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Sustainable Agricultural Development: Issues, Problems, and Solutions

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SUSTAINABLE AGRICULTURAL DEVELOPMENT: ISSUES, PROBLEMS, AND SOLUTIONS

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WHAT ARE THE ISSUES?

Perhaps the most critical sustainability issue in the agricultural development of developing countries is the prevention of unsustainable land use, wherein the central issue is the conversion of land use from perennial crops to annual crops. This conversion happens at both ends of the rainfall regime. At the wet end, tropical forest gets converted into annual crops, such as corn. At the dry end, perennial grasses get converted into annual crops, such as millets and sorghums. The main reason why this conversion is bad is that in the wetter areas where the topography is not flat, the very high rainfall, often combined with erosive soils, results in massive sheet and gully erosion and destruction of the land resource. At the dry end, the low total rainfall, usually concentrated into heavy bursts of rain over short periods of time, means that with the conversion to annual crops there is danger of substantial wind and even water erosion. At both the wet and the dry margins, it is important to keep perennials on the land.

The second critical issue is one of preserving biodiversity. Although one can find ways of increasing the intensity of the use of natural areas, the critical issue in preserving biodiversity is to keep some areas of land in a purely natural state. There will, of course, be the continual creation of new biological materials and the destruction of old materials, but that process should proceed slowly and leave a highly diverse circumstance. We want bio-diversity because of its importance to the improvement of commercial crops as well as for its intrinsic value. As species ourselves, we are reluctant to see the destruction of other species. Since the issue is one of preserving land in a low intensity of use, other ways must be found to raise the incomes of the people who would naturally intrude into such areas. In addition, because this particular land use may provide smaller short-run returns, the question arises of how large an area should be preserved in a natural state. A related issue is who should pay for

the maintenance of this bio-diversity if the optimal global solution results in a disproportionate part of the burden being borne by a few relatively low-income countries.

The third issue is one of preventing land degradation. It is an issue both of adoption of unsuitable land uses, and of cropping carried out at so intensive a level that it continually extracts nutrients from the land without any means of replacing them. There are vast areas in the world supporting large numbers of people where the land has become highly degraded through many centuries, and even aeons. This raises the question, "should the productivity of this land not be increased through its rejuvenation by the addition of nutrients, organic matter, and other productive elements?"

Fourth, there is the issue of preventing pollution of the land. Such pollution may arise from excessive fertilization with inorganic chemicals. An important and particularly unhealthy source of pollution is that from human excrement, because low incomes and lack of education prevent more sanitary ways of dealing with this natural problem.

PROBLEMS IN PREVENTING UNSUSTAINABLE AGRICULTURE

Probably all of these processes of land degradation, reduction of bio-diversity, shifts of land into unsustainable uses, and pollution problems, are proceeding more rapidly and destructively in developing countries than in developed countries but there is no evidence that the values of people in developing countries differ from those of developed countries with respect to the sustainability issues. Why then the greater problem of preventing unsustainable agriculture in the developing countries? The difficulties arise from an extraordinarily rapid population growth, massive poverty, low levels of rural infrastructure and low levels of education.

We must continually remember the problem of population growth in developing countries. Rapid population growth is a significant factor in preventing income growth which can lead people to make the investments and follow practices towards more sustainable agriculture. Population growth pushes people out into the marginal lands at both the wet and dry ends of the rainfall regime, bringing about unsustainable land use. Population pressure is destroying bio-diversity through the clearing of natural areas. Population growth, because of poverty and lack of development, causes land degradation. Not to be neglected is

the increasing human pollution.

There seems to be no short-run solution to the problem of population growth. In the long run, economic growth, at least where it is broadly participatory, brings about diminution of desire for large families and gradual institution of family planning. Hence, population growth rates gradually decline. Education and integration of rural people into the larger economy greatly accelerate these processes. In the meantime, however, there is increasing population pressure. This means that any necessary decreases in intensity of land use and increase in the populations to be supported on the land must be matched by large increases in intensity on much of the land base. One of the critical issues with respect to sustainable agriculture in developing countries is which land will be suitable for massive increases in production intensity with high productivity to inputs, and which land can be used in a more extensive way.

