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POLICY OPTIONS PAPER ON
POPULATION, ENVIRONMENT AND DEVELOPMENT

WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT

POLICY OPTIONS PAPER

POPULATION, ENVIRONMENT AND DEVELOPMENT

MAY 1985

Population, environment and development 1/

The problem.-

1. In its basic dimensions, the problem is that of access to the resources and material base, including water, land, food, energy, and minerals, necessary for the development of a particular social unit consisting of a given population number at a given standard of living. The subject has been on the agenda of national and international organizations for more than a decade, but it seems to have defied the attempts to delimit and tackle it firmly in theoretical, methodological, operational and policy terms.

2. In the year 1 of our era, the population of the world stood around 300 million inhabitants and it took 1500 years to see it double. By the middle of the 18th century and coinciding with the initiation of the industrial revolution population started to grow constantly and notoriously and it took 150 years to witness another doubling, which meant a population of 1700 million around 1900. During the XXth century, population growth continued to accelerate particularly in the last few decades, when from 2500 million in 1950 it almost doubled again reaching 4800 million at the beginning of the 80's. Although birth rates are diminishing, projections point towards a population of 9800 million by 2050 and stabilization in 2150 at around 11000 million inhabitants (Annex`1).

3. The rate of population increase, particularly during the last decades, has brought the issue to the forefront of international discussion. In the past at different junctures in history, increases in population were resolved (or sorted themselves out) through a variety of changes including wars, societal collapse, famines, ecosystem change, massive migrations, subjugation of far away places to the dominators' own needs, but also by virtue of technological and scientific innovation and breakthroughs, social organization and change and increasing international trade and specialization.

4. Today the issue has assumed new dimensions as some of the traditional ways of coping are no longer acceptable or feasible under normal conditions and there are important elements that complicate the situation even further:

- an extremely uneven access to resources by different groups of the population (both within nations and between nations) (Annex 2).

- explosive and diversifying demands of the consumer society, (industrialized countries and the wealthy elites of some developing countries) which have an increasing and ever more varied capacity to impact negatively the environment and the natural resource base through increased pressure over resources and even sometimes, through unreasonable wasteful patterns of utilization; all of which has global repercussions;
- the accelerated development of varied technologies which have an increasing destructive impact on the natural resource base and the fact that they have been and continue to be widely used without real attempts to upgrade, improve or change them for environmental reasons. Technological innovation leading to environmentally sound technologies lags behind requirements.

5. In brief, given the facts, the problems regarding environment and population that present day civilization faces can be stated as follow:

- from an ecological point of view, the biosphere - as any ecosystem - can accept changes in its structure up to a certain limit; therefore even though, as we shall see, the carrying capacity (Annex 3) can be improved enormously, it would be unrealistic to believe in the sustainability of an indefinite increase in population;
- although an overall conflict between population numbers and resource availability and production has not occurred nor is likely to occur in the near future, at the global level, there are localities and/or regions which are getting into the situation where their population growth is outstripping their ability to provide enough food to feed their people and where poverty prevents poor people from buying food on the markets;
- some nations and/or regions of the world have the capacity to provide resources to satisfy the needs of their own population and that of others, (even to utilize in a wasteful manner varying amounts of their resources), whilst other nations and regions undergo progressive underdevelopment with its spiral of pervasive poverty, deteriorating environments, rising mortality rates through starvation and rising fertility rates to compensate for rising mortality rates. This is basically due to internationally prevalent patterns of development which are characterized by internal

- factors such as the inadequate distribution of income and wealth and external factors related to the characteristics of international economic relations such as commodity prices, trade and aid patterns, access to technology and others. Population growth in itself, is not the determining factor nor the sole factor in the dynamic process, although it can become a very relevant one.

6. There are several current interpretations and positions in relation to possible actions that can be taken vis-à-vis the problematique:

- * some believe that a combination of socioeconomic and technological policies directed at increasing the carrying capacity with population policies directed at lowering fertility rates, is required to prevent appearance of imbalances in the population, environment relationships;
- * others believe that the more people, the more brains available to solve the problems creatively and the more hands to do the required work;
- * some based on religious dogma, find it difficult to accept most systems of birth control;
- * there are those who have never ending faith in the possibilities of solving the problems through technological innovations;
- * the prevalent position in the last decades has been that the fertility rate must be decreased by all means thereby solving the basic problems of poverty and environmental degradation.

Analytic Considerations

8. Population (Annex 4).- The accelerated rate of increase of population has been pointed out. Since the Bucharest Conference in 1974 the world population has grown from 4 billion to 4.8 billion, or roughly by 20%. Nevertheless, it is estimated that between 1975 and 1985, the annual rate of growth of the world population has declined from 2.0% to 1.7%. Declines occurred both in the developed as well as in the developing countries. Among the latter, the decline observed in China is the most significant: from 2.4% to 1.2% per year. If China is excluded, the decline in the rate of growth of LDC's is far less significant: from 2.5% to 2.4% per year. This is due to the fact that the fertility decline in LDC's excluding China was almost offset by a corresponding declining mortality (Annex 5).

9. The decline in the rate of growth of the world population is noteworthy from a historical perspective. However, this deceleration is at present a very slow process and is expected to be even slower in the near future. Though absolute population numbers will continue to increase for several decades, the issue now is how quickly the rate of increase can be slowed down and how individual countries (and the international community) are to cope with continued growth in the meantime.

10. We have mentioned earlier some projections referring to the demographic future. Even allowing for some error, it seems likely that world population would stabilize around the year 2150, having increased from almost 4.8 billion at present to around 11 billion. The population of today's developed countries would grow from about 1.2 billion today to 1.4 billion, while those of LDC's from 3.6 to 8.4 billion. It is clear that future population increases will be concentrated in what are now the poorer areas of the globe. Some of the critical assumptions at the base of these projections are that the declining mortality will continue until life expectancy of about 80 years is reached and that fertility will decline to replacement level in developed countries by the year 2010 and in developing countries, between the years 2005 and 2045. The latter depending on recent mortality levels, fertility trends, and family planning efforts. (In those several developed countries in which fertility is now below replacement level it is assumed to rise and then stabilize at replacement)²

11. Carrying capacity.-- A study recently published by UNESCO carries a definition of the term which is qualitatively different from the concept borrowed and transported from the natural sciences. It reads: "Carrying capacity is defined as that population, at any moment in time, which can be indefinitely sustained at a given standard of living. It is not a threshold, and can be enhanced by appropriate national development using physical and human resources. Socio-cultural factors can both enhance and diminish carrying capacity." This definition implies flexibility and the transformation and adaptation of the environment and the natural resource base assuming a dynamic and progressive development scenario. Recently also, the concept "social carrying capacity" has been used to refer to the great variation in social relations and to the viability of different organizational forms that human beings have used to relate to the natural endowment and resource base. These, as can be appreciated in the course of history, have had varying degrees of success.

12. Social Organization as the Mediator of Environment and Population. A review of past experiences, will show that those countries that responded to major urges of population pressures by innovating the structure, for example, of property rights, became economically ascendant; those that failed or sought to protect the existing social structure and the established property rights, fell behind and their populations became more vulnerable to physical scarcities. The relationship between population and environmental factors is not a direct one, nor a simple one, but is mediated by social institutions.

13. A careful consideration and analysis of a set of publications that is emerging on what we may call ecological history, clearly show that the relationship between environmental conditioning factors and society has changed fundamentally over the course of human history. It shows in addition, that this transformation has occurred unevenly across societies. It demonstrates that these differences among societies are accounted for, not only by physical parameters but by social (and institutional) factors. It is the society, i.e. the social structures and the social relations, rather than the population per se or its size, that interact with and transform the natural resource base and environment through the development process. Indeed, such factors as levels of development, patterns of production and consumption, food and agricultural systems, means of production and levels of technological development, concentration of population, organizational skills and managerial strategies, cultural prescriptions, belonging to different social classes and income groups, etc., play a crucial role in determining the nature of the interrelationships in a given setting and at a given time.

