POLICY OPTIONS FOR A MORE SUSTAINABLE AGRICULTURE

Patrick Madden
The Pennsylvania State University

Discussions of policy options frequently lack clarity because policy goals are not specified. Multiple, and often conflicting, goals befuddle efforts to come up with definitive and widely acceptable policy options. Nowhere is this more true than in the area of sustainable agriculture.

The Goal

Much has been written in the past five years on the subject of sustainable agriculture. Gips provides an excellent historical background, summarizing extensive literature on four dimensions of sustainability: ecological soundness, economic viability, social justice and humaneness (Gips, p. 71–85). Lockeretz juxtaposed several concepts related to sustainable agriculture (alternative, low-input, ecological, regenerative and organic) and addressed a number of key questions about the meaning and applicability of sustainable agriculture.

Low-input/sustainable agriculture is best understood in an integrated systems approach rather than a reductionist orientation commonly used in disciplinary research. For example, fertilizers not only promote crop growth but also increase disease incidence, increase pest attack and promote growth of weeds. Organic matter in the soil can promote the growth of beneficial pathogens that control diseases and various pests, but fungicides can lessen the populations of beneficial species. Insecticides usually reduce insect damage, but can deplete populations of beneficial organisms such as predators and parasites, thereby leading to secondary infestations of pests that previously were held in check by their natural enemies. Insecticides deplete populations of polinators essential for production of many seed, fruit, vegetable and nut crops and decimate populations of earthworms, hence lowering soil fertility (Cook and Baker 1983; Cook 1987; Edwards 1987). An integrated systems approach recognizes these complex interactions and uses them to advantage.

The goal of low-input/sustainable agriculture is to reduce the farmer's dependence on certain kinds of purchased inputs in ways that increase profits, reduce financial risks and environmental hazards, and ensure a more sustainable agriculture for generations to come. Low-input farming methods encompass a wide array of approaches to farming including:

- Crop rotations and mechanical cultivations to control weeds rather than relying exclusively on herbicides, which cause groundwater pollution and human health hazards, especially to farm workers.

- Control of insects and other pests by integrated pest management strategies such as careful monitoring, biological control of pests through enhancement of natural enemies, and crop rotations that deprive pests of essential food sources, with minimal to no use of pesticides after a transitional phase.

- Replacement of some purchased chemical fertilizers by use of legume crops that transform nitrogen from the air into a form plants can use, and by application of livestock manures, municipal sludge and compost. Plant breeders are developing new legumes that biologically fix much more nitrogen than earlier cultivars (Barnes, et al. 1986).

- Overseeding of legumes (sometimes in combination with other crops such as rye) into maturing fields of corn and other grain crops or as post-season cover crops. This low-input farming method sharply curtails soil erosion and captures soluble nutrients in plant biomass, which prevents nutrient losses and groundwater contamination due to leaching. It also controls many weeds through allelopathic action (Rice 1983 and 1984).

A low-input/sustainable farming system is a combination and sequence of low-input farming methods or technologies integrated into a whole-farm managerial plan. Many of the concepts underlying low-input farming methods, such as crop rotations and application of manures, have been known for decades or even centuries. However, the essence of this approach is not a reversion to the technologies of previous decades or centuries, but a combination of the best of modern agricultural science and technology with the practical experience of farmers who are profitably substituting management for most or all of their purchased inputs of synthetic chemical pesticides and fertilizers.

Increasing Public Concern

Modern conventional agriculture, with its heavy dependence on synthetic chemical pesticides and fertilizers, has been heralded as a great boon to mankind, often lifting (or at least delaying) the Malthusian threat of widespread famine. However, recently emerging information has identified a number of unanticipated adverse side effects and alarming trends. This new information has prompted many observers to reexamine their concept of "improved" conventional farming technology. Broader social and ecological goals must be reflected in the accounting. Some of the major trends recognized today are:

- Widespread pollution of surface and groundwater by pesticides and fertilizers (Hallberg 1987; Holden 1986).

- Pesticides cause cancer and birth defects. Farm workers are at greatest risk, due to direct and prolonged exposure (Wasserstrom and Wiles 1985). A study of cancer mortality data covering the period from 1950–1969 in the 1,497 nonmetropolitan counties of the United States found very strong statistical evidence that people living in areas where pesticides are heavily utilized have elevated risk of dying from certain kinds of cancer (Stokes and Brace 1988).

- An increasing number of pesticides are being banned or more severely restricted by regulatory agencies.

- Pesticides are rapidly becoming obsolete as pests develop genetic resistance (National Research Council 1986).

- The cost of developing and gaining approval of new pesticides, already astronomical, is rapidly rising.

- Known and inexpensive reserves of irrigation water, phosphate and potassium, as well as fossil energy sources required to manufacture nitrogen fertilizers are being depleted (Council for Agricultural Science and Technology 1988, pp. 24, 28–29).

These alarming trends have stimulated considerable public pressure to develop and promote more widespread adoption of farming methods that are less hazardous to human health and the environment and more sustainable for generations to come.

