



# Alternative Patterns of Development for the Agricultural Sector

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ALTERNATIVE PATTERNS OF DEVELOPMENT  
FOR THE AGRICULTURAL SECTOR

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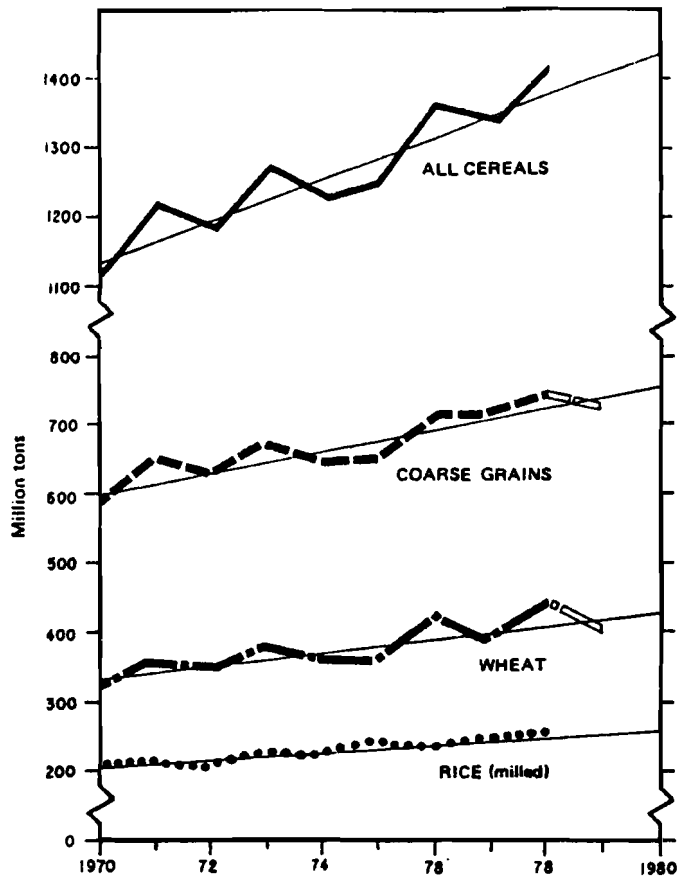


## Introduction

The benefits of the modern technological and industrial developments and the unprecedented postwar expansion in world economic activities benefited all nations, but the benefits, unfortunately, were very unevenly distributed among various countries, depending on many different factors, including the then stages of development of individual countries. This, plus the fact that the developing countries had a far larger population growth than the developed countries, both in absolute and percentage terms, have made the gap between the rich and the poor nations progressively wider. The latest demographic data, however, is cautiously encouraging. Current evidence indicates that since about 1965, the population growth rate has started to decline for the first time during the last 250 years on a global level in each continent. For example, during the period 1950-1965, decline in fertility in Latin America as a whole was negligible and only by 2 percent in all of Asia. In contrast, fertility rates have started to decline significantly during the post-1965 era in countries as diverse as Brazil, China, Colombia, Egypt, Indonesia, Malayasia, Mexico, The Philippines, Tunisia, Turkey and Morocco.

A major consequence of the unequal growth has been the lack of availability of nutritious food to a significant portion of the world's citizens. The production of cereals, while increasing continually (Figure 1) have not kept pace with population growth. Overall cereal import demand in recent months has increased substantially above expectations, and this combined with continuing inflationary pressures has contributed to the increase in grain prices as shown in Figure 2 (FAO, 1979).

Food is just one aspect of basic human needs, which according to ILO (1976) include two elements: "First, they include certain minimum requirements of a family for private consumption: adequate food, shelter



WORLD CEREAL PRODUCTION  
(Actual and 1960-77 Trend)