14. There has been a tendency to ignore the role of international economic relations, including its historical and colonial roots and the fundamental role of North-South divisions in shaping the relationship between population, environment and development situations nationally and internationally. This is one more example of how the social mediation of the relationship between population and environment is frequently forgotten or played down. For example, regarding resource distribution and access, it has been a classical belief that gaining control over or securing access to adequate supplies of essential raw materials is a necessary condition of becoming and remaining a great power. Consistent with this belief the nations that have the power, have exerted influence on those that have not, notwithstanding the distortions caused to latter's production and consumption patterns, and regardless of the needs of the indigenous populations and those of its natural environment. In many places in the

world where the relationships between population, environment and development are unbalanced and show signs of strain, the international or the "transnational connection" is one of the key variables ("independent" as far as the local people are concerned, who can do little if anything to modify it and one of the determinants of what happens locally or what could be done locally to improve a situation) Therefore, the analysis and consideration of this subject and particularly the suggestions for action directed at changing the status quo, should by all means consider this aspect.

15. Interdependence and Inter-Connectedness.- In studying and in taking action to influence the relationships between population, environment and development, it is of great importance to consider that there are phenomena at several different levels which are connected and interdependent. The connections between ecosystems in the biosphere through several natural channels provide one of the paths for the linkages between different levels. The social political and economic interdependence provide yet other important possibilities for linkages and interaction.

16. Let us take a concrete form of resource and environment utilization at a given place (e.g. a development project establishing a medium size agroindustry in a rural setting). It generates specific effects on the local population dynamics (through changes in migration, income, subsistence strategies and birth rates), the environment and the natural resources, and therefore on the relationships between population, environment and development. A development project of this kind is usually induced to by a policy, or a set of policies at the national level, including financial incentives and technological support intended to stimulate production of given agricultural products for export and/or for national use. Obviously what transpires at this level has impacts on the population dynamics, the environment in a number of places within the country, and in many instances depending on the nature and role of the country in the world economy outside.

17. A policy at the national level is not usually autonomous or autarkic and is affected or can be explained by what transpires at the international level, thus, for example, the conditions of the international agricultural commodities market and the foreign debt requirements can be of critical importance in determining policies implemented nationally; the occurrences and phenomena at this level, have important effects on the population dynamics environment and resources around the world. The dynamic interaction of the systems that interest us, is different from one level to the other. We have to keep in mind that with so many intervening layers the

phenomena at, for example the local level, may be caused by interactions which, because they are occurring at other levels, are not perceived by those that are at the end of the causal chain in charge of undertaking given concrete action. Unfortunately, there is no chance of successful action at that level, unless some action is taken and changes occur at another level.

Relevant experience.-

18. An important amount of experiences on population change has been accumulating over the past decade. It underscores, in developing countries, the strong link between fertility decline and the general level of socio-economic development. Differences in fertility among and within countries are related, less to income per person than to life expectancy, female illiteracy and the income of poorer groups³. (Annexes 6 and 7). According to World Bank documents, it has been almost two decades since the peak of population growth in developing countries was passed. But the turn around to slower growth has been slow and has not occurred everywhere. Two decades after the turn around, the slow pace of change and its uneven incidents, point more than ever to rapid population growth as a central development concern. For the next five or six decades, the problem goes beyond one of global resources and their relationship with population numbers and it does not seem easily amenable to technological fixes. It is a mismatch between population and income producing ability, a mismatch that leaves many of the world's people in a vicious circle of poverty and high fertility. All the experience shows that the progress in economic development by itself generates new signals that decrease the rate of population growth.

20. In the early seventies a pronounced international concern with the world food problem arose. The so-called food crisis has been and still is a matter of intense international concern, emphasized as it is, by recent developments in Africa. The 1972 World Food Conference offered a diagnosis which has remained very much the official explanation of the problem. It regarded the crisis as no more than a reflection of the problem created by an imbalance between food production and population expansion (Annex 8 and 9). Consistently with this diagnosis, actions directed towards the eradication of malnutrition and famine from the world have been centered on an attempt to achieve a decline in the rate of growth of the population.

21. The official explanation is that malnutrition in some groups of the population, in those developing countries that have food problems, is basically due to the fact that population is growing more quickly than local food production. Therefore, developing countries become net food importers and depend for their subsistence on exports (aid) from industrialized countries. This implies that the level of grain stocks of the major exporting countries has a direct bearing on world food security. Finally, natural disasters such as droughts have been considered sufficient direct causes of the famines that have affected some regions of the world from time to time.

22. These assertions have been challenged lately by several studies of what has happened in Africa and other Third World countries (Annex 10, 11 and 12). A careful analysis of the statistics on food production at world level, do not show a disaster back in the 1970s or presently. Natural phenomena, such as changes in the climate and drought of the same magnitude or worse, have occurred before without having the impacts on human beings which are now being suffered. Data seems to point towards characteristics of international economic relations (trade, pricing, distribution, transport, etc.) as an alternative explanation for the fact that while some people starve in some places, others have abundant food in other locations (food is even sometimes thrown away in some places).

23. Although it seems that rapid population growth in itself is not the explanation for poverty, famine and other social disasters, it surely makes adjustment more difficult. One can say that population growth would not be a problem if economic and social adjustment could be made fast enough, if the carrying capacity of ecosystems could be changed rapidly through technical and social changes. The world development report of 1984 published by the World Bank contains the following statements "no one would argue that slower population growth alone will ensure progress; poorer economic growth, poverty and inequality can persist independently of population change"... "This report has shown that economic and social progress helps slow population growth; but it has also emphasized that rapid population growth hampers economic development. It is therefore imperative that governments act simultaneously on both fronts"⁴ (Annex 13).

Policy Options

24. General characteristics of policy options. As shown, the issue at stake is really a complex system of interacting systems which challenges traditional approaches used by scientists, decision makers and politicians. It is fundamental to aim towards an integrated understanding of the complex web of intervening variables without missing the diversity of concrete situations. Therefore, policy options open to prevent or improve imbalances in the population, environment, development equation should have the following characteristics in order to achieve the desired results:

- a) policies should be formulated and implemented to be applied in different spatial scenarios in order to tackle the characteristic diversity and singularity of the specific situation. Space can be broken down in different ways e.g. global, regional, national and local. As we go from the more general to the more specific scenario, the diversity and therefore the heterogeneity of the interacting components is seen more clearly and should therefore be taken into account for action. This implies differences, for example, in types of settlements, types of productive processes, income, cultural patterns, environmental degradation, birth and death rates, etc. Conclusions stemming from one level do not generally apply to the others;
- b) policies should have components with foreseeable effects at different time horizons or, there should be different policies for the different time spans that have to be considered, i.e. short - medium - long - very long. Time horizons must be expanded. Classical formulations in economic planning do not normally go beyond ten years which is considered the long term and in our case we need several decades, and even sometimes, up to centuries, to evaluate impacts of actions taken today. This is so because the effects of the decisions taken or foregone at present may not fully materialize until well into the future and it may take equally long to reverse such effects if it becomes necessary;
- c) policies should be formulated with the clear realization - and hopefully the necessary information basis - that interlinkages between different levels of intervening phenomena (natural and social) frequently determine the success or failure of action at a specific level. Sometimes it will be necessary to take action at the international level in order to achieve results with some policies applied at the local or national level and the same is true in the opposite direction.

25. The population, environment and development issue and its solutions revolve basically around possible changes in the following formula:

$$\frac{CC}{P} \quad SR$$

CC = Carrying capacity
P = Population members
SR = Social relations

The characteristics of social relations (SR) - which imply also different social structures - relate both to the numerator and to the denominator of the relationship shown above and also to the characteristics of the interrelations between both. It is difficult to envisage successful changes of the carrying capacity without changes in the social relations within the communities, that would enable them to use the land, carry out work and productive activities in different ways. The same is true of population policies: social changes are necessary to make them successful in diminishing the fertility rates. At the same time if a correct dynamic diagnosis of the kind of interrelations between population and the carrying capacity of the environment, in a specific time and place are needed (as they are to take adequate action to influence them), it is clear that there are differences depending on the social structure and relations in that same time and place.

