SUSTAINABLE AGRICULTURE - A PERSPECTIVE

R. G. Hoeft and E. D. Nafziger[1/]

There is little evidence to suggest that agriculture as practiced in a variety of ways is not sustainable. We think of sustainable agriculture as a management system that uses inputs...both those available as natural resources on the farm and those purchased externally...in the most efficient manner possible to obtain productivity and profitability from a farming operation, while minimizing adverse effects on the environment.

Several groups have published materials suggesting techniques that should be used to attain the goals of sustainable agriculture. The University of Nebraska has prepared a list of "Components of a Sustainable System", including:

Cultural practices

- Careful variety/hybrid selection for the system
- Crop rotations with legumes
- Winter cover crops
- Intercropping
- Conservation tillage and residue management

Soil fertility programs ("fertilize the crop, not the soil")

- Precision-calibrated soil test and "accurate" fertilizer recommendations
- Band application of fertilizers
- Planting time and sidedress applications of nitrogen (N) for maximum efficiency
- Use of available manures and wastes
- Allowing N credit for legumes and for nitrate in irrigation water

Pest management

- Selecting pest-resistant cultivars
- Use of pest population dynamics, damage thresholds, and certain aids
- Integration of cultural, mechanical, and chemical control methods
- Use of biocontrol agents when available

[1/]Professor, and Associate Professor, respectively, Department of Agronomy, University of Illinois, Urbana-Champaign.

Water conservation

- Use of the concepts of irrigation scheduling and limited irrigation
- Use of ecofarming and other moisture-harvesting systems in semi-arid areas
- Crop selection based on the efficiency of water use

This is an excellent list of suggestions and is similar to those given in the Illinois Agronomy Handbook for many years. For various reasons, some advisers and farmers have not paid adequate attention to some of these items in the past. The following discussion will focus on the validity of those reasons.

Sustaining Soil Fertility

The use of a legume as a winter cover crop is being promoted as a way to produce "free" N for the following crop. Although the production of "free" N is a commendable benefit, it occurs rarely under Illinois conditions or in most of the Midwest. Fall-seeded legumes tend to utilize the residual N from the soil, thus reducing the potential for leaching. But under most Illinois conditions fall-seeded legumes can be shown to fix little additional N for early planted grass crops. Given the severe penalties for delayed planting of corn, delaying planting to allow for N fixation is unacceptable.

Fertilizer is one of the largest single cost items associated with crop production. This factor, combined with the fact that some feel we are "poisoning the soil" with fertilizers, has drawn a lot of attention to fertilizers from the proponents of sustainable agriculture. The Nebraska list suggests that the recommendations for fertilizer use could be more "accurate" and "precise" and that the emphasis should be on fertilizing the crop rather than the soil. Unless followed properly, those recommendations may result in fertilizing the crop by depleting the soil for future generations.

Fertilizer recommendations can be made for the short term, for minimum input, and for maximum profit, or they can be made for a sustainable system. If the amount added is significantly less than the amount removed in harvesting, the soil will eventually be depleted. This situation could hardly be defined as sustainable agriculture.

Soil tests cannot be calibrated for each particular site (field), so recommendations that are made from a soil test are based on research involving a limited number of soil types. Some recommendations will be above and some below that actually needed for the crop that year. In addition, the vagaries of the weather from year to year make it difficult to be precise in all recommendations. In the long run, the goal of any fertility recommendation based on a soil test should be to obtain a profitable yield while maintaining the fertility status of the soil.

Animal and other organic wastes have long been applied to the land. Some improvement in utilization of these products might be made, but the impact of such an improvement on U.S. farm input and output figures will be negligible. With current livestock prices and trends in consumer preference, there appears to be little chance that livestock numbers and the waste they produce will increase significantly.

There is ever-increasing interest on the part of the society to recycle and utilize by-products. Some of those products have been shown to be valuable resources for agricultural land under the right circumstances. Because of the cost associated with their disposal, however, manufacturers are usually willing to provide them to agriculture at a reduced cost or, in some cases, at no cost to avoid the disposal fee.