Figure 1

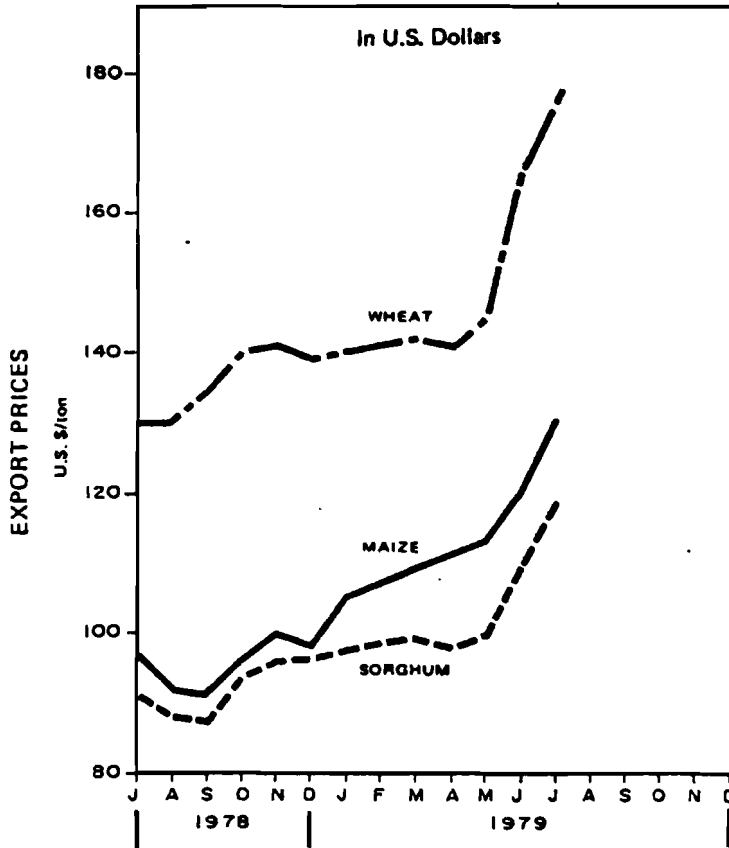


Figure 2



and clothing, as well as certain household equipment and furniture. Second, they include essential services provided by and for the community at large, such as safe drinking water, sanitation, public transport and health, educational and cultural facilities." These goals should be satisfied, according to ILO, by the year 2000, or within one generation. If these goals are to be achieved, there is a need to change the patterns of growth, including our present modes of use of natural resources.

#### Alternative Development

There is a common tendency to accept the fact that there are three basic types of development process which are based on capitalist, socialist or dictatorial methods of governments. While this may be correct at broad conceptual level, very few countries follow the identical development process irrespective of which "label" we decide to attach to them. This is due to a variety of social, cultural, institutional and historical reasons. Thus, the development process pursued by the United States differs from those followed by England or Sweden and that of the Soviet Union is not identical with those of China or Yugoslavia. Each differs from the other in distinctive ways.

Alternative patterns of development does not mean that we scrap the present development process, and start with a new one which could conceivably solve all our pressing problems. It is unlikely that we would be able to "design" a new development process which will solve all our ills and that every country will embrace this "miracle" method voluntarily. A quick study of our past history will quickly convince any skeptic that it is not a plausible alternative.

The development processes, however they are defined, have so far not been successful in being neither sufficiently fast nor sufficiently broad based to reduce the numbers of people in absolute poverty throughout the

world. In fact, on the basis of current trends, it is evident that absolute poverty of a significant percentage of mankind will continue to remain a major problem for many decades to come. There is no doubt in our minds that the development strategies of all developing countries must continue to emphasize economic growth with equity for eventual reduction of poverty of all mankind.

Thus we suggest a pragmatic approach to alternative patterns of development: we start with our existing systems, determine which aspects are wrong with them, and then attempt to correct those imbalances. This would not only be a more acceptable approach to most people than a complete revolutionary change of direction, but it would also achieve results much faster than may otherwise be possible. In other words, the emphasis will be to maximize the positive aspects of the existing development processes, and to eliminate or significantly reduce the undesirable elements.

Within this general overall philosophy, we shall attempt to suggest some criteria for alternative patterns of development for the agricultural sector.