26. The basic policy options are, therefore:

- * refrain from action and allow natural regulatory mechanisms to correct imbalances and problems
- or
- * effect social changes that may allow both for successful implementation of population policies (achievement of replacement level fertility rates) and sustainable increases of the carrying capacity.

If the latter is chosen, it has to be kept in mind that the concrete combination of the desirable social, population and carrying capacity changes, will be determined by the dynamic characteristics of the interrelations in the specific place and time under consideration.

27. Supporting policy options. There are many policy options that relate to the basic one and would have to be implemented, to solve the problems. An attempt is made at grouping them according to the closer relationship they may have to the elements of the formula presented earlier. It should be noted that in many cases, the options cited, beg the question of "how". This question is crucial. It goes beyond the scope of the present paper; but it is a question to which the Commission will retain in considering the other subjects on its agenda.

28. Those related to all three:

- * formulation of clear explanatory conceptual frameworks for policy and decision makers which have to be consistent across the borders of disciplines and traditional sectors, (it is important to consider that there may be different and alternative conceptual frameworks but that it is indispensable to count on a coherent set of dynamic explanations to guide action);
- * channel additional resources and manpower into studies on population/environment and development particularly into already identified gaps in knowledge and critical areas (e.g. methods of tackling complex systemic issues);
- * map and evaluate critical population/environment and development problem areas in the world;
- * create a quantitative data base which is of relevance to population/environment and development interrelationships;
- * create handbooks and booklets on environmental management with knowledge easily accessible and understandable by those who are not scientists;
- * reform education, at all levels to include the basic knowledge and experience on environment, population and development;

29. Those related to population

- * stimulate governments to formulate clear and implement a population policy based on the cultural and economic situation that prevails within their country;
- * undertake special programmes to make women aware of the population, environment, development relationships as they have a particularly important role in the education of the new generations and therefore in the creation of fundamental habits and traits;
- * reinforce and develop health policies to decrease mortality rates, particularly infantile mortality rates;
- * family planning programmes, contraception and other means to reduce birth rates, where necessary;
- * formulate and implement policies to improve population distribution.

- * introduce incentives and disincentives as additional ways of encouraging parents to have fewer children, where necessary;
- * and others.

30. Those related to changes in carrying capacity:

- * promote rural development and sustainable agriculture;
- * increase research and development on resource saving methods and technologies for urban and rural development;
- * introduce measures to develop and promote technological innovation oriented towards sustainable development;
- * promote the upgrading of indigenous capacities and knowledge with inputs from science and technology;
- * and others.

31. Those related to changes in social relations:

- * promote changes in international economic relations that would further sustainable forms of development in all regions (this refers to a set of different policy options that would have to be taken, basically, by multilateral agreement);
- * increase the rate of economic growth and development in specific places or countries (this implies policy changes at the local, national and sometimes international levels and therefore it refers to a cluster of policy options, some mentioned in the following lines);
- * recaste the traditional criteria and rationales which guide public and private decision-making concerning investment and development;
- * examine measures to guide communication techniques and education directed at important changes in attitudes and wasteful consumption patterns;
- * strenghten measures to increase public health (clean water, sanitation, etc.);
- * increase literacy and levels of education;
- * improve the distribution of income;
- * create and expand where available, managerial skills for productive activities;
- * and others.

Notes

1. For the preparation of this paper, several publications have been consulted. In some cases graphic material and texts have been taken and used as annexes to illustrate some of the points made. In other cases ideas have been integrated in the contents of this paper without indication of the source. The principal publication consulted are:
 - "Carrying capacity assessment with a pilot study of Kenya". Final Report. Resource Utilization Institute, UNESCO 1984
 - "Food systems and society" by Rolando García, UNRISD, Geneva 1984
 - Review and appraisal of the world population plan of action. E/Conf.76/4 (for the International Conference on Population, Mexico City, August 1984) United Nations, 1984.
 - "The Political Economy of Soil Erosion in Developing Countries" by Blaikie, Piers, Longman, New York, 1985.
 - World Development Report 1984, The World Bank (Oxford University Press 19)
 - Worldwatch Paper No. 29 ("Resource Trends and population policy: a time for reassessment" by Lester Brown) and several publications of the Worldwatch Institute.

2. The problems related to migration have increased importantly in the last decades. They expressed among other phenomena, the inadequacy of population distribution in specific regions, but in as much as sometimes they are caused by political upheavals; they may tend to worsen or originate population distribution problems. Some of these migratory movements are clearly related to environmental and resource problems and what may be called the ecological migrants/refugees may be a category which will be seen more often in the future. The old but continued process of migration from the rural to the urban settlements, has close ties with economic and social development possibilities and realities and there is no reason to believe that it will stop, if

everything else continues to be managed as is currently done. The proportion of the world population living in urban areas has increased from 38% in 1974 to 40% in 1980. It is expected to reach 48% by the year 2000. There is a fair amount of heterogeneity among the less developed regions: Asia and Africa were the least urbanized areas in 1974 and, even at the end of the century will remain predominantly rural, while Latin America in 1974 had an average of 61% of urban population. The world's urban population which stands at present at around 1.97 billion is projected to increase to 3 billion in the year 2000. In this context it is important to note that there will be several megalopolis and more than 400 cities of more than a million inhabitants by the year 2000.

3. In this respect, it is interesting to note that a country like Mexico, which until recently had continued economic growth and development as well as stringent population policies, has seen its fertility fall by more than 30% in the last decade. It is clear that this result is the outcome of a major decrease of birth rates in highly urbanized and developed areas which have undergone important changes in the social structure and social relations (education, health, "modernization") and almost no change in rural areas where social changes have been less or sometimes, almost inexistent.
4. In this respect it is interesting to note that China that used to have yearly devastating famines, after important changes in its social structure and social relations after 1949, has been capable of satisfying at least the basic needs of its population, even though a major increase in absolute numbers of the population took place. Furthermore it has been also capable of establishing successful population policies which are bringing down the fertility rate and allowed for the projection of stabilization in population growth earlier than in other parts of the Third World.