An Array of Policy Options

Some of the policy options for increasing the sustainability of agriculture include:

Regulatory Action

The primary actors employing the regulatory approach are the U.S. Environmental Protection Agency (EPA) and its various state-level counterparts. In general, the regulatory approach has been largely ineffective. It is slow, expensive and subject to widespread violation. An EPA official once told me he estimated the regulatory approach historically has had a negative net impact on human health, because by the time enough evidence is assembled to ban or severely restrict a pesticide, several new substances are on the shelf that later prove to be more harmful than the original. The regulatory approach has been far more effective in withholding approval of new pesticides than withdrawing older ones. This policy has had the benefit of preventing many new monster chemicals from reaching the market at least in the United States—export to developing nations is, unfortunately, still prevalent. But it has had an unintended perverse effect: some of the older chemicals protected by the "grandfather clause" are sometimes more hazardous than newer chemicals withheld from the market. In recent years EPA and state agencies (most notably in California) have become much more aggressive in restricting pesticide use and penalizing violations. Nonetheless, highly toxic substances continue to make their way through the black market. For example, ninety barrels of DBCP were seized in a "sting" operation in Fresno. This soil sterilant is one of the most potent toxins made by man, causing cancer, sterility and other health problems even with minute amounts of exposure.

Soil Conservation

The Soil Conservation Service and local conservation districts have been active for decades in promoting adoption of soil conservation strategies on farms. In recent years, highest priority has been given to conservation tillage, which is highly cost-effective in most situations as compared with building terraces and other structures. However, the herbicides used in lieu of tillage to control weeds have become a major source of environmental damage in many instances. Thus, while this policy is highly effective in attaining one goal of sustainability, it is contrary to other goals, including reduction of environmental hazards and human health risk associated with use of synthetic chemical pesticides.

Extension Education

A number of public and private organizations (including farm supply firms) provide information and educational services to farmers regarding their decisions to adopt or not adopt low-input farming methods and systems. While extension has historically served to promote farming methods that have increased productivity, the consensus among farmers attempting to profitably adapt low-input/sustainable farming methods to their farms is that extension personnel do not have the answers. This perception is mirrored by extension personnel who complain that the research simply isn't available to answer the questions being raised. Some private organizations such as Rodale Institute have proven to be highly effective in promoting adoption of low-input farming methods.

Research

Another policy for enhancing the sustainability of agriculture is research. In the FY 1988 federal appropriations hearings, the House

Agriculture Committee report listed more than $166 million of research in FY 1988 on topics directly or indirectly related to low-input agriculture, $101 million of which was being done by Agricultural Research Service. While this estimate is subject to considerable controversy, it is clear that a large amount of research has been and is being done on topics directly relevant to low-input agriculture. Findings of this research, if translated into readily usable form, potentially could be useful in making low-input methods more productive and enhancing their profitability in farming systems. However, much of this research is done in a single discipline context that ignores the complexities of decisions facing operating farmers. And many of the findings are never translated into a form that farmers, extension personnel and others would consider readily usable.

The LISA Program

Congress created and funded the "Agriculture Productivity Act," a new research and education program as part of the 1985 farm bill, Subtitle C of the Food Security Act of 1985 (PL 99-198). This subtitle specifically calls for research and educational efforts to promote the development and adoption of low-input/sustainable farming methods. As a direct result of a highly professional lobbying effort spearheaded by McMahon Associates and funded by Rodale Press, in December of 1987 Congress appropriated $3.9 million to begin work under this program. The program is now called "Low-Input/Sustainable Agriculture" (LISA). The central purpose of the program is to fund research and educational projects in the public and private sectors that will reduce environmental risks and human health hazards attributed to synthetic chemical pesticides and fertilizers, by improving the practicality and profitability of low-input alternatives. An essential part of the LISA program is the development and adoption of a decision support network linking many data bases and other sources of information of value to farmers, educators, researchers and public officials.

Guiding Principles

Ten principles have guided the development of the LISA program:

1. If it isn't profitable, it isn't sustainable.

2. Farmers need accurate information in readily usable form about impacts on cash flow and profits; labor and management; productivity of soil; health and financial risks; and environmental impacts.

3. Somewhat lower yields plus much lower costs equal higher profits.

4. Farmer's results can be anticipated only in a whole-farm system plan.

5. Low-Input profits can be enhanced by research and education (Madden 1989).

6. Team effort is required, including meaningful participation of farmers; public and private organizations; and research and extension.

7. In the design and implementation of the program, the Cooperative State Research Service (CSRS) must work in full partnership with extension, the Soil Conservation Service and private research and educational organizations.

8. The program is administered at regional level with regions in the Northeast, North Central, South and West. Major decisions are made by regional technical committees including farmers, researchers and educators to keep administrative expense and bureaucratic hassle minimal.

9. Low-Input/Sustainable methods are highly site-specific.

10. A multi-year transition is often required for profitable adoption because of the time needed for the reestablishment of beneficial pest control species; changes in soil tilth and productivity; the temporary use of fertilizers and pesticides that are sometimes needed; management and labor adjustments; and cash-flow problems due to starting rotations.

