Commentary

Tilting at windmills?

by **Dennis Schroeder**

For many years, there have been small numbers of advocates of certain "low level" technologies as being particularly appropriate for use in the less industrialized countries of the world. Meanwhile in the highly industrialized countries, a patter" of development has evolved based on the innovations of modern "high technology" supported by the cost-benefit analyses of modern economics. Application of this approach has generally been considered by most development experts to be the best solution to the problems of poorer countries if only these countries possessed the proper infrastructure..

But a growing series of crises in the industrialized countries — energy shortages, economic stagnation, environmental degradation, urban decay, increasing crime — seriously calls into question the appropriateness for rich *or* poor countries of a technology that is based on manipulation of poorly understood ecological and social systems and an economic analysis that exaggerates or invents economic benefits, while discounting or ignoring environmental or social costs.

As a result of these crises there is a reawakening of interest in the possibilities of adapting some of those nearly-forgotten "low level" technologies for use not just in poor countries but in the highly industrialized countries as well.

This is particularly true in the case of energy consumption, where much of modern technology is based on a" extravagant and wasteful use of non-renewable resources. Now that the era of cheap and plentiful oil is rapidly drawing to a close and concern is mounting about the grave dangers of a headlong rush to nuclear energy, there is growing interest in obtaining renewable, non-polluting energy from sources such as the sun, the wind, and wastes.

This interest was very much in evidence at the first annual meeting of the Solar Energy Society of Canada, held in Ottawa in June. The conference was attended by nearly 400 people, including architects, engineers, government officials, officials from power companies and manufacturing industries, academics, and other interested or concerned individuals, some of whom have already built solar heated houses.

While not all forms of solar technology are necessarily simple or unsophisticated-something that became clear from some of the very complex schemes described during the conference-it was also clear that economically and technically viable energy-getting systems have long existed but have been virtually ignored as long as petroleum has been predominant as an energy source. Commented one high federal government official, "Solar and wind energy are so obvious that people feel there must be something wrong with them."

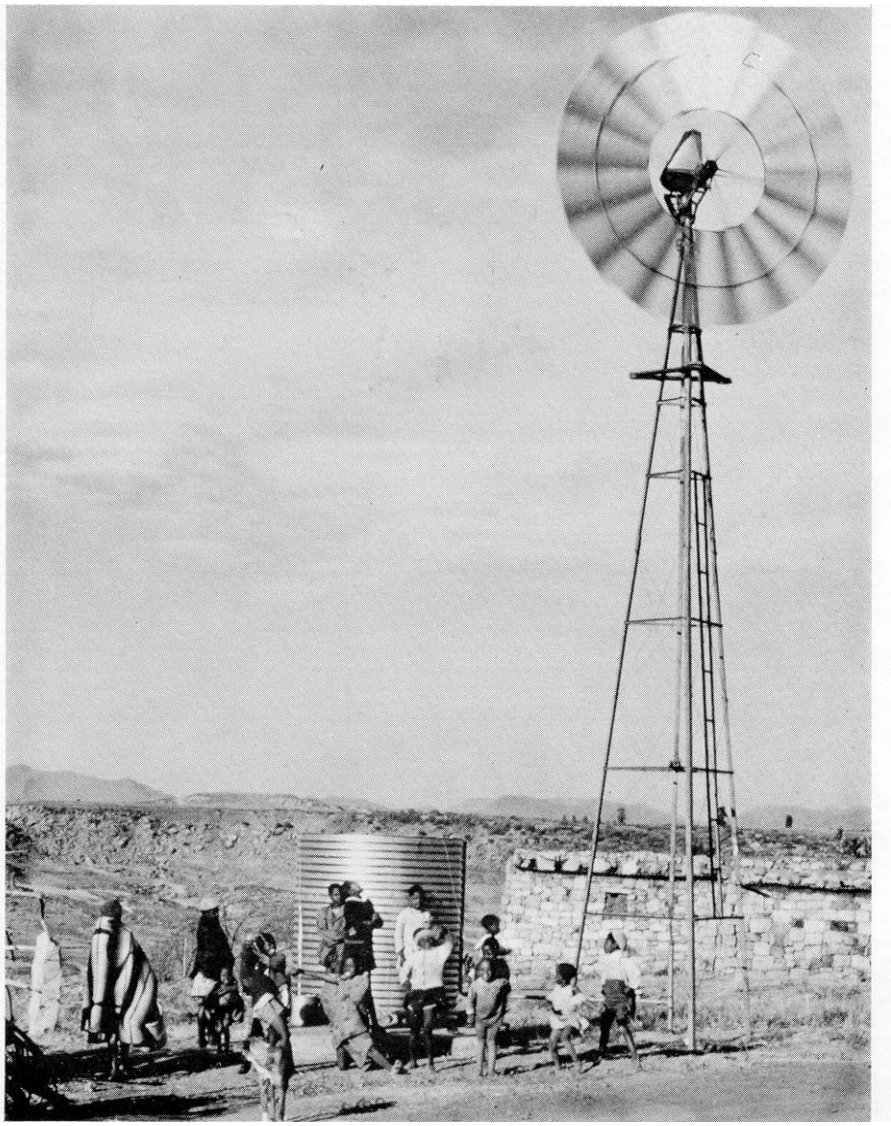
Much of the discussion dealt, not surprisingly, with solar and other renewable sources of energy as they relate to present and future Canadian needs. But numerous references were also made to the Third World, giving one the impression that there is a growing awareness among Canadians that solutions to world problems such as energy and food shortages, overpopulation, overconsumption, pollution and waste, must apply equally everywhere: certain privileged societies can no longer hoard their riches and large sectors of humanity can no longer be discriminated against blatantly. For example, one speaker pointed out that, at present levels of energy consumption, a North American baby will grow up to be 500 times as expensive as a" India" baby.