#### Agricultural Sector

There is no doubt that we have to increase the world food production on an urgent basis, both to account for increasing number of population anticipated and also to provide for higher levels of affluence. This increase in food productions, however, must take place within a certain overall framework, without which it is highly unlikely that poverty and malnutrition can be reduced. According to Edouard Saouma (1979), Director-General of FAO, the nutritional gap in developing countries in the year 2000 could be equivalent to only 2 percent of current world cereal

production. Thus, given political determination and adequate effort and investment, this gap could be closed. If the gap is not closed, and if the scourge of poverty and malnutrition remains, or even continues to widen, it would continue to remain a major threat to world peace and stability. The situation could be further aggravated by the continued landlessness, joblessness and hopelessness of the rural poor.

Alternative pattern of development in the agricultural sector can be formulated only within an appropriate policy framework, which must have some important criteria that are briefly discussed herein.

1. *Sustainability*--Any strategy for agricultural development must be sustainable on a long-term basis. There is a very real danger that in our efforts to increase food production on a crisis basis, we may adopt strategies that could be self-defeating on the long run. It is possible, if sustainability is not considered, we may find ourselves in a far more precarious situation in the mid- or late 1980s, when the demand for food and other resources will be much higher than it is today, due to both higher population and increased levels of affluence. This could occur since there is a distinct possibility that production from land could level off, or even start to decline, with man's reliance on short-term, ad hoc strategies. History is replete with telling examples of such occurrences from all corners of the earth (M.R. Biswas, 1979).

Let us consider one area alone--horizontal expansion of agriculture. Currently much emphasis is being placed to increase the land available for agricultural production. While this is a viable alternative to solve the world food problem, the investment costs to bring new land under cultivation should not be underestimated. For example, costs of the magnitude of \$ 5,000 to \$ 6,000 per hectare for exclusively gravity irrigation systems are now not exactly uncommon (A.K. Biswas, 1979).

While much emphasis is being placed on horizontal expansion of agriculture, not enough interest is being expressed to prevent the loss of productive land. During the U.N. Conference on Desertification, its Secretary-General Dr. M.K. Tolba (1977) pointed out that between 50,000 to 70,000 km<sup>2</sup> of useful land are going out of production every year (M.R. Biswas, 1978). According to Kovda (1974), the total area of destroyed or degraded soil that was once biologically productive is estimated at 2 billion hectares, a figure that is 33 percent higher than the entire area cultivated for agricultural purposes at present.

Soil loss is an important problem in all countries, whether developed or developing. We shall just consider two countries, one developed--the United States--and the other developing--Egypt.

In the United States, during the last 200 years, at least 30 percent of the topsoil on agricultural land has been lost. The U.S. Department of Agriculture estimated in 1935 that nearly 100 million acres of land had been ruined for agricultural purposes by soil erosion, and 50 to 100 percent of topsoil had been lost in another 100 million acres. Thus, by 1935, some 200 million acres of land were either ruined or seriously affected due to soil erosion. The U.S. Soil Conservation Service estimates that more than 3.2 billion metric tons of soil is lost each year through erosion, from approximately two-thirds of the U.S. land which is privately owned (Council on Environmental Quality, 1973). The Service further estimates that soil loss from cropland adequately treated against erosion averages less than 11 metric tons/ha/yr, from pastureland less than 4.5 4.5 metric tons/ha/yr, from rangeland about 33 metric tons/ha/yr, and from forest land about 1.1 metric tons/ha/yr (Council on Environmental Quality, 1973). So far some 40 million acres of land have been lost to urbanization, nearly half of which used to be cropland, and another 32 million acres

have been lost to roads and highways. In addition, strip mining directly disturbs 153,000 acres of land every year, and affects at least three to five times the exploited area due to acid drainage and accelerated erosion (Pimentel, *et al.*, 1976).

The situation is not much different in a developing country like Egypt, which has continued to lose some of its better agricultural land to urban development. The magnitude of the problem can be best realized by considering the fact that total irrigated land has virtually remained the same in Egypt during the last two decades, in spite of the thousands of hectares of new irrigated land developed by the building of the Aswan Dam. In other words, Egypt has continued to lose good arable land to urbanization as fast as she has brought new land under irrigation, at tremendous investment costs. Closer analysis of these facts indicates that the situation is far worse than normally realized. Overall, better quality agricultural land has been lost to urbanization than that brought under cultivation. Moreover, the agricultural land lost was closer to centres of population, and thus the energy cost of transportation of products to the market and the necessity of developing sophisticated storage systems were minimum. Since the new land is not so conveniently located, more energy has to be expended to transport, store and distribute the products, thus imposing additional costs on the already strained economy (Biswas and Biswas, 1978).