Project Proposal Evaluation Criteria

In each of the four regions (Northeast, North Central, Southern and Western) an ad hoc management team developed a set of criteria for use in evaluating proposals submitted for funding by the LISA program in their region. While each region's criteria differed somewhat, the following are fairly typical:

1. Relevance to the goals of LISA program
2. Appropriate methodology for research and/or education
3. Functional integration of multiple organizations
4. Explicit plan for making findings readily usable
5. Feasibility of attaining the objectives
6. Regionality — more than one state
7. Whole-farm systems approach including profitability estimates

Projects Funded in First Year

More than 400 proposals submitted by public and private organizations were evaluated in May and June. The total allocation to each of the four regions in FY 1988 was $851,000, including an initial $15,000 grant for getting the program started. A somewhat larger appropriation is expected next fiscal year (Madden, et al. 1988).

Challenges to Low-Input/Sustainable Agriculture

Barriers to the development and adoption of low-input agricultural methods can occur at any of several points in the chain of science, technology development, dissemination and adoption by farmers. The farmer may be reluctant to adopt some low-input methods because of unfamiliarity or concern that profits would decline because of crop failure or inability to get technical help with emergencies. Farmers must deal with several transitional difficulties as they begin adopting certain kinds of low-input farming practices. Not the least of these difficulties is the development of the special management skills needed to profitably use alternative farming methods. The central purpose of LISA is to improve the options available to farmers so they can more confidently adopt low-input/sustainable farming systems with less fear of financial ruin.

Public sector researchers such as university professors typically operate under a tenure and promotion rewards system that favors sole-authored technical articles using the latest fad in analytical procedures and theories favored by the editorial boards of the most prestigious refereed journals in each of the various disciplines. Developmental research, interdisciplinary team efforts and systems projects applying existing knowledge from an array of disciplines to the solution of farm-level problems tend to be given lower prestige in academic institutions — and sometimes very low assessment in tenure reviews. These are not insurmountable problems; they are being overcome at several institutions. However, faculty perception of penalties inherent in the academic rewards system is a major barrier, especially to younger faculty vulnerable to adverse personnel actions.

Another kind of barrier inhibiting adoption of certain kinds of low-input farming methods is public policy. For example, federal price support policies encourage maximum production of certain key commodities such as corn and wheat, but these policies penalize farmers for reducing their acreage or yields of the price-supported commodities. This reality effectively discourages many farmers from producing forage legume crops that would improve soil productivity, prevent much soil erosion and reduce the farmer's dependence on purchased inputs of fertilizers and pesticides.

A Vision for the Future

How would American agriculture and rural communities be impacted if low-input agricultural methods were to become much more widely adopted? Speculation abounds and opinions differ widely (Madden 1988). Much of the difference in opinion stems from differences in definition of the concept. The controversy is clouded by a lack of data — nobody knows how widespread various low-input farming practices are at the present time. Other differences in opinion are rooted in lack of knowledge regarding the yields, food quality and resource requirements of low-input farming methods.

Economic theory and experience lead one to believe that widespread adoption of low-input farming methods would lead to major changes in the structure of agriculture. Regional patterns of production would shift, for example, away from locations heavily dependent on synthetic chemical pesticides (such as Florida) toward areas where cold winters and shorter growing seasons make it possible for natural enemies to more effectively control pests. The prices of these commodities would be likely to increase, especially during the winter and early spring. Dietary consumption patterns would likely shift toward vegetables and fruits that could be produced efficiently with low-input methods. If low-input farming methods become more widespread, premium prices farmers now receive for some commodities would decline as the market becomes saturated. The equilibrium price level for perishable crops grown totally without chemicals would likely be higher than present prices. However, with low-inputs such as Integrated Pest Management (IPM) that (usually) reduce the level of pesticide use, and with some of the more successful biological control programs, production costs and prices are actually reduced. The overall effect of widespread adoption of low-input farming methods is impossible to estimate accurately because of the multiplicity of markets, resources and climatic conditions involved.

Clearly the yields of some farm commodities are not adversely affected by adoption of low-input methods. Many field crops such as wheat, corn and soybeans can be produced in many locations with little or no use of synthetic chemical pesticides, and reliance on legumes as the primary or sole source of soil nitrogen.

Significant changes would also occur in employment and income patterns in rural areas. Firms supplying synthetic chemical inputs would tend to decline or shift toward other services such as sale of clover seed and providing pest scouting services. The regional patterns of production of livestock and poultry, highly concentrated in recent decades, would tend to become more dispersed as legume-based crop rotations provided increasing amounts of forages that cannot be profitably shipped great distances. With an increase in the prices of many commodities, farm exports would decline and imports would increase. Consumers would expend a higher percent of their income on food.

Beyond the economic impacts, widespread adoption of certain kinds of low-input farming methods would have significant environmental impacts. Pollution of surface and ground water by chemicals would be reduced along with the health risks due to the manufacture, storage, transport, handling and application of agricultural chemicals.

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