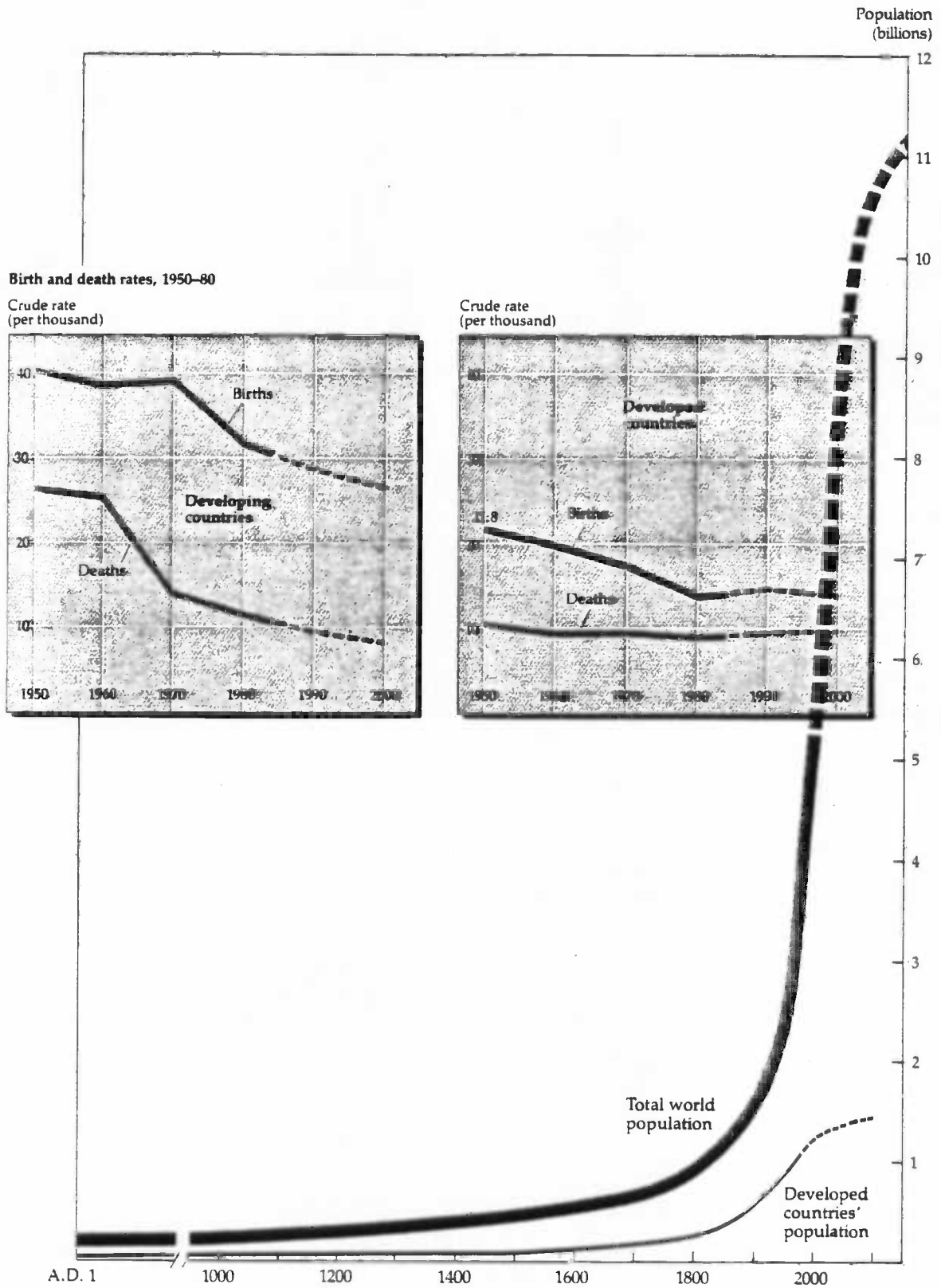
(Draft Policy Options Paper)

POPULATION, ENVIRONMENT AND DEVELOPMENT

Annexes

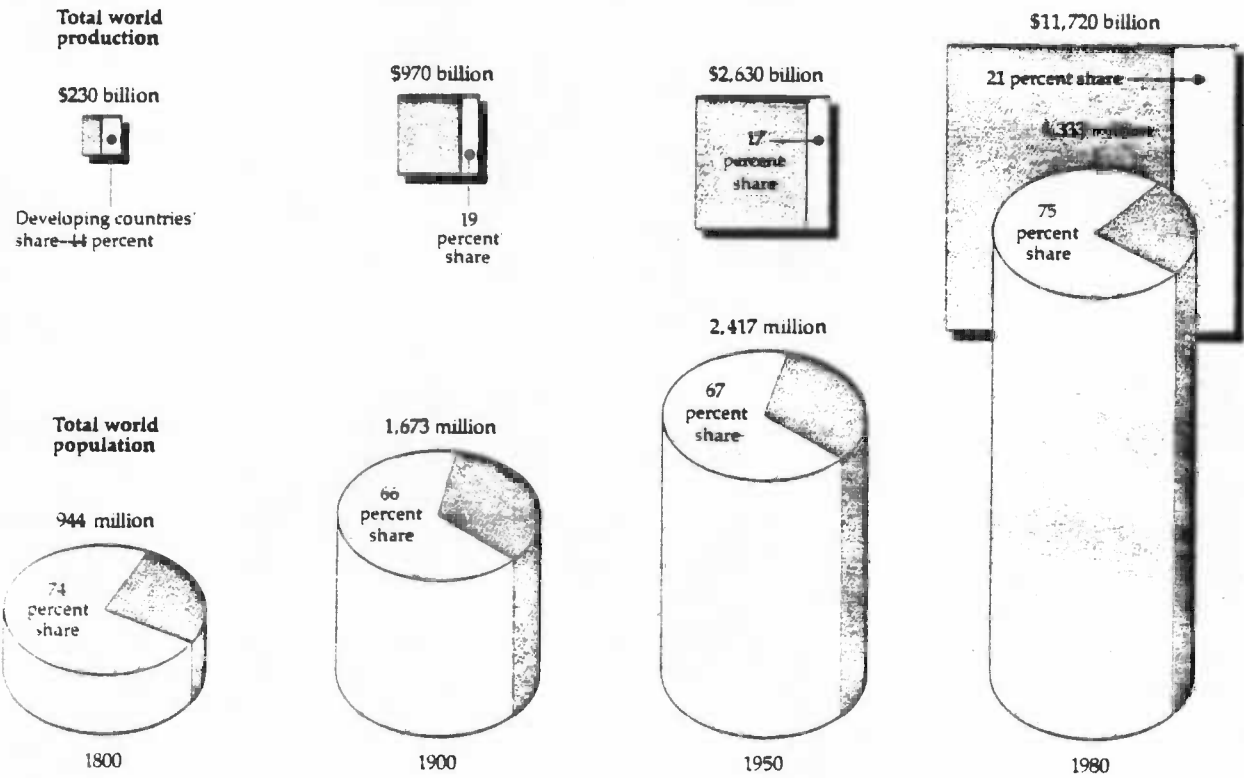
ANNEX I

Past and projected world population, A.D. 1-2150



Sources: Durand, 1977; UN, 1966.

Developing countries' share of population and production, 1800-1980



Source: McGreevey, 1984.

THE CONCEPT OF CARRYING CAPACITY

Economic Science is concerned with growth over the relatively short term. It has not yet managed to qualify satisfactorily the longer term factors affecting development, such as population and the environment. Recently attempts have been made to extend the ecological concept of carrying capacity to national economies, so as to identify those conditions in which populations may be sustained indefinitely at given standards of living. Carrying capacity is not in this way seen as a threshold but may be expanded through an appropriate course of development. The problem is one of establishing the rates at which carrying capacity may be expanded, given the constraints and advantages of the national system concerned*.

Sustainability

An essential aspect of carrying capacity is sustainability, for a country whose development cannot be sustained, whether for environmental or other reasons will eventually exceed its carrying capacity. A sustainable economy requires that agricultural practices do not degrade its soil, that forests be maintained and that a country can maintain its industry and provide food for its population indefinitely.

* A working definition of carrying capacity is the number of people sharing a given territory which can for the foreseeable future and in accordance with the socio cultural values of that territory, sustain a given standard of living utilizing energy and other physical resources as well as technology, enterprise and skill.

Self-Reliance

Self-reliant development has been described as "local initiative applied locally". A country which cannot increase food production (directly or through imports) and other means of subsistence in line with population growth may, again, overreach its carrying capacity and become increasingly dependent on foreign aid. Enhancement of a nation's carrying capacity thus implies, as far as possible, the provision of its own needs through its own resources, whether human or physical.

Carrying Capacity As A Total Resource Approach

The carrying capacity approach offers a holistic framework within which development options may be identified. It attempts to relate goals to means, over the long term and at the level of national decision making. For this a total resource strategy is needed to interrelate the different population resource and environmental factors involved. Increasing populations and higher standards of living imply greater agricultural and industrial output. The intensification of output of agricultural land, for example depends not only on soil structure, climate, crop types, water, etc. but relies on the whole panoply of industrial development as well as education, transport, storage or incentives to bring about changes in land use. Economic sectors still tend to be planned as independent entities. However, the national system must be considered in its totality if policies are to be determined which as a whole can move a country towards sustainable development and ensure a balance between its population and the means for meeting the requirements of that population. Different processes and actions must proceed hand in hand and at complementary rates, water and energy supply, for example, matches needs set by population, industry, agriculture and environmental stability.

