operated.
- Hired-worker days usually do not exceed farm-family worker days.
- The farm is usually a partnership of not more than three families.
- The farm is structured as a joint management-labor relationship.
- The operation places major emphasis on biological diversity.
- There is an emphasis on the use of on-farm resources.
- Site-specific and real-time decision-making are important components of the system.
- A diverse set of enterprise statements includes environmental goals, natural re-source conservation objectives, economic priorities, production system goals, family quality of life objectives, local community quality of life activities, and urban-suburban community interfacing mandates.

Public Policy and Recommendations

It is clear that a philosophy of sustainable development cannot be based on our current Human-Oriented/Materialistic World View of the "Industrial Growth Age." It must be founded on an alternative world view. An Ecological World View appears to have most of the components necessary for sustainable development (Nebel and Wright, 1993). This world view is based on the principle that natural resources are products of the natural environment, and that resources are finite and limited by their regenerative capacity. Sustainability depends on suitable protection and stewardship of the natural environment. It is based on the principles of the science of ecology that have evolved during the last 50 years (Odum, 1953; Snrith, 1990). It mandates the philosophy and technologies of holistic resource management (Savory, 1988). It is a "Leaver" World View (Quinn, 1993).

Changes in public policy are imperative if the industrial model of conventional agriculture is to undergo successful transition to sustainable practices in a timely and orderly manner. The following public policy initiatives must be part of this process:

- Serious evaluation of alternative farming systems,
- Rebuilding a symbiotic relationship between the farm sector and rural communities,
- Increased use of on-farm resources,
- Enhanced networks of on-farm research,
- Formulation of farmer to farmer education activities,
- Evaluation of the potential role of local food councils,
- Increased grassroots support for the farm sector based on the development of new rural, urban and suburban coalitions,
- Facilitation of local and regional thinking,
- Focus on ecological solutions, and
- Development of a goal that assures the viability of a twenty-first century agrarian as a producer of food, food and fiber and primary steward of the land with potential to play a role as a major citizen leader.

Our current knowledge of how the world works mandates that a future of industrial technological dominance is not feasible. An alternative future scenario of global decline in quality of life is highly undesirable. The attributes of a future based on the advanced, dynamic and highly complex technologies of sustainable development appear to be a global imperative. Appropriate changes in public policy are necessary to facilitate transitioning to an age of sustainable development. Transitioning from the Human-Oriented/ Materialistic World View of the Industrial Growth Age to an Era of Sustainable Development based on an Ecological World View may require a major societal transformation. This transformation could be of the magnitude of the earlier tool, agricultural, and industrial revolutions.

References

Batie, S.S. 1992. Biotechnology and Science: The Imperatives of Choice. 18th James C. Snyder Memorial Lecture in Agricultural Economics. Purdue University, West Lafayette, Indiana.

Bird, G.W. 1989. The integrated pest management experience. p. 31-41. In Reform and Innovation of Science and Education: Planning for the 1990 Farm Bill. Senate Report 101-61. Committee on Agriculture, Nutrition and Forestry, U.S. Government Printing Office, Washington, D.C.

Bird, G.W. 1992. Sustainable agriculture research and education program: With special reference to ecology. J. Sustain. Agric. 2:141-152.

Bird, G.W., T. Edens, F. Drummond, and E. Groden. 1990. Design of pest management systems for sustainable agriculture. p. 55-1 10. In C.A. Francis, C.B. Flora, and L.D. King (ed.). Sustainable Agriculture in Temperate Zones. J. Wiley & Sons, New York, N.Y.

Bird, G.W. and J. Ikerd. 1993. Sustainable agriculture: A twenty-first century system. Annals of the Amer. Acad. Political & Social Sci. 529:92-102.

Clinton, W.J. 1993. Presidents's Earth Day Address, April 21. Washington, D.C.

Daly, H.E. and J.B. Cobb, Jr. 1989. For the Common Good. Beacon Press, Boston, Massachusetts.

Goldsmith, E. 1992. The Way: An Ecological World-View. Shambhala Publications Inc. Boston, Massachusetts.

Lacy, W.B., L.R. Lacy, and L. Busch. 1992. Emerging trends, consequences and policy issues in agricultural biotechnology. p. 3-32. In M.C. Hallberg (ed.) Bovine Somatotropin and Emerging Issues. Westview Press, Boulder, Colorado.

Meadows, D.H., D.L. Meadows, and J. Randers. 1992. Beyond the Limits. Chelsea Green Pub. Co., Post Mills, Vermont.

Miller, G.T., Jr. 1993. Environmental Science: Sustaining the Earth (4th. Ed.) Wadsworth Pub. Co., Belmont, California.

Nebel, B.J. and R.T. Wright. 1993. Environmental Science: The Way the World Works (4th. Ed.) Prentice Hall, Englewood Cliffs, New Jersey.

Odum, E.P. 1953. Fundamentals of Ecology. W.B. Saunders Publ., Philadelphia, Pennsylvania.

Quinn, D. 1993. Ishmael. A Bantam/Turner Book. New York, N.Y.

Rodale, R. 1984. Our Next Frontier. Rodale Press, Emmaus, Pennsylvania.

Savory, A. 1988. Holistic Resource Management. Island Press, Covelo, California.

Smith, R.1. 1992. Farming Activities and Family Farms: Getting the Concepts Right. Joint Economic Committee Symposium. Agricultural Industrialization and Family Farms: The Role of Federal Policy. U.S. Congress. October 21.

Smith, R.L. 1990. Ecology and Field Biology. Harper Collins Pub., New York, N.Y.

Strange, M. 1988. Family Farming: A New Economic Vision. University of Nebraska Press, Lincoln, Nebraska. UNCED 1992. Addenda 21. United Nations.

World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press, New York, N.Y.