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VIA FAX 525/954-1059

Dear Norma:

As you know, I asked you some time ago to serve on the Executive Advisory Committee for the *Encyclopedia of Agricultural Sciences* which is being published by Academic Press. As editor-in-chief of the encyclopedia, I was hoping that you would be willing to author a foreword for the 4-volume work. To make that chore less of a burden on you, my editorial assistant has drafted a foreword for you to review. She derived most of it from an essay you published in a book entitled *Future Dimensions of World Food and Population*, published by Westview Press in 1981. Please feel free to modify that draft in any way you see fit, or to write the foreword yourself. I would be pleased to be able to have any remarks you might want to say published in the encyclopedia.

Since the encyclopedia will go to press on May 1, it is extremely important that I have your approval or changes on the foreword draft, or any new remarks in advance of that date. I realize that it is not much time. If you don't want to participate in this project by having the foreword, please let me know and we will turn to someone else.

Thank you for supporting the encyclopedia project as a member of the Executive Advisory Committee. I believe the work will have a number of excellent articles and be useful to students and others both in this country and internationally, although it can hardly be said to cover the entire field of the

agricultural sciences in four volumes. Since this is the first encyclopedia to broadly cover agriculture, I hope it will provide a good base for others to build on in the future.

Please give a call if you want to discuss this. All the best.

Sincerely yours,

Charles J. Arntzen, Ph. D.
Professor, Biochemistry and Biophysics

CJA:js

FOREWORD

The *Encyclopedia of Agricultural Sciences* takes as its subject the set of activities which are probably the world's most important endeavor. About half the total world population is engaged in agriculture and animal husbandry, although this percentage varies greatly from country to country. In the United States for example, less than two percent of the people are engaged in agriculture -- yet they produce food for the entire population an din addition a vast amount for export. Contrast this to developing countries where 70-90 percent of the population is engaged in subsistence agriculture. Where in developing or developed countries, the food that these millions of people are striving to produce has biological importance, economic worth and political value. The significance of food for simple biological survival is self-evident. Nevertheless, in the affluent nations most people take food abundance for granted while in the proportions in years when crops are poor. The economic worth of food is variable according to location and time. In food abundant countries, families spend a relatively small proportion of their income for food, whereas in developing nations spending 70 to 75 percent to of income is not uncommon even when harvests are good. The political value of food goes far beyond its monetary value. For example, government policy related to food pricing is often used to pacify urban consumers. Large food surpluses in the food-exporting nations serve as tools of international influence. Governments may also use food production policy in support of political ideology, as we saw in the centrally-planned socialist nations of Eastern Europe and the former Soviet Union. Because food is a biological necessity, meeting the world's food needs is vital to civilization's survival. But because food production is also an integral part of economic and political systems, meeting world food needs becomes a highly

complex problem in which the sciences can play only a partial role, albeit an extremely significant one.

The status of agriculture varies enormously between developed nations and food-deficit nations. A key difference are the resources dedicated to the agricultural sciences. Agricultural science and research is largely a 20th century phenomenon. For most of their existence, humans survived as wild plant gatherers and hunters. Although deliberate plant raising and animal husbandry began about 10,000-12,000 years ago, formal agricultural education or research did not occur until the end of the 18th century in Europe. Perhaps the most important date in the history of agricultural science is 1862, when the U.S. Congress created the Department of Agriculture and provided for colleges of agriculture in each state. This started a worldwide research and extension movement which literally took scientific advances to the farms and fields. The agricultural sciences can thus be credited with providing the basis for the stable, abundant, safe, wholesome and nutritious food supply available in developed nations today. Yet, in the midst of continuing scientific advances, farmers in many parts of the world use methods not far removed from those of a hundred, or even a thousand years ago. In some countries, fragile economic, political and social systems, as much as the need for scientific development and agricultural education, have kept food security an unrealized goal.