Table 1 (continued)

| Region, years ^{a/} | Population size (millions) | Annual rate of change ^{a/} (percentage) | Crude birth rate ^{a/} (per 1,000 population) | Crude death rate ^{a/} (per 1,000 population) | Total fertility rate ^{a/} | Life expectancy at birth ^{a/} | Infant mortality rate ^{a/} (per 1,000 births) | Urban population (percentage) | Number of cities of 4 million or more |
|-----------------------------------|----------------------------------|---|---|---|--|--|--|-------------------------------------|--|
| Major regions (medium) | | | | | | | | | |
| Africa | | | | | | | | | |
| 1984 | 537 | 3.01 | 46.4 | 16.5 | 6.4 | 49.7 | 114 | 31.4 | 2 |
| 2000 | 877 | 3.05 | 42.6 | 12.1 | 5.0 | 55.7 | 84 | 42.2 | 11 |
| 2025 | 1 643 | 1.96 | 26.7 | 7.1 | 3.2 | 64.9 | 47 | 50.3 | 36 |
| Latin America | | | | | | | | | |
| 1984 | 397 | 2.30 | 31.0 | 8.2 | 4.1 | 64.1 | 63 | 60.1 | 7 |
| 2000 | 550 | 1.85 | 25.5 | 6.7 | 3.1 | 60.3 | 44 | 76.6 | 11 |
| 2025 | 707 | 1.17 | 18.0 | 7.0 | 2.4 | 72.2 | 27 | 84.2 | 21 |
| Northern America | | | | | | | | | |
| 1984 | 261 | 0.89 | 16.0 | 9.1 | 1.9 | 74.1 | 12 | 74.2 | 4 |
| 2000 | 290 | 0.74 | 14.3 | 8.7 | 2.1 | 76.2 | 8 | 78.0 | 4 |
| 2025 | 347 | 0.49 | 13.5 | 10.2 | 2.1 | 77.5 | 6 | 85.0 | 8 |
| East Asia | | | | | | | | | |
| 1984 | 1 239 | 1.14 | 18.2 | 6.0 | 2.3 | 68.0 | 36 | 28.7 | 8 |
| 2000 | 1 470 | 1.11 | 18.2 | 7.1 | 1.9 | 71.4 | 24 | 34.2 | 10 |
| 2025 | 1 696 | 0.40 | 13.1 | 9.1 | 1.9 | 75.2 | 12 | 51.2 | 18 |
| South Asia | | | | | | | | | |
| 1984 | 1 539 | 2.20 | 34.9 | 12.9 | 4.7 | 53.6 | 109 | 27.3 | 12 |
| 2000 | 2 074 | 1.65 | 26.1 | 9.6 | 3.2 | 59.0 | 76 | 36.0 | 20 |
| 2025 | 2 771 | 0.86 | 16.6 | 8.0 | 2.1 | 68.7 | 37 | 55.3 | 41 |
| Europe | | | | | | | | | |
| 1984 | 490 | 0.33 | 14.0 | 10.7 | 1.9 | 73.2 | 16 | 72.0 | 6 |
| 2000 | 513 | 0.26 | 13.0 | 10.4 | 1.9 | 75.4 | 11 | 79.0 | 7 |
| 2025 | 527 | 0.06 | 12.6 | 12.0 | 2.1 | 77.3 | 7 | 85.9 | 8 |
| Oceania | | | | | | | | | |
| 1984 | 24 | 1.50 | 21.1 | 8.4 | 2.7 | 67.6 | 39 | 71.7 | 0 |
| 2000 | 30 | 1.27 | 18.0 | 7.0 | 2.5 | 71.7 | 25 | 73.1 | 1 |
| 2025 | 40 | 0.80 | 15.0 | 8.3 | 2.3 | 75.7 | 14 | 78.5 | 1 |
| USSR | | | | | | | | | |
| 1984 | 276 | 0.85 | 18.0 | 9.3 | 2.4 | 70.9 | 25 | 65.7 | 2 |
| 2000 | 315 | 0.76 | 16.3 | 8.7 | 2.3 | 74.0 | 17 | 74.3 | 2 |
| 2025 | 367 | 0.56 | 15.2 | 8.6 | 2.3 | 76.7 | 10 | 83.4 | 2 |

Source: United Nations Population Division, World Population Prospects: Estimates and Projections as Assessed in 1982 (to be issued as a United Nations publication); and United Nations Population Division, Estimates and Projections of Urban, Rural and City Population, 1950-2025: the 1982 assessment (to be issued as a United Nations publication).

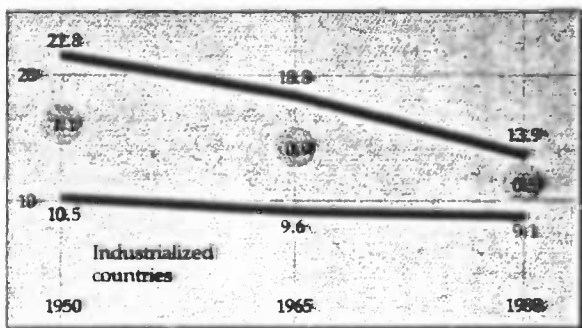
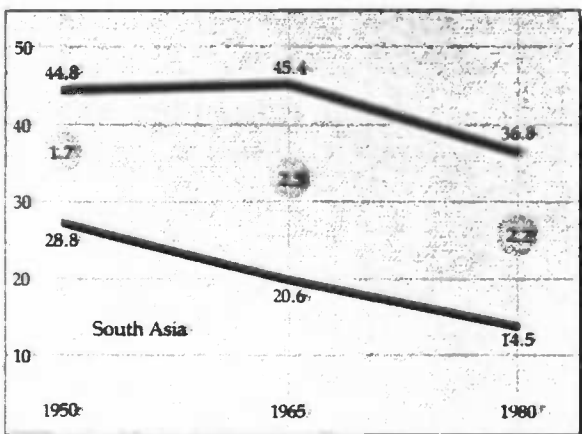
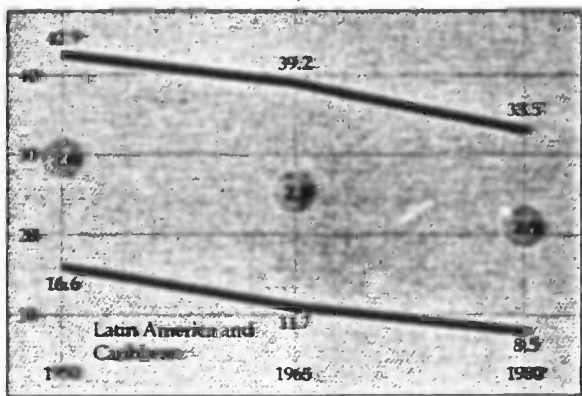
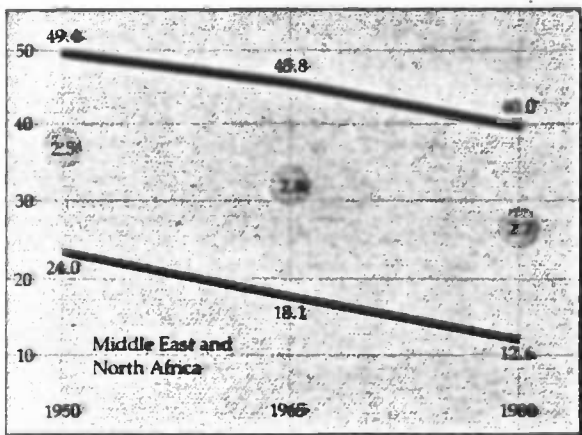
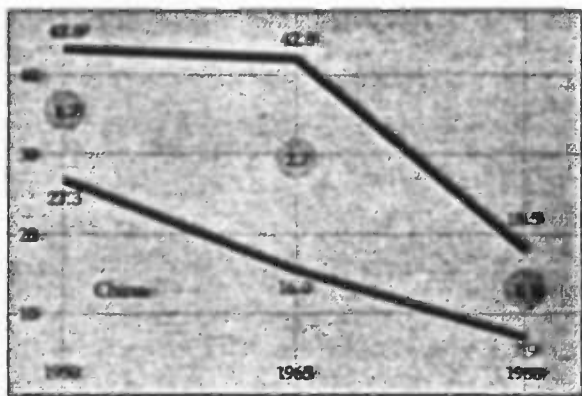
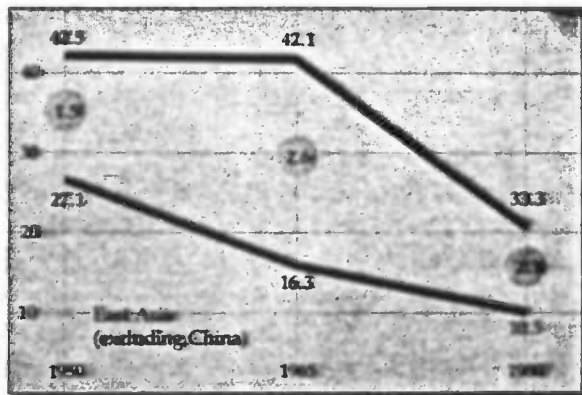
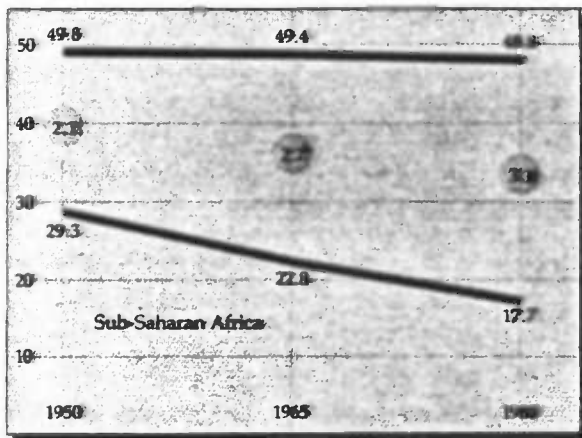
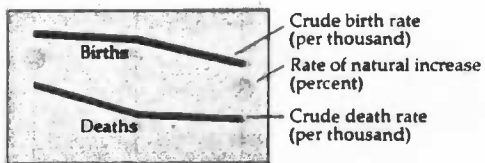
^{a/} The figures shown for the specified years refer to the following time periods: (a) 1974 is for 1970-1975; (b) 1984 is for 1980-1985; (c) 2000 is for 1995-2000; and (d) 2025 is for 2020-2025, with the exception of population size, urban population and the number of cities of 4 million or more, which refer to specified years.