Thus, it is imperative that any pattern of development must consider sustainability of the agricultural system on a long-term basis.

2. *Equity* - According to the World Bank (1978), 40 percent of the population of developing countries, some 800 million people, are still living in absolute poverty. The rate and nature of growth during both the First and Second Development Decades of the United Nations have left much to be desired. The concept of "trickle-down" development has failed to

make much inroad in reducing the regional disparities. For example, if we consider Bangladesh, land holding pattern has progressively deteriorated in many aspects during the last decade as shown in Figure 3 (Stepanek, 1979). In 1967-68, approximately 20 percent of the farm households were without land: a decade later the corresponding figure is around 33 percent. Currently less than 10 percent of the rural households control 50 percent of the cultivable land. The situation is getting progressively worse since the poorer farmers are being forced to sell land and farming equipments in bits and pieces just to survive from floods, droughts, poor crops, high inflation and low employment rates. Furthermore, family plots are becoming smaller and smaller with increasing population. Accordingly, the average farm size has been reduced to 2.3 acres at present, a reduction of 50 percent in only a decade. Only 20 percent of the farms are now more than 3 acres (Stepanek, 1979). Similar disparities can be observed in many other developing countries as well.

In most developing countries the benefits of economic growth during the last two decades have basically bypassed the real poor for a variety of reasons. Among these reasons that are specially important to the agricultural sector are:

- i) higher rates of population growth which means that the meagre productive assets they own have to be spread even more thinly with the passage of time;
- ii) lack of education (often they are illiterate), and thus not enough information is available as to how to use their meagre assets more effectively;
- iii) weak links to the organized market economy, i.e., lack of credit, problems with marketing of the products;

