SUSTAINABLE AGRICULTURE FOR THE UNITED STATES

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"Sustainable agriculture" for the United States is an agriculture that provides for the health and economic well-being of the American people without compromising the ability of future generations of Americans to do the same. This concept specifies "for the United States" because of the central importance of agriculture to the U.S. economy and the standard of living of the American people. Countries with economies less dependent on agriculture may have different expectations of their agriculture. The United States has the world's largest economy, and agriculture at about 16% of U.S. GNP is the largest industry in the United States. The reference to "health and economic well-being of the American people" includes American farmers and agricultural communities as well as the American citizenry more generally, who currently spend, on average, about 11% of their income for food. Sustainable agriculture includes sustainable processing and distribution as well as the sustainable production of food, fiber, and other plant and animal products.

Sustainable agriculture for the United States can also be defined to include a sustained capacity of the nation to provide 1) affordable, wholesome, safe food for domestic use; 2) renewable alternatives for industrial products currently produced from petrochemical and other nonrenewable resources; 3) a strong positive balance of payments in world markets for raw agricultural commodities and value-added agricultural products; 4) an environment with clean air and water; and 5) protection of the soil, water, genetic, and other natural resources upon which agriculture depends. Failure of any one of these provision would gradually if not rapidly affect the ability of American agriculture to assure the health and economic well-being of present and/or future generations of American people.

Ideally, crops should be sufficiently healthy to take full advantage of the inputs and produce optimally near or at the physical limits that define the site and year. A crop that, because of diseases or pests, produces at some fraction of its attainable yield or quality as determined by the physical limits of the environment and fertilizer and irrigation inputs is not only inefficient, such crops waste water, leave fertilizer unused in the soil, and return less organic matter to the soil. Soil fumigation has not only been profitable as a tool for disease and pest management on certain high-value horticultural crops, these treatments have also redefined our concept of a healthy crop by revealing the enormous toll extracted by pests and diseases, especially root diseases of crops otherwise considered as "healthy." The goal of plant disease and pest management in sustainable agriculture is to assure that the yield and quality of each crop is near or at the genetic potential optimized within the limits set by uncontrollable variables such as climate, weather, growing degree days, sunshine and/or carbon dioxide for photosynthesis, available water, or other physical constraint imposed on the crop.

Agriculture needs to consider a proactive role in overcoming the myth that farming and ecosystem management are in conflict. Toward this end, sustainable agriculture should be expected to provide for certain ecosystem functions beneficial to the environment or society while allowing the grower to profitably produce food and other plant and animal products--a win win strategy. "Positive ecosystem functions" includes providing habitat for wildlife, capturing carbon dioxide as stored organic carbon in soil, and purification of surface-water resources, as examples, and depending on the crop or cropping system. The adoption of "no-till" systems for the dryland cereal-based agriculture in the semiarid Pacific Northwest is such a win win example: The costs of production are reduced because planting, fertilization, and even some herbicide applications are done with a single piece of equipment as one pass; the yield potential is increased because of water saved for the crop; soil organic matter is increased and erosion is decreased because of less tillage; water that runs off the fields into streams is clean compared with water than runs off of tilled fields; and the stubble left standing provides habitat for birds and other wildlife. The challenge for these systems has been how to control the weeds and soilborne pathogens without tillage (not unlike the challenge of how to control these same kinds of pests without methyl bromide), especially since these systems typically also involve little or no crop rotation. These challenges are now being met with great success for no-till dryland cereals, demonstrating that through science and engineering, agriculture can achieve the high yields possible within physical limits of a system while enhancing the natural resource base and providing other positive ecosystem functions on the road to greater sustainability.

Agriculture is already unquestionably the most sophisticated example of ecosystem management, but sustainable agriculture depends on even more sophisticated ecosystem management systems. Achieving these idealized goals requires that U.S. agriculture shift from a resource-based to a knowledge-based enterprise. Acquiring and sharing this knowledge depends on research and education.