Table 1 Major demographic indicators

| Region, years 2/ | Population size (millions) | Annual rate of change 2/ (percentage) | Crude birth rate 2/ (per 1,000 population) | Crude death rate 2/ (per 1,000 population) | Total fertility rate 2/ (per 1,000 population) | Life expectancy at birth 2/ (years) | Infant mortality rate 2/ (per 1,000 births) | Urban population (percentage) | Number of cities of 4 million or more |
|-----------------------------|----------------------------------|--|--|--|--|--|---|-------------------------------------|--|
| World | | | | | | | | | |
| 1974 | 3 994 | 2.03 | 32.7 | 12.7 | 4.5 | 55.4 | 94 | 38.0 | 20 |
| 1984 (medium) | 4 763 | 1.67 | 27.3 | 10.6 | 3.6 | 58.9 | 91 | 41.2 | 41 |
| (high) | 6 367 | 1.74 | 25.9 | 8.7 | 3.3 | - | - | - | 69 |
| 2000 (medium) | 6 127 | 1.52 | 24.1 | 9.1 | 3.0 | 63.5 | 50 | 48.2 | 66 |
| (low) | 5 899 | 1.29 | 22.3 | 9.4 | 2.7 | - | - | - | 64 |
| (high) | 9 105 | 1.33 | 20.9 | 7.7 | 2.0 | - | - | - | 150 |
| 2025 (medium) | 8 177 | 0.93 | 17.6 | 8.4 | 2.3 | 70.0 | 31 | 62.5 | 125 |
| (low) | 7 278 | 0.59 | 15.0 | 9.2 | 2.0 | - | - | - | 107 |
| Developed countries | | | | | | | | | |
| 1974 | 1 085 | 0.09 | 17.0 | 9.2 | 2.2 | 71.4 | 21 | 68.3 | 13 |
| 1984 (medium) | 1 164 | 0.64 | 15.5 | 9.6 | 2.0 | 73.0 | 17 | 72.0 | 14 |
| (high) | 1 316 | 0.71 | 15.5 | 9.2 | 2.3 | - | - | - | 16 |
| 2000 (medium) | 1 276 | 0.52 | 14.1 | 9.4 | 2.0 | 75.4 | 12 | 77.0 | 16 |
| (low) | 1 230 | 0.34 | 12.7 | 9.6 | 1.8 | - | - | - | 15 |
| (high) | 1 536 | 0.50 | 15.3 | 10.2 | 2.3 | - | - | - | 26 |
| 2025 (medium) | 1 397 | 0.29 | 13.5 | 11.0 | 2.1 | 77.2 | 8 | 85.4 | 21 |
| (low) | 1 275 | 0.0 | 11.6 | 11.9 | 1.9 | - | - | - | 15 |
| Developing countries | | | | | | | | | |
| 1974 | 2 909 | 2.46 | 38.7 | 14.0 | 5.5 | 52.7 | 106 | 26.0 | 15 |
| 1984 (medium) | 3 597 | 2.02 | 31.2 | 11.0 | 4.1 | 56.6 | 91 | 31.3 | 27 |
| (high) | 5 050 | 2.02 | 28.0 | 8.6 | 3.5 | - | - | - | 53 |
| 2000 (medium) | 4 851 | 1.79 | 26.9 | 9.0 | 3.2 | 61.0 | 65 | 40.4 | 50 |
| (low) | 4 660 | 1.56 | 24.9 | 9.3 | 2.9 | - | - | - | 49 |
| (high) | 7 649 | 1.40 | 22.1 | 7.2 | 2.0 | - | - | - | 124 |
| 2025 (medium) | 6 788 | 1.06 | 18.5 | 7.0 | 2.4 | 68.9 | 35 | 57.7 | 114 |
| (low) | 6 003 | 0.72 | 15.7 | 8.5 | 2.0 | - | - | - | 92 |

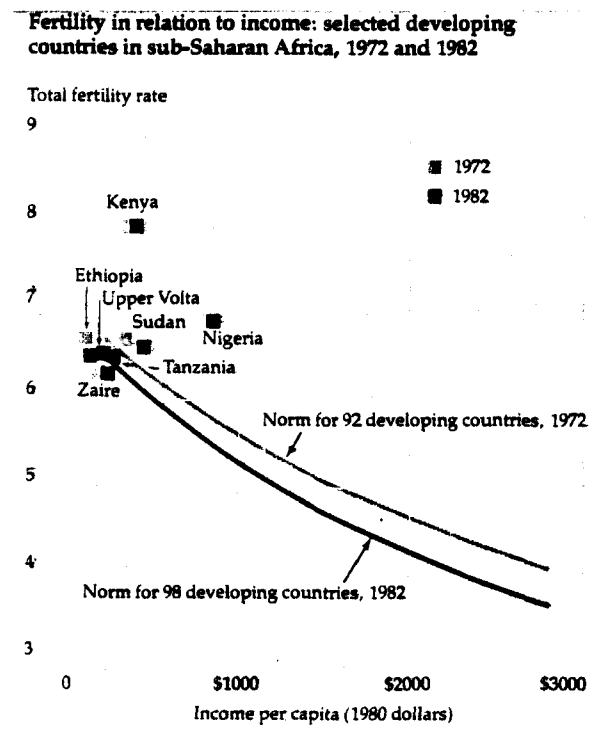
ANNEX 5

Birth and death rates and rates of natural increase by region, 1950, 1965, and 1980