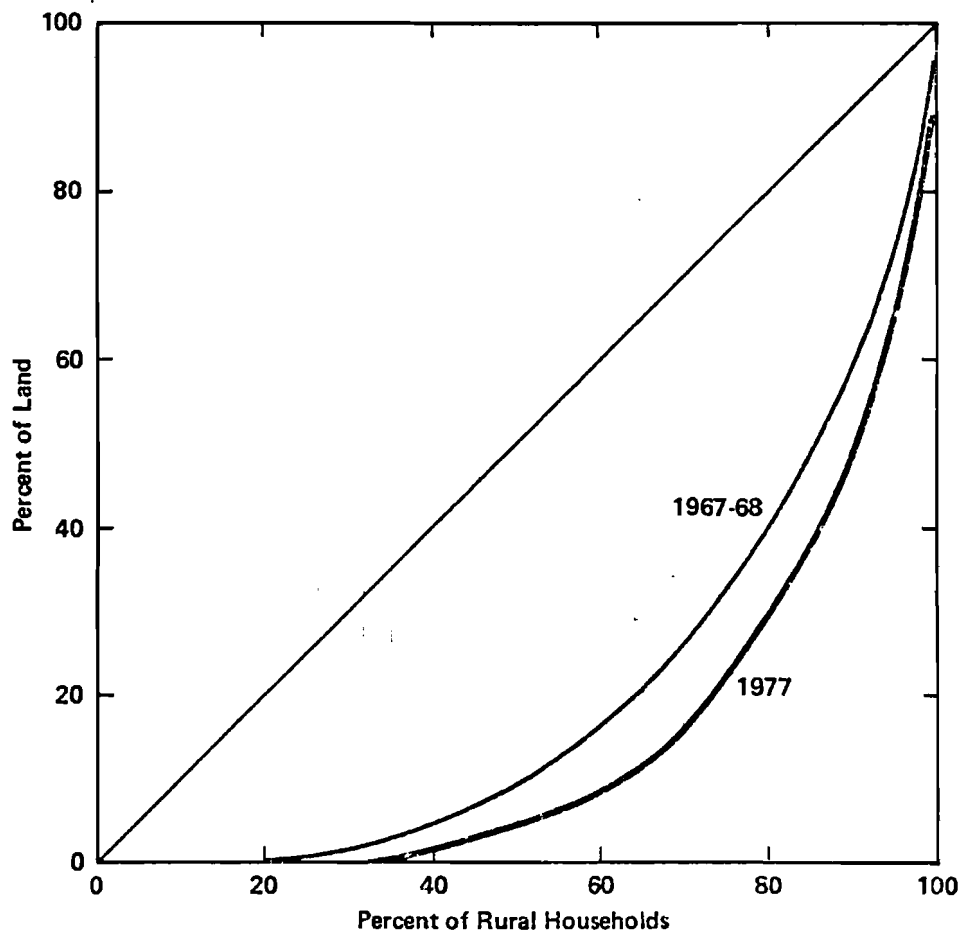


Figure 3. Land holding pattern in Bangladesh

- iv) in poor health, due to unavailability of nutritious food, potable water and health care facilities;
- v) an ancient and well-established social structure that tends to preserve the imbalances.

If there is a need for a new alternative pattern to development, there is no doubt it is most urgently needed in the rural economies of developing countries. Majority of the poor live in rural areas and their incomes are directly linked to the agricultural sector, as shown in Table 1 for the low income Asian developing countries (World Bank, 1978). It is this sector where modifications in the present pattern of growth are urgently needed. Such modifications can only take place if the rural poor, and specially those who are landless or have very small holdings and who constitute the core of the rural poverty problem, are specifically considered to be the important beneficiaries of any development strategy. Thus, it is important to consider not only the total benefits accruing from the agricultural sector but also the nature of the beneficiaries. Any social system where distribution of benefits is markedly skewed and primarily accrue to a select group of elites, is bound to be unsatisfactory and also unstable in the long run.

Countries	% of Population in Rural Areas, 1975	Agricultural Product as % of GDP, 1976
Bangladesh	91	59
Burma	78	47
India	78	47
Indonesia	81	29
Pakistan	73	32
Vietnam	83	Not available

Table 1. Dependence on Agriculture in Low Income Asian Countries (World Bank, 1978)



It should also be noted that techno-economic analyses of agricultural projects in the past have tended to emphasize the nature of the benefits but have provided very little or no information on the nature of the beneficiaries. And yet, information on who benefits and who pays the cost lie at the very heart of the decision-making process.

During the present decade, it has been fashionable in certain quarters to propose zero economic growth. There is no doubt that improvements of the lifestyles of the poor, and reduction of the present imbalances, cannot be made without maintaining high rates of economic growth. What is important, however, is that the present trend should be significantly modified so as to ensure that:

- i) productivity and incomes of the poorer sections of the population are raised;
- ii) poor receive better access to essential public services; and
- iii) increasing the employment opportunities of both rural and urban poors, by encouraging more labour-intensive patterns of production that are efficient.

Simultaneously emphasis also should be placed on increasing the effectiveness of institutional infrastructures to stimulate the agricultural productivity of the rural areas, promote more efficient use of resources, increase the present levels of technical and management skills, and generate increased savings which can be reinvested to further improve the agricultural sector.

Thus, however we define alternative development for the agricultural sector, it is imperative that production across the board must be increased, and at the same time it should be ensured that the small farmers and tenants receive their fair share of the benefits. This will only happen if the small farmers have easy access to credit, necessary inputs,

improved technology, and marketing facilities. Furthermore, for the landless poor it is important that potential for employment is not diminished through uneconomic use of labour-saving farm technology. Otherwise the exodus of the rural poor to the urban centres will continue, and thus further aggravate a situation that is already untenable.

3. *Flexibility* - It is difficult to forecast accurately the secondary and tertiary effects of projects undertaken for agricultural development. Lack of knowledge and understanding of some of the important environmental processes, dearth of long-term reliable data, unavailability of adequate analytical methodologies, inflexibility of institutional arrangements and lack of technical expertise in many developing countries mean that some errors, often serious, have been committed. Accordingly, it is essential that the planning and implementation strategies should be flexible, and not rigid, so that problems, as they surface, can be quickly identified and appropriate countermeasures can be taken. It may even be necessary in some cases to completely change the direction of the development process or perhaps stop further development until more information can be obtained to assess the situation with reasonable accuracy. For major projects, it may be necessary to divide the developments into different phases, since it takes time for certain secondary and tertiary costs to develop, and thus become visible.