Massive poverty in rural areas of developing countries is a grossly underrated source of unsustainable agricultural production. There are about a billion people in the world, essentially all in developing countries, who do not have adequate caloric intake for a reasonably healthy and active life. Amongst many unfortunate effects, such massive poverty pushes people into shifting cultivation and accounts for a substantial proportion of the loss of tropical forest. Such poverty also pushes people out further into the marginal, dry areas and out of the valleys and up the hillsides in hill regions, tearing up perennial grasses and bringing unsustainable land use. If our objective is an enhanced environment in rural areas of developing countries, we must tackle the problems of poverty in order to deal with the environmental issues.

Frequently it is observed that building roads in rural areas results in environmental damage. We must search for less damaging and more environmentally sound ways of building roads, but we must also recognize that optimal land uses, from an environmental and sustainable agriculture point of view, often require specialized land uses and producing certain products far in excess of what can be consumed locally. At the same time, those optimal land uses can result in a deficit of production in critical food components. Specialization and trade can bring about improved land use under such circumstances, but requires low transaction costs which are significantly affected by road quality. The hill areas of Nepal are a good example: they

need to grow less of annual crops like maize on the hillsides and more of perennial crops, such as grasses for grazing and trees for its various fruit and nut crops. These products must be then traded with those of an increasingly intensive agriculture in the Terai of Nepal, the flat areas beyond the foothills which can support a more intensive agriculture.

There is too little recognition that environmentally sound practices in the context of agricultural intensification forced by poverty and population growth are complex practices which require substantial education. Farmers in the United States quickly respond to environmental and sustainability needs and the dictate of higher prices of inputs by using their inputs much more carefully - for instance, they apply fertilizer in precisely correct combinations and with precisely correct timing and placement in the soil with the result that there is a much higher proportion of these nutrients going into the plant where the farmer would like them to go, and much less into the water table, where nobody wants them to go.

How do we bring about such improvements in farming practices in developing countries where the extension service may be staffed by people with at best a secondary school education and no real understanding of the science of modern farming, and where farmers have very little education? We all know stories of a brilliant farmer with no formal education, completely illiterate, who seems to grasp these complexities, but that is not the norm. The norm is for a very close relationship between the effectiveness of adoption of conserving techniques and the level of education. This point can be made even more powerfully for integrated pest management, where it is required that very careful population counts be made as well as judgments on the precise timing of the spraying of chemicals.

POLICIES FOR SOLUTION

In the developing country context of rapid population growth, extreme poverty, poor infrastructure, and low levels of education, we have to ask ourselves what can be done to move more quickly towards sustainable agriculture. Foreign assistance can help in bringing about some reallocation of finances for building infrastructure and education, and in providing the technical assistance necessary to come up with the appropriate technologies for a sustainable agriculture carried out under the necessarily increasingly intensive

conditions.

The critical element is sustainable growth through improved technology which increases the productivity of all resources, allowing those which may be polluting, but which counter degradation, to be used more sparingly and productively. Agricultural and economic growth which can finance infrastructure and education in rural areas is necessary to increase specialization so that we can have more nearly optimal land uses.

There are three basic sources of such agricultural growth. First, a set of institutional developments which facilitate technological change is needed. Included in this set will be research systems to provide optimal agricultural systems; extension programs to carry the word to the farmers; input distribution systems with adequate education systems so that farmers can afford the right mix of the various purchased inputs. Second, massive investment in infrastructure is also needed for the reasons indicated above. Finally, there must be substantial investments in education.

Rising incomes and trade allow adaptation to varying land use needs. As people's incomes rise, they diversify their consumption patterns away from monocultures, usually annual crops, and increasingly towards livestock and perennial grasses as well as towards various tree crops producing fruits and nuts. The tendency to spend increased income on these items, which allow a more varied and hence more effective land use, is high amongst poor people.

International trade can be helpful in this process. There are vast areas in the tropics which should be devoted to perennial trees, providing a level of output far beyond local consumption and which could be traded with temperate-latitude countries which have a surplus of land which can be effectively used in producing annual food crops.

Finally, we must recognize that the world debt crisis, arising from the past tendency of rich countries and their Bankers, to dispense vast sums of money for quite unproductive uses, is highly destructive of the environment. It keeps people in poverty, prevents the two-way trade which can give better land use, and slows down the demographic transition.

Thus, we face a problem in developing countries of widespread unsustainable land degradation, and significant

pollution arising from poverty, population growth, lack of physical resources, and ignorance. People in the developed countries have a stake in slowing these unsustainable processes. Not only must they diagnose and understand these processes, but they must also recognize the extent to which these differ from their own conditions. Furthermore, they must recognize there is a price to be paid in slowing down unsustainable processes and they must be part of the process of paying that price.