BIOETHICS, SURVIVAL AND GLOBAL DRAMA

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Introduction

The role of science and new technologies in shaping and solving environmental problems is of the utmost interest. The new perspective of environment preservation requires the application of new sophisticated techniques in order to remedy the environmental alterations made by humans. Currently, new perspectives in environmental problems are emerging. Major trends in scientific thinking are:

- maintaining the basic life support systems (land, ecosystems);
- enlarging the range of choices in resource management;
- refinement in methods of risk assessment;
- streamlined methods for monitoring environmental change; and
- increased efforts to examine environments within holistic frameworks.

The health of the land and its associated plants, animals, ecosystems, is basic in understanding the interactions that affect the net ability of the land to support life. We do not know and we do not have fully adequate means to estimate the capacity of land areas to permanently sustain a diverse population of species especially if different chemicals are applied. These may mask long-term deteriorations of the producing base (land). We need more extensive and penetrating studies in the vital capacities and processes by which the cultivated land is maintained or changed.

The trend in handling resource problems is very slowly moving away from single-purpose to multipurpose programs, especially in relation to water and land management. We have to pay more attention to studying complete natural systems and to the use of alternative methods and strategies for managing them. As the risk in this case is expanding, the risks and gains have to be presented to the public prior to decision and policy. In these decisions, usually the cost-benefit analysis is used, but long-term impact on ecosystems and on the quality of life is underestimated and neglected. The divergence is nowhere more extreme than in the realm of energy options where the estimated risks of using coal, solar, or nuclear energy not only divided the experts but provoked strong responses from different publics. Nuclear power is seen by certain citizen groups as carrying threats to life ten times those of other environmental hazards, while the National Research Council (U.S.A.) places the risks to health from nuclear power far lower than coal (see reference). It is evident today that the method of risk assessment and interpreting the result should be scientifically improved, and wider ranging investigations are needed.

Judgment about what occurs in natural systems depends considerably on the measure of accuracy and the scope of monitoring observations. The task of monitoring rests partly on improving basic knowledge of the systems, partly on improved instrumentation, and partly on innovative methods of using small bits of data to describe large systems. Major advances in electronics and integrated systems offer new approaches to environmental problems.

Genetic Engineering as a Choice for Preserving the Bio-Environment

Major problems facing the world require scientific research and development of new technology. Preserving and cleaning the environment will require extensive research from the very basics to the most highly developed. Major technological innovations require, however, many distinct investigations – findings or innovations – for their success. Since these component inventions or research findings come from a variety of unrelated fields, we need productive international research cooperation in order to advance complete technology for the preservation of the environment and in relation to the world nutrition. The attempts to solve these problems would require an acceleration of the development and application in low-income countries of a broad spectrum of new technologies based on advances in the biological, physical, social and psychological) sciences.

It may be instructive to consider the spectrum of research which is invoked, essential to progress in dealing with bio-preservation and harvest improvement. The examples I shall emphasize are primarily biological, but there are parallel requirements in the psychological sciences, where efforts must be made to learn the aspirations of people, how best to organize services, and what policy changes would be beneficial.

In addition to industrial pollution, the major contamination of the environment, especially of the land, is coming from the application of

agricultural chemicals: generally mutagenic and carcinogenic, which raises very important residue problems. The use of chemicals such as herbicides, fungicides, insecticides, and fertilizers improves plant productivity and growth, but these chemicals are polluting water and impoverishing long-term productivity of the land under cultivation.

The preservation of cultivated land is very closely correlated with concerns about feeding the rapidly increasing world population. With facts that land areas suitable for agriculture are finite and partly very polluted, meeting food demands over the next century must be based on preserving and raising the productivity of land already under cultivation. That is a global challenge. The new plant growth regulators, composite plants and new plant varieties, better land and plant productivity, are expected by some, to offer the best approach to preserving the environment.

Our new approaches to the preservation of the environment, based on new biological knowledge and technologies, are likely to emerge in the next ten to twenty years. Genetic engineering, in my opinion, is at present one of the best methods for saving the environment and increasing world food production. With genetic engineering, it will be possible to accelerate plant breeding and confer traits such as resistance to insects, fungi, bacteria, viruses and nematodes. The results will be decreased dependence on agricultural chemicals and increased emphasis on disease prevention and preservation of the bio-environment. The key event is the ability of the soil bacterium called agrobacterium tumefaciens, to act like a mini-hypodermic needle, carrying specific foreign genes which, integrated into the plant cells' genome, would become part of the plant's own genetic make-up and remain in the plant from generation to generation. The increased tolerance in the plant would enhance productivity on existing farm land and enable poorer land to be cultivated for the first time. Controlling a plant's protein synthesis and storage system could lead to the improvement of nutritional quality of seed grains. This may significantly affect nutrition in developing countries. By controlling the function of the plant's growth regulatory genes, planting and harvesting cycles can be altered, permitting growth of more than one crop without applying agricultural chemicals. Hybridizing major crops, such as wheat, soybeans, and rice will result in hybrid vigor that could increase world crop yields enormously.

Ultimately, through genetic engineering, plants may even be led to produce raw materials for the chemical industry such as latex from rubber plants, oil from palms, starch from corn and other crops, sugar from sugar cane, cellulose and lignin from trees. All of these principal chemicals derive from agriculture.

Genetically engineered soil bacteria to enhance crop yields are another approach to preserving the bio-environment from further chemical pollution. Nitrogen fixing bacteria that invade the plant roots, will be urged to convert atmospheric nitrogen to ammonia and thus reduce the need for fertilizers. Genetically engineered soil microbes that produce specific pesticide chemicals could be introduced within the next 10 years. Such genetically programed microbes and viruses could provide a significant advantage to disease prevention and the preservation and cleaning of the bio-environment.

It is evident that a great variety of environmental problems have international implications. The global perspective is gaining rapidly in scientific work in at least two environmental sectors. One is the accelerated networking of scientific experience in coping with environmental deterioration through more concerted efforts to exchange available knowledge and to stimulate new research into fields such as deterioration, pollution prevention and preservation of the bio-environment. The second is acknowledgment that, during the past decade, a few environmental alterations may have brought about a change in the global systems, a convention for the protection of endangered species on a world-scale, and a bank of plants' and animals' genes, preserving unique genetic resources.

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