It is equally important that the alternative development processes be not based on dogmas. One should have an open mind and attempt to use the optimum solution available, and thus should not be based on doctrinaire considerations of any kind. For example, in recent years there has been tendency to introduce one's own hobby horses in the developmental processes. Thus, currently one group flatly states that "small is beautiful" and the other is equally convinced that "big is magnificent".

Any objective person who has worked in the development area in developing countries must admit that there are a variety of solutions to a specific type of problem. The optimum solution is not necessarily identical in all locations: it is a function of many factors, only part of which are technical. Accordingly small is not always beautiful and big is not necessarily magnificent!

4. *Appropriate Technology* - Technology by itself is neutral, but how technology is used can make the most profound difference to the development of marginal areas. Type of technology used depends on a variety of technical, social, economic and political factors, and what is the most appropriate technology in one country could be most inappropriate in another to solve the identical problem. The agricultural history of the recent past is replete with examples in which straight technology transfer from developed to developing countries has created more problems than they have solved. A few select examples are the deep-plowing of the rice paddies in Java by the Dutch, corresponding operations by the British in Burma, failure of the groundnut scheme in Tanzania and broiler production in Gambia, and the folly of cultivating marginal lands which should never have been broken in Kenya and several Latin American countries.

Probably the most spectacular failure was the British plan to develop large-scale groundnut plantations after the Second World War, in what was then known as Tanganyika. The area selected covered 3.25 million acres, 70 percent of which was uninhabited, for what later turned out to be good reasons. All sorts of experts were recruited for the ambitious project. Bulldozers were extensively used to remove deep tree roots. The soil, as in several other similar cases in the tropics, could not stand up to the machines, and there were severe losses due to wind and rain. Artificial fertilizers used were not effective because of lack of water, and

germination turned out to be difficult in hard-packed soil. The project was eventually abandoned after six years of desperate efforts and capital investment of some \$ 100 million.

A recent bandwagon among the "in" people has been South-South technology transfer or "sharing of technology." While technical cooperation among developing countries makes a great deal of sense, it is naive to expect that it will present no problems. It is too early yet to make an objective assessment of the results, but all developing countries are not the same. They are at different stages of development, and have different social, economic, institutional, and cultural backgrounds. Accordingly, South-South technology transfer should also be carefully planned: otherwise problems will be inevitable. Let us consider only one example, an attempt to transfer technology between India and Tanzania in the agricultural sector.

Most of Tanzanian cashew-nuts are processed in India, and the process is certainly labour-intensive, and many may call it "appropriate technology." A logical extension of this development was to bring the technology to Tanzania and process the nuts there. Accordingly several workshops were started with Indian technicians. The results, however, were not positive. The work turned out to be dull and dirty. The salary of the workers had to be determined by the world market price of cashew-nuts, and was low. In addition, acids from the nuts started to damage the fingers of the workers. The turn over of labour force became so high that the workshops had to be closed.

Why did the technology which worked in India did not work in Tanzania? A main reason was that the Tanzanian labour-force had a better alternative: they could go back to their farms, where the income was equal or higher, but the life was certainly more pleasant. In contrast, the Indian workers

had no other alternative to earn a living: they had to work in the factories. This is just one example which indicates it would be a major error to assume that South-South technology transfer will be free of all problems.

Alternative patterns of development based on appropriate technology can only occur if there are a set of consistent long-term policies that encourages local mastery of the technology, and an intimate understanding of social, economic, cultural and institutional forces on technology. In most cases, appropriate technology to do a specific task in developing country does not exist as such to be picked up off the shelves from a store or from a manufacturer's catalogue and applied immediately to a development project with a guaranteed probability of success. We still do not have sound techniques in many instances which are well-tested with proven success over a reasonable period of time. Imported technologies, whether from the North or South, have to be used carefully and selectively.

