

COMMITTEE V

The Human Food Chain

Commentary

by

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on

ECOLOGICAL ASPECTS OF THE HUMAN FOOD CHAIN

by

David Pimentel

It is said that if a gun is mentioned on the first page of a novel, it must be used before the end.

The first sentence of this paper nicely sets the stage for an ecologically insightful, well documented account of agricultural production: "Agricultural science could benefit from a holistic or integrated approach." The central thesis is that the fragmentation of agricultural science is creating problems, and that "a major breakthrough in agricultural research will be when this science becomes unified and the many disciplines start working together on the major problems facing agriculture".

It is noteworthy that the title of this paper refers to ecological (rather than agricultural) aspects of the human food chain. The clear message is that the human food chain has to be examined in an ecological rather than technological context. The dictum of ecology is that everything is connected;

hence the necessity of a holistic approach. The author has stated this message eloquently.

The analysis is focussed on crop and livestock production. It begins with the simple assertion that production of crops and livestock for the human food chain is subject to the same principles that have been developed in relation to non-humanized ecological systems. The flow of energy through ecosystems then becomes the basis for comparing the efficiencies of production of humanized and non-humanized food production systems.

Total energy inputs (direct solar and fossil fuels) are given for varying types of corn production systems ranging from slash/burn to man/ox to high technology systems (fertilizers-pesticides-tractors) and to "biculture" involving Leucaena trees (a built-in source of firewood and nitrogenous fertilizer) and corn (food). A case is made that the more intensely Biospheric resources are managed the greater the requirement for energy from fossil fuels and human labor; also that agro-forestry (Leucaena and corn) can be more productive (6 times the energy capture, 3.5 times the biomass production) than corn monoculture.

The use of energy rather than dollars as the basis of an agricultural accounting system is further expanded to include energy costs associated with pesticide production and use, soil erosion and provision of nutritionally balanced diets. The overall conclusion is that "energy accounting can be helpful in identifying areas of research that might lead to the development of technologies that will reduce energy inputs and make agriculture more profitable and more environmentally sustainable".

In my role as a critic of this paper I recognize the immense influence of the author over the past two decades in directing global attention to the ecological and energetic bases of agriculture. He has fired the gun, and accurately. My only criticism is that through a combination of externally imposed and self-imposed limitations he has not shot all six bullets. His holism is good, but not extensive enough.

Other ecological aspects of the human food chain that might have been referred to, even if passingly, are:

1. An enormous amount of evolutionary work has been expended over several billion years in putting us here - in providing the information within human fertilized eggs on how to construct each and every one of us. In this sense, most of the human work that goes into agricultural production systems has been derived from the pre-technology and pre-human Biosphere. This implies an indebtedness to nature of which we are part.
2. The ecosystemic costs of high-technology agriculture are referred to but not adequately discussed or taken into account. The energy and dollar costs of environmental protection agencies are appreciable. More important, what are the deferred costs to human health from our "buy now, pay later" philosophy in regard to toxic industrial chemicals? Is the societal goal "better living through chemistry" or "better chemistry through living"?
3. The unstated assumption in the design of this Committee's program is that human problems can be solved through provision of resources such

as food; but men do not live by food alone. One is reminded of John B. Calhoun's classic experiment in which he provided a population of mice with unlimited supplies of food, water, and fresh air and seemingly unlimited living quarters. Over a period of several years the population increased from an initial few to several thousand and then declined to extinction.

4. It is inevitable that the more we draw on Biospheric resources the greater will be the disruptions to other living communities. Is there an ecosystem ethic in the making comparable to the land ethic described by Aldo Leopold in "Sand County Almanac"? As we move from a free-living species in the Biosphere to a parasitic species on the Biosphere will we not be forced to invest more and more energy in protecting our "host"?
5. Perhaps the most unusual non-holistic aspect of our times is the contrast of bottom-up ecological systems based on energy transfer and political hierarchies based on top-down chains of command. The coming together of the two in an ecosystems approach to living is a pressing need that cannot be ignored.