While there is no indication that a major shift to solar and other related energy forms is imminent, the implications of such a shift reach far beyond a simple change in technologies. These forms of energy are available everywhere and their most efficient use in terms of energy costs is probably on a comparatively small scale at the local level, thus avoiding the high cost of long distance transmission. This could result in significant alterations in the lifestyle that accompanies present patterns of energy consumption. For example, there would likely be a greater decentralization in the control and use of energy, and less highly concentrated forms of human settlement might become more common. Moreover, solar energy technology, not lending itself particularly well to mass production techniques, is less likely than other forms of energy production to fall into the control of a few large multinational corporations. Thus, there could be a far greater degree of local self-sufficiency in supplying basic needs of people.

This has in fact long been the case in many parts of the Third World; now the task of developing and implementing environmentally appropriate technologies and lifestyles must be shared by societies at all levels of technological sophistication. Knowledge and wisdom accumulated during centuries of 'trial-and-error' experimendation, as well as the deductive methods of modern science, all must be used in this process.

Nowhere is the need for a change in our attitudes toward nature as reflected in our technologies more obvious than in agriculture, one of the most important of human activities and our principal link to the ecosystem. In many industrialized countries, there have been remarkable increases in agricultural productivity during the twentieth century, but they have bee" accompanied by hidden costs that are only now becoming more apparent. Agriculture has become increasingly energy-intensive and has caused extensive environmental disruption as it has come to be regarded as a commercial industry and inappropriate industrial methods have been applied to it,

New and more powerful machinery has been developed and farms have been enlarged and redesigned to accommodate the changes. This has facilitated the development of monoculture-the raising of single crops in the interests of economies of scale -covering whole regions. Another development has been hybridization, no longer primarily for disease resistance or nutritional value, but for high yields and, in the case of fruit and vegetables, for appearance and ability to withstand long-distance transportation. One result has bee" a decline in the size of plant gene pools which, together with the practice of monoculture, has made plants more vulnerable to predators. This has bee" compensated for by heavy usage of chemical pesticides, insecticides, herbicides, and fungicides, while greatly



increased applications of synthetic fertilizers have been needed to maintain high yields. This, in turn, has led to problems of soil leaching and pollution of ground water. Examples of high energy costs and environmental damage can also be seen in other modern agricultural practices such as livestock feeding and raising techniques.

Traditional agriculture in less industrialized countries has generally been much more energy-efficient, While Canadian agriculture now uses an average of five BTUs of fossil fuel energy to produce one BTU of food energy (nearly a five-fold increase since 1910), Chinese wet rice agriculture produces about 53 BTUs of food energy for each BTU of human energy input. Unfortunately, inappropriate industrial agricultural technology has been transferred to many tropical regions and resulted in more severe problems of social dislocation and ecological damage than have taken place in temperate zones, and food shortages have not been overcome. It does not necessarily follow, of course, that traditional agricultural methods are superior. For example, overcultivation and overgrazing have led to a depletion of soil nutrients and to erosion and the spread of deserts in some areas.

Thus, in countries such as Canada, there is a need to revive a number of agricultural practices that have been largely phased out, such as the use of animal manure, the decentralization of feedlot operations, a switch from monoculture to mixed farming, crop rotation, and the growing of nitrogen fixing crops.

Beyond this, however, signs of a new development option are emerging. As an alternative to increasingly centralized social and economic systerns addicted to growth for its own sake and relying on technological advances that require people's lifestyles to be adjusted to them rather than vice versa, there is a possibility of evolving smaller, less centralized, more self-sufficient communities that exist as part of an integrated, mutually-supportive ecological system. This does not imply a return to some nonexistent golden age of the past. Much valuable knowledge has been accumulated that did not exist in the past; it is a faulty perception of our relationship to nature that has led to its misapplication. The newly-evolving communities, whether they are in currently rich or poor countries, could continue the process of research and exchange of information, in effect decentralizing these functions as well and involving more non-'experts' in them.

One of the most promising approaches in this area is ecosystem farming: the development of artificial systems that imitate those found in nature. A number of small groups in North America and Europe have been attempting to develop ecosystem farms. One such group is the New Alchemy Institute in the United States. It has been successful in integrating vegetable gardens, worms, insects, bees, fish, animals and humans into a small self-sustaining system. It is also planning to develop a complex known as the "Ark," consisting of greenhouse, aquaculture, and other living components powered by the sun and the wind, in Prince Edward Island. Many of these small groups have been inspired by the polyculture economies that have long existed in Third World countries. For example, in Southeast Asia, there are polyculture farms that integrate vegetables, fish, and livestock into one system.

There are many other examples of agricultural research that could be mentioned and there are other areas — such as transportation — where much more research into the use of renewable energy sources and environmentally appropriate technology is needed. But the important point is that nature is composed of complex, interrelated systems, and scientific research must help us to understand those systems and relationships more clearly. Our technology, must be redirected to organize our productive activities and restructure our lifestyles so they are in harmony with those systems. In this respect, no societies are fully "developed" or "underdeveloped"; we are all in the process of developing human systems that are either moving closer to or farther away from a symbiotic relationship with other life systems in nature.

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