Technology transfers have often not been successful because of lack of proper consideration of the social, cultural, educational, economical and ecological conditions of the local regions. But equally dismal has been man's performance to date in failing to use successfully technology that is already available. For example, the effects of soil erosion caused by deforestation and flooding were graphically described by Plato some 20 centuries ago, and the need for terracing for agriculture on sloping land was pointed out by Bernard Palissy of France nearly four centuries ago. And yet, any one who has travelled in Kenya, Indonesia, the Philippines and many other countries cannot help wondering why simple countermeasures like the use of terracing are not taken to prevent soil erosion. The technology has been available for centuries, it is widely known, not expensive to implement, and urgently needed for medium and long-term conservation measures, and yet it is not used.

5. *Environmental Considerations* - Any form of alternative development strategy for the agricultural sector must explicitly consider its environmental and social impacts. While much lip-service is given to the environmental implications of the agricultural sector, not much is done about them in most countries. The emphasis has often been on short-term *ad-hoc* gains that may not be sustainable over a longer period of time.

FAO has already stressed that "the major environmental problems facing agriculture, forestry and fisheries were not only avoidance of environmental pollution but the ensuring, in the development process, of the maintenance of the productive capacity of basic natural resources for food and agriculture through rational management and conservation measures" (FAO, 1974). It also "recognized that agricultural development and world food security depended on careful husbandry of living resources, on their biological laws and ecological balances, as well as on the adjustments of production, supply, and reserves to demands."

There are many environmental implications of any new development strategy for the agricultural sector, but only one will be discussed here, pesticides. It is now evident that continued heavy reliance on pesticides to protect vast areas of monoculture is ultimately bound to be a self-defeating strategy. Such a practice kills all useful insects that could naturally keep the pest population down, and ensures continual increase in the doses of application and continual development of new forms of pesticide-resistant species. Thus, the number of applications of pesticides to cotton in recent years has risen from 8 to 40 in some Central American countries (FAO, 1974), and evolution of new strains of cotton pests necessitates the use of new forms of pesticides every three years or so in Egypt.

The Canete Valley in Peru is an example of an ecological disaster that could occur due to heavy reliance on pesticides. The area covers some 22,000 ha of irrigated land on which cotton was grown. During the period 1949-1956 the use of pesticides was constantly increased to control the cotton pests. New pests appeared in the crops because of the destruction of predators and parasites, and the pests themselves started to develop resistance to the chemicals used. The cost of greater application of pesticides increased tremendously, and gradually all useful insects were destroyed. By 1956, the situation had become critical and nearly 50% of the crop failed (FAO, 1974).

The use of pesticides as the exclusive form of control was banned in 1957. Synthetic organic insecticides were completely prohibited, and mineral insecticides were used. Enemies of cotton pests were reintroduced and cropping practices were changed based on a study of the ecology of the cotton fields. The equilibrium of the valley's ecosystem was eventually restored several years later (FAO, 1974).

There are several similar examples of eventual reduction in crop production due to heavy reliance on chemical pesticides. Thus, any new alternative development strategy will have to depend on new concepts of integrated pest management, which can be broadly defined as an ecological approach to pest control by optimal combinations of biological and chemical control technologies. This would be based upon information about individual pests, their environment, and their natural enemies. Farming practices are modified to control the pest and aid its natural enemies. Realistic economic injury levels of crops would be used to determine the need for suppressive measures. For example, during the first 30 days and for stages after 100 days after planting, cotton can withstand up to 50% defoliation. During the period of fruit formation (30-100 days) the economic level for

defoliation drops to about 20%. Integrated pest management takes advantage of these types of sensitivities, and the measures undertaken might include releasing biological control agents or pest-specific diseases or, when necessary, applying pesticides in limited amounts. The use of biological control against fungi and weeds has so far been little exploited. Release of sterile males or artificially reared natural enemies of the pest have proven successful to control a number of insects pests.

Integrated pest management provides better pest control at lower cost, and with significantly fewer environmental problems than exclusively reliance on chemical pesticides. This type of systematic approach has progressively reduced the average number of pesticide applications in the cotton fields of Nicaragua from 28 (range 16-35) during the 1967-1968 season to 22 (range 14-30) in 1970-1971, and to 18 (range 10-25) in 1971-1972. It has also reduced pest control costs by about 40%, and has lowered the pesticide residues in adjacent crops, livestock, and dairy products (FAO, 1974). Thus, it should be an important aspect of any agricultural development strategy.