The traditional agriculture of developing nations has several characteristics that greatly restrict world food production. Soil infertility is the joint effect of natural weathering followed by leaching and combined with extractive farming practices. The traditional crop varieties used in the countries have low genetic yield potential. Poor agronomic practices, such as giving little attention to conserving moisture, using irrigation efficiently or lack of week control also inhibit productivity. Inadequate or nonexistent control of diseases and insects subjects

farmers to severe crop losses. A lack of production inputs such as seeds of improved crop varieties and fertilizers further restricts productivity. Appropriate government economic policies affecting agriculture may not be in place, and weak research and extension programs, due to lack of trained personnel, make it difficult to move from traditional agriculture to modern agriculture. IF the world is to be fed, it will be necessary to transform much of the traditional low-yield, subsistence agriculture. This will require development and application of appropriate technology, based on research. The agricultural sciences, through efforts such as the development of drought-resistant crop varieties, refinement of integrated pest management systems and improved farm technologies, must make a major contribution to this transformation.

The articles in the *Encyclopedia of Agricultural Sciences* describe the current state of knowledge and potential new developments related to a wide rage of specific subjects. In doing so, many of these articles also touch on or are related to environmental issues which have become a major socio-political factor influencing agricultural science today. The production of food, fiber, and forest products, as well as the indirect noncommercial benefits such as watershed protection, aesthetics, wildlife and recreation, involves the complex issues of land use in the broadest sense. It is claimed by some individuals and groups, especially in developed countries, that agriculture consumes too much energy, employs too many chemicals, pollutes the environment unnecessarily and endangers many species of wildlife.

What often fails to be understood in arguments over environmental issues is the limitation of the natural resource base for food production. Much of the world's land is desert or wasteland, of little value for agriculture and animal husbandry. In land reform programs around the world, I have seen peasant farmers being allocated land that is incapable of producing food for their families. In the

developed countries, large areas of valuable agricultural land are being removed from agricultural use and converted to industrial and residential sites. While the energy use required for mechanized farming and chemical fertilizer production are criticized, the alternatives of returning to labor-intensive farming and use of draught animals in the developed world, or of abandoning the mined-out, tired soils of the developing world seems unlikely. I would look instead to the agricultural sciences to develop means of reducing energy use and of someday succeeding in developing effective nitrogen-fixing properties in the roots of plants to supply a large portion of the nitrogen fertilizer required to produce high yields. The use of chemicals to protect agricultural crops and forests from disease, insects and other pests has also become a cause of public concern. Yet very few people comprehend the difficulty of pest control, given the taxonomic diversity and genetic variability and instability in the disease pathogens and insects and other pest species that continue to threaten crop and forest production. My personal experience, as well as that of many other scientists, indicates clearly that keeping crop losses from diseases and pests at acceptable economic levels requires utilization of a package of integrated control practices. Those practices may include choice of well-adapted crops, use of disease- and insect-resistant strains, improved cultural practices, biologic control, and proper use of insecticides, fungicides and herbicides. The agricultural sciences will have the key role in developing solutions to environmental problems and dealing with issues raised by the pubic. This work will enable us to better understand the complexities of ecosystems and overcome the many difficulties encountered by industry, agriculture and forestry in taking action to improve the environment while still maintaining food and fiber production.

Involvement in food production necessitates a concern not only about the land base upon which we depend, but the number of people that land base must feed. If human population growth rate continues at its present rates, food and fiber

production over the next several decades must increase at least as much as it as increased in the 12,000 year period from the discovery of agriculture to today. While governments and people attempt to dealing effectively and humanely with population growth issues, we must succeed in increasing the production of the basic necessities to meet growing human needs.

Is agriculture up to this task? I believe it is, providing world governments give high enough priority and continuing support to agriculture, aquaculture and forestry. Equally important will be continuing work to expand our scientific knowledge and improve technology so that our finite land and water resources can be more productive. This encyclopedia, as a means of summarizing, integrating and disseminating knowledge in the agricultural sciences, contributes to that effort.