Source: World Development Report 1984, The World Bank

ANNEX 6

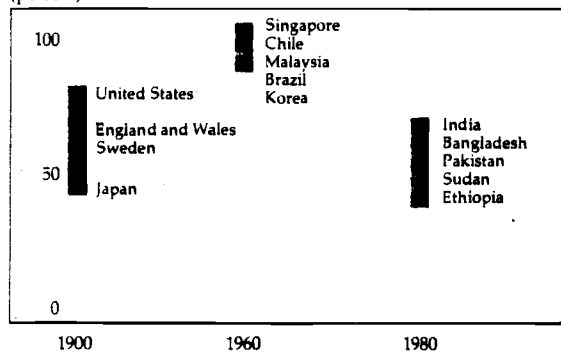


Source: World Development Report 1984, The World Bank

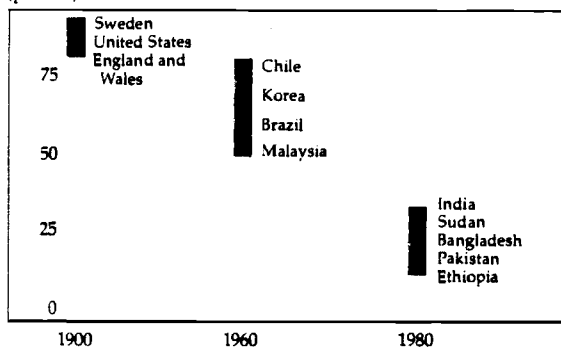
ANNEX 7

Indicators of standard of living, selected countries and years

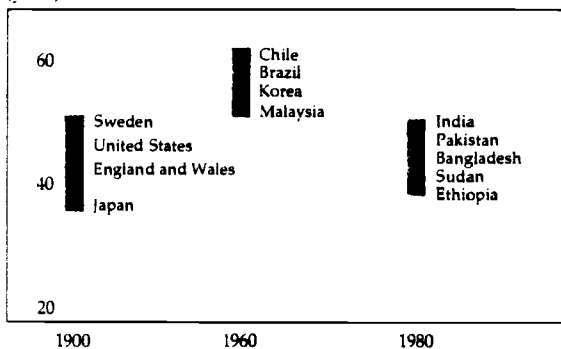
Primary school enrollment rate (percent)



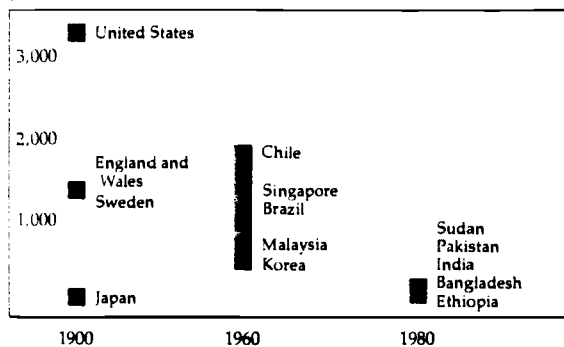
Literacy rate (percent)



Life expectancy at birth (years)



GNP per capita (constant 1980-82 dollars)



Sources: Tan and Haines, 1984; U.S. Bureau of the Census, 1960; Keyfitz and Fleiger, 1968; Mosk, 1983; Johansson, 1977; Zimmerman, 1965.

"As world population has moved toward four billion and beyond, human needs have begun to outstrip the productive capacity of many local biological systems."

Human population growth is also closely tied to the earth's energy resources. The great postwar growth in food production that sustained the massive increase in world population depended heavily on the abundance of cheap energy, particularly oil. Recent changes in oil production and pricing policies in key producing countries are altering the oil supply situation. As the oil outlook changes, population projections must be reconsidered.

Assessing the impact of population on the earth's resources is complicated analytically because population growth and rising affluence both increase pressure on the earth's resources. Not only are the effects similar, but from 1950 through 1973 each accounted for roughly half of the 4 percent annual growth in the world demand for goods and services. Since then, however, global economic growth has fallen to only 3 percent per year, and the population component of the overall growth in global demand has become dominant.²

An abundance of evidence indicates that pressures are mounting in a way that will influence future population trends. To be realistic, demographic models need to incorporate feedback mechanisms that reflect changing attitudes toward population size at both the national and the individual levels as the various ecological and economic stresses associated with continued population growth become evident. This in turn calls for an analysis of the relationship between population growth and both the earth's basic biological resources and its oil supplies.

Pressures on Biological Resources

An understanding of the carrying capacity of the earth's basic biological systems is a prerequisite of meaningful population projections. A biological concept, carrying capacity is a management tool widely employed by ranchers, wildlife managers, and others concerned with the sustainable yield of local biological systems. The failure to incorporate this concept into considerations of future population size has led to the projection of vast increases in numbers, even though in many local situations populations are already outgrowing the biological systems they depend on.

The increase in human numbers thus far has depended heavily on the product of the earth's basic biological systems—fisheries, forests, grasslands, and croplands. These four systems supply not only all our food but, with the important exception of minerals and petrochemicals, all the raw materials for industry as well. With the exception of croplands, these are essentially natural systems that cannot always be improved by human management.

The carrying capacity of the three natural systems is essentially fixed by nature. A natural grassland can support a set number of cattle or a somewhat larger number of sheep. A fishery can supply the protein for a certain number of people and the forest surrounding a village can satisfy the firewood needs of a given population. If the trees removed from a forest exceed its rate of regrowth, then the forest will eventually disappear. If the catch from a fishery exceeds its regenerative capacity, stocks will dwindle, and it will eventually collapse. If herds grow too large, livestock will decimate grazing lands and the resulting erosion will turn the pastures into barren wastelands.

Once the growth in human demand reaches the sustainable yield threshold of a given biological system, further increases in demand often can be satisfied only by consuming the productive resource base itself. This in turn causes it to shrink faster. Once the sustainable yield threshold is crossed, further population growth has a double-edged effect, simultaneously expanding demand and reducing the supply.

As world population has moved toward four billion and beyond, human needs have begun to outstrip the productive capacity of many local biological systems as currently managed. At the global level, these excessive pressures can be seen most clearly for oceanic fisheries. Throughout most of human existence, there were more fish in the oceans than humans could ever hope to catch or consume. As world population expanded following World War II, so did the fish catch and the investment in fishing fleets. The catch increased along with world population until the latter reached 3.6 billion in 1970. At this point, population continued to grow but the fish catch did not. Since 1970, investment in fishing fleets and fish farming has increased markedly, but the annual catch has remained around 70 million metric tons. With the catch leveling off since 1970, the fish supply per person has fallen by 13 percent. (See Table 1.)

The second global life-support system that is under mounting pressure is grasslands. Although data are not as complete as for fisheries, the signs of excessive stress are unmistakable. The pressures are evident in the deteriorating condition of grasslands in vast areas of the world and in the production trends of livestock products themselves.

From early biblical times until quite recently, the number of cattle, sheep, and goats has expanded more or less apace with the human population, supplying meat, milk, butter, cheese, leather, and wool. Although the dairy industry in the industrial countries relies heavily on the use of grains and other feed concentrates, most of the world's beef and mutton are produced with forage, largely grasses of one type or another.

The areas of the world used for grazing are almost without exception those areas that are too dry or too steeply sloping to sustain crop cultivation. Once the plow has run its course, the area remaining in grasslands around the world, roughly double that in crops, is essentially fixed by nature. Human intervention can sometimes raise the productivity of grasslands, and productivity can always be reduced through mismanagement, but the resource base itself cannot be significantly expanded. Indeed, as world population has expanded since mid-century, the area of grassland per person has diminished steadily.