5. *Strengthening of local capabilities* - To paraphrase Abraham Lincoln, planning is "of the people, by the people and for the people." Thus, participation of the people in any agricultural planning process is essential, since it is their lives and futures the process is trying to enhance. Furthermore, in the ultimate analysis, resources do not exist as such. Man must use his knowledge and technology available to transform his environment into usable resources. Hence, ultimately one can argue that resources available are directly dependent on resourcefulness of the people, and what is considered to be a non-resource or a pollutant at one place or time could be considered an important resource elsewhere, and for another timescale.

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Within this general criterion, it is useful to consider the following factors as well:

- i) use of indigenous resources as much as possible on an efficient and rational basis;
- ii) generation of employment, savings and thus capital;
- iii) production of goods, services and income especially for those sectors of the society whose basic need is least satisfied;
- iv) emphasis on development strategies that use and build on endogenous technical traditions; and
- v) encouragement of local research and development systems.

6. *Information* - It is difficult to plan and implement any development strategy in the absence of reliable information. In fact one can define management as the process of converting information into action as shown in Figure 4. Management success depends not only on the quality and extent of the information available but also on what information is selected for use and ultimately channelled into the planning and decision-making processes (Biswas, 1976).

One can argue that for optimal development to occur man should do what he would do if he had perfect knowledge, and if he was completely rational. Perfect knowledge in this context may be defined as information on exact probabilities of each of the alternatives and outcomes and their values to the planners. In other words, information should be available on technological alternatives, their relative costs and benefits to society as a whole, and other relevant data. However, under normal circumstance, various types of information on agricultural development areas in developing countries are hard to obtain, and even if they are available in a few instances, it is not exactly unusual to find that those who must make the plans do not have access to the data. In other words, one has to

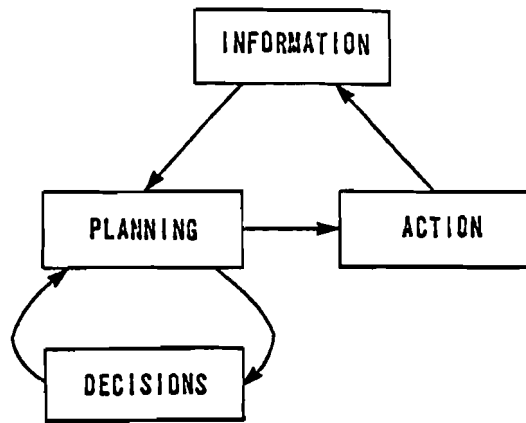


Fig 4. Flow of the management process, illustrating the basic components and sequence of events

accept that imperfect decisions (i.e., not the optimal) have to be made. The situation, however, is not as bad as it sounds at first sight. In most cases the problems initially started with give rise to new problems, which require new solutions or radical modifications of the ones being used, which in turn makes planning a dynamic process. Hence, for development of marginal areas, it is important to devise a planning strategy that is flexible, and are not based on one of decisions. In other words, planning should constitute a series of successive decisions, somewhat similar to the dynamic programming type off approach. As more information becomes available, and thus the system is better understood, the planning process should be flexible enough to enable a change of direction, if it is so necessary. Such a felexibility is not only desirable but also absolutely essential, since many of the secondary and tertiary effects are difficult to predict at the beginning of the development process. As such side-effects begin to appear, countermeasures need to be taken to alleviate their overall impacts.

## Conclusions

There is no doubt that changes in the development strategies in the agricultural sector are essential to eliminate world hunger. In this paper an attempt has been made to outline some of the criteria on which new strategies should be based. It should also be realized that the changes that are necessary to adopt an alternative form of development will not be easy, because any change affects certain segments of the population adversely, and one can be assured that the vested interest will oppose them strongly. Thus, it is naive to assume that a better strategy will be automatically adopted. The proponents of the change will have to convince the people at large that such changes will be beneficial and necessary. It will not be an easy task, but certainly worthwhile to accomplish.

## Note

Opinions expressed are those of the author and not necessarily of IIASA or any Institute, Agency or Government he is associated with.

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