In addition to utilization of "wastes," some have also suggested the use of biological controls and additives. Commercial agriculture has long used this technique, as evidenced by the continued selection process to achieve disease resistance for many agronomic crops. Similarly, N derived from symbiotic biological fixation by legumes has long been recognized and credited. However, that process is only an economical credit when one grows the legume for the seed or forage produced. It has not been economical to grow the legume just for the N, particularly in areas of the country where growing crops occupy the land during a large part of the growing season, thus leaving little time for legume growth.

Alternative Crops

In order to be economically sustainable, agriculture must produce a marketable product at a lower cost than the market is willing to pay. This idea has prompted many to suggest that we consider producing alternative crops, new crops that can replace those currently grown.

In order for a new crop to provide much relief to the agricultural economy, it must provide a product that will replace a nonrenewable resource. For example, a crop that could replace a substantial amount of imported petroleum would have a tremendous impact on the agricultural economy. Governmental policies and economic realities will determine the extent to which such crops will be grown in the future.

Misinterpretations of Sustainable Agriculture

A new term proposed along with sustainable agriculture is "thought-intensive agriculture." It means "to think carefully about all available strategies in the farm system that can deal with the problem and create production opportunities." Irrespective of the system selected for the farm operation, one cannot argue with that concept. One method is to plant soybeans within a standing crop of

wheat, barley, or other small grain. This is hardly a new concept: it has been evaluated in Illinois research for at least 15 years. Even though the results have shown that given the right year, it will work well, it has not been widely adopted because of the associated high risk.

The term "regenerative agriculture," is frequently used synonymously with sustainable agriculture. This concept means "the capacity of the natural environment to recover from disturbance." As applied in the present sense, this concept seems to propound a return to the "natural" physical, chemical, and biological conditions of the soil. To deplete present soil nutrient levels to their native state, inactivate current drainage systems, and otherwise work toward returning soil conditions to those in Illinois before farming began, would not only take years, it would also be absurd.

According to Robert Rodale (of Rodale Press), farms that have been worn out and abandoned almost always begin to regenerate within a short period of time. Most of these "worn-out" farms have been intensively cropped without replenishing the nutrients, or the productive topsoil has been allowed to erode. While the topsoil cannot be easily replaced, a good fertility management program will rapidly improve the productivity of such land.

We accept the concept of "sustainable" agriculture to the extent that it calls for reasonable and conservative use of agricultural inputs. We do not agree however, with some of the undertones of the movement based upon certain interpretations of this concept.

First, the assumption that American agriculture is incapable of far-ranging change is not true; the changes we have seen in tillage and pest control over the past 20 years would have been considered revolutionary in 1960. As markets have tightened, more attention is given to product quality, alternative uses, and value added technology. Simply put, the idea that agriculture is uncontrollably headed toward disastrous disruption is at odds with the flexibility that the industry has historically shown. Research will continue to guide the necessary changes.

A second problem with the present "sustainable" approach is the failure to recognize the increase in risk associated with many of the changes being encouraged. Much of the "proof" to indicate that such changes are beneficial is anecdotal in nature and does nothing to asses risks, beyond the occasional admission that a particular practice failed. Farmers have never been, and never will be, well served by casually generated "technology." This is not to say that such technology will never work, but rather emphasize that risk aspects are being ignored in the haste to bring change.

Finally, we reject the anti-science bias that characterizes much of the present "sustainable agriculture" movement. This bias is very clearly seen in its opposition to many new technologies and in its

assertions that public researchers do research only to benefit agricultural input suppliers, rather than farmers. It is difficult to imagine how anyone who has had any contact with research and Extension specialists can continue to hold such views, especially, with the present emphasis on the efficiency of production.

In the end, it is only through use properly conducted and properly interpreted research that an individual producer, when faced with new constraints will be able to properly adjust his input to maximize net income.

PROCEEDINGS OF THE EIGHTEENTH

NORTH CENTRAL EXTENSION - INDUSTRY SOIL FERTILITY WORKSHOP

9-10, November 1988, Holiday Inn St. Louis Airport North

Bridgeton, Missouri

Volume 4

Program Chairman:

K. A. Kelling

Department of Soil Science
University of Wisconsin-Madison

CREDITS

The professionalism shown by Ms. Barbara Brown in typing portions of this document and in helping organize its preparation is acknowledged and appreciated.

Department of Soil Science
University of Wisconsin-Madison

and

Potash and Phosphate Institute
2805 Claflin Road
Suite 200
Manhattan, Kansas