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The Next Generation of Agricultural Research

Productivity of the major food crops has plateaued. Yields of wheat, maize, sorghum, soybeans, and potatoes in the United States have not increased since 1970. This is true of maize, potatoes, wheat, and cassava in Latin America. World grain yields have declined. Increased production has been achieved largely by cropping more land.

This phenomenon needs careful analysis. Farm yields rose rapidly in the United States following World War II. These were accompanied by technologies requiring massive inputs of fossil energy channeled to the farm as fertilizer, pesticides, irrigation, mechanization, and new seeds. Greater production efficiency was the goal. The result was plentiful food at low cost. All of these external inputs, with the possible exception of genetic improvements, are becoming increasingly costly, subject to more constraints, and less available. Some come from nonrenewable resources. Meanwhile, soil erosion continues unabated nationally and globally. After 40 years of a U.S. soil conservation program no more than 25 percent of our farmlands are under approved conservation practices. Topsoil continues to be lost at an enormous rate. Soil organic matter is being reduced. There is greater compaction from excess and untimely tillage. Air pollution is becoming more severe. Additional land areas brought into cultivation may be less productive. With increasingly greater pressures on the productive land resource base, the options for use of water, fertilizer, pesticides, and mechanization become progressively less.

Some would credit the recent plateauing of crop yields to adverse and fluctuating climate and weather. Season-to-season variations, however, are far more significant than any identifiable long-term trends. Regulatory and financial constraints on the use of labor, chemicals, water, and energy are increasingly costly and stifle production. Finally, there has been a 12-year erosion of the federal investment in agricultural research, not only in manpower but in new equipment and facilities. Enrollments in the colleges of agriculture in the land-grant universities have tripled in 10 years with little if any increase in faculty. Scientist years in support of agricultural research have not changed since 1966. Teaching needs had to be met. Research was left behind.

This brings us to the next generation of agricultural research. There are technologies that will result in stable food and fiber production at high levels, are nonpolluting, will add to rather than diminish the earth's resources, be sparing of capital, management, and nonrenewable resources, and are scale neutral. The time strategy, however, requires more than a 3- to 5-year plan. These technologies depend on mission-oriented basic research relating to the biological processes that control and now limit crop and livestock productivity. It is research that will address the problems of enabling plants and animals to more effectively utilize present environmental resources, through (i) greater photosynthetic efficiency; (ii) improved biological nitrogen fixation; (iii) new techniques for genetic improvement; (iv) more efficient nutrient and water uptake and utilization, and reduced losses of nitrogen fertilizer from nitrification and denitrification; and (v) more resistance to competing biological systems and environmental stresses. These are the areas identified in recent National Academy of Sciences–National Research Council reports and elsewhere as grossly underfunded; where we no longer exercise world leadership, and where the United States with its vast human, financial, and natural resources could make its greatest contribution to the agricultural development of Third World nations. Such technologies would be economically, socially, and ecologically sound. They could ease the inevitable transition we must make from nonrenewable to renewable resources. We must address ourselves to them.—S. H. WITTWER, *Director, Michigan State University Agricultural Experiment Station, East Lansing 48824*

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