ANNEX 9

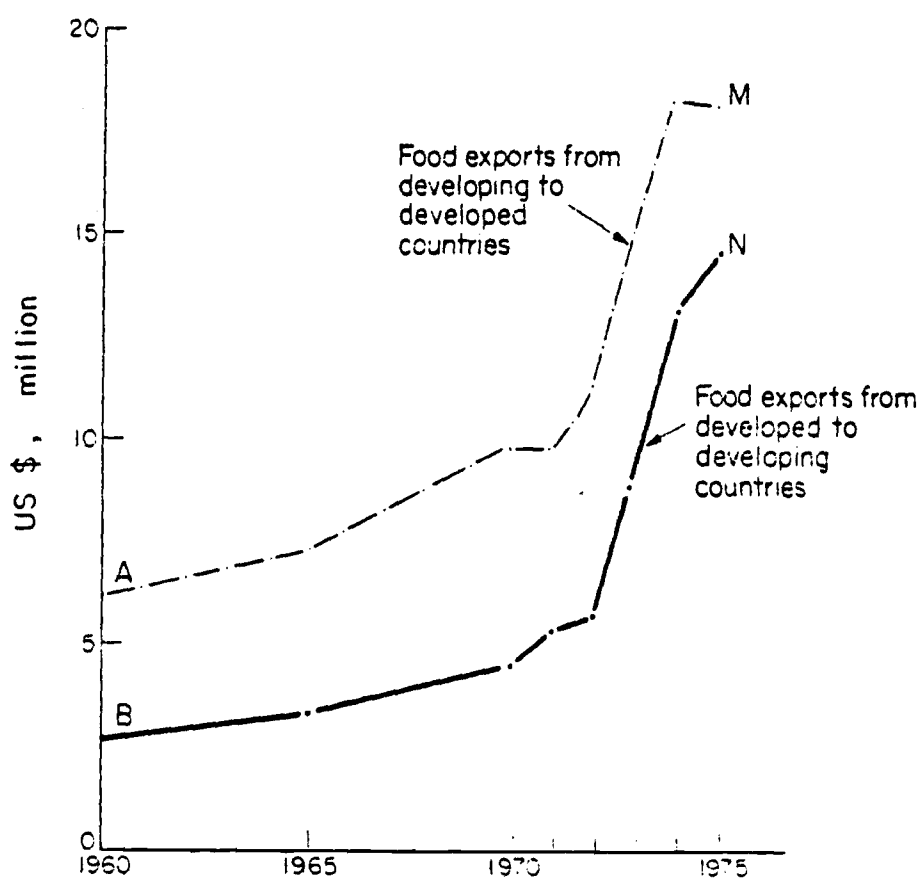
**World Production Per Capita of Key Commodities of
Biological Origin, 1960-78, With Peak Year Underlined**

| Year | <u>Forests</u> | <u>Fisheries</u> | <u>Grasslands</u> | | | <u>Croplands</u> |
|-------|-------------------|------------------|-------------------|-------------|-------------|------------------|
| | Wood | Fish | Beef | Mutton | Wool | Cereals |
| | (cubic meters) | | (kilograms) | | | |
| 1960 | — | 13.4 | 9.43 | 1.91 | <u>0.86</u> | 287 |
| 1961 | 0.65 | 14.3 | 9.67 | 1.91 | 0.85 | 278 |
| 1962 | 0.66 | 14.5 | 9.90 | 1.90 | 0.85 | 292 |
| 1963 | 0.66 | 14.7 | 10.25 | 1.89 | 0.83 | 286 |
| 1964 | 0.67 | 16.1 | 10.12 | 1.84 | 0.81 | 297 |
| 1965 | 0.67 | 16.2 | 10.09 | 1.82 | 0.79 | 288 |
| 1966 | 0.67 | 17.1 | 10.39 | 1.80 | 0.80 | 308 |
| 1967 | <u>0.67</u> | 17.7 | 10.59 | 1.92 | 0.79 | 308 |
| 1968 | 0.66 | 18.4 | 10.86 | 1.92 | 0.80 | 318 |
| 1969 | 0.66 | 17.7 | 10.90 | 1.88 | 0.79 | 316 |
| 1970 | 0.66 | <u>19.5</u> | 10.80 | 1.90 | 0.76 | 314 |
| 1971 | 0.66 | 19.2 | 10.57 | 1.91 | 0.74 | 335 |
| 1972 | 0.65 | 17.6 | 10.75 | <u>1.92</u> | 0.73 | 319 |
| 1973 | 0.66 | 17.5 | 10.63 | 1.83 | 0.67 | 337 |
| 1974 | 0.65 | 18.1 | 11.16 | 1.80 | 0.65 | 322 |
| 1975 | 0.62 | 17.6 | 11.49 | 1.80 | 0.67 | 321 |
| 1976 | 0.62 | 18.2 | <u>11.81</u> | 1.79 | 0.65 | <u>342</u> |
| 1977 | 0.62 | 17.4 | <u>11.53</u> | 1.78 | 0.63 | <u>333</u> |
| 1978* | 0.61 | 16.6 | 11.21 | 1.77 | 0.64 | 340 |

*Preliminary estimates.

Source: Food and Agriculture Organization and U.S. Department of Agriculture.

ANNEX 10



Source: World Development Report 1984, The World Bank

ANNEX 11

The 1972 food crisis was the subject of a detailed study in an IFIAS project entitled "Drought and Man".^{1/} The diagnosis emerging from this study is very different from the picture described above. The main conclusions may be summarized as follows:

- (1) In 1972 there was no disaster in food production at world level. On the contrary, from 1965 onwards production increased impressively, with two peaks in 1971 and 1973. Cereals production fell by 2.2 per cent in 1972 *in relation to the all-time high* of 1971. The average increase in production more than exceeded the world increase in population: 1972 production was 5.7 per cent higher than the average from 1965 to 1970. Between 1970 and 1976, world food production increased at an annual rate of 2.4 per cent, while population grew at an annual rate of 1.9 per cent.
- (2) Wheat production, excluding the United States and the USSR, *increased* by 4 per cent in 1972. Total cereals production (excluding rice) declined by only 0.5 per cent. But it has to be remembered that the Government of the United States paid high subsidies to farmers *not to grow*. With the average yield in that year, production from land kept fallow would have been more than double the deficit of the countries which suffered a food shortage.
- (3) The problems of the countries that experienced food shortages were not solved in 1972 - nor have they ever been solved before or since - by utilizing the sales of the exporting countries.
The shortfall in cereals production in the five Sahelian countries most affected by famine in 1972 and 1973 was 800,000 tons. No one could argue that there were no stocks to cope with this tragic situation. India suffered from great shortages in 1972 but refrained from importing because it did not accept the political conditions imposed.
- (4) The figure of 800,000 tons of cereals mentioned in the previous sub-paragraph stands out in comparison with others: in the same year *400 million* tons went to feed animals in the industrialized countries. The United Kingdom alone used *29 million* tons of cereals for its cattle. The Soviet Union imported 16 million tons in 1972 and 24 million in 1973. The figures for Japan were 16 million and 18 million tons.
- (5) The great variations in the international cereals market in 1972-1973 were confined to the great powers. It was the rich countries that bought cereals and obtained credit to buy. A comparison between the credits obtained by the USSR and the cutting off of exports to Chile (under the Allende Government) clearly illustrates the trend, sometimes purely commercial and sometimes purely political, in sales.

- (6) The massive purchases of grain by the Soviet Union in 1972-1973 were only partly due to the decline in production because of drought. The most significant fact was that the USSR went ahead with its plan to change the diet of the population: the 1972-1973 period marked a record in the production of animal protein in that country, and cereals were used for cattle feed.
- (7) The spectacular rise in the price of wheat, followed by other cereals was only partly due to the increase in exports (which were then ascribed with a great deal of exaggeration to the drought). The inflationary process began earlier, as a result of the crisis in the international monetary system, and it was reflected in all sectors of production. The increased demand for cereals was merely an aggravating factor, but it did not start off the process or determine the shape it took. Speculation and the reorientation of North American export policies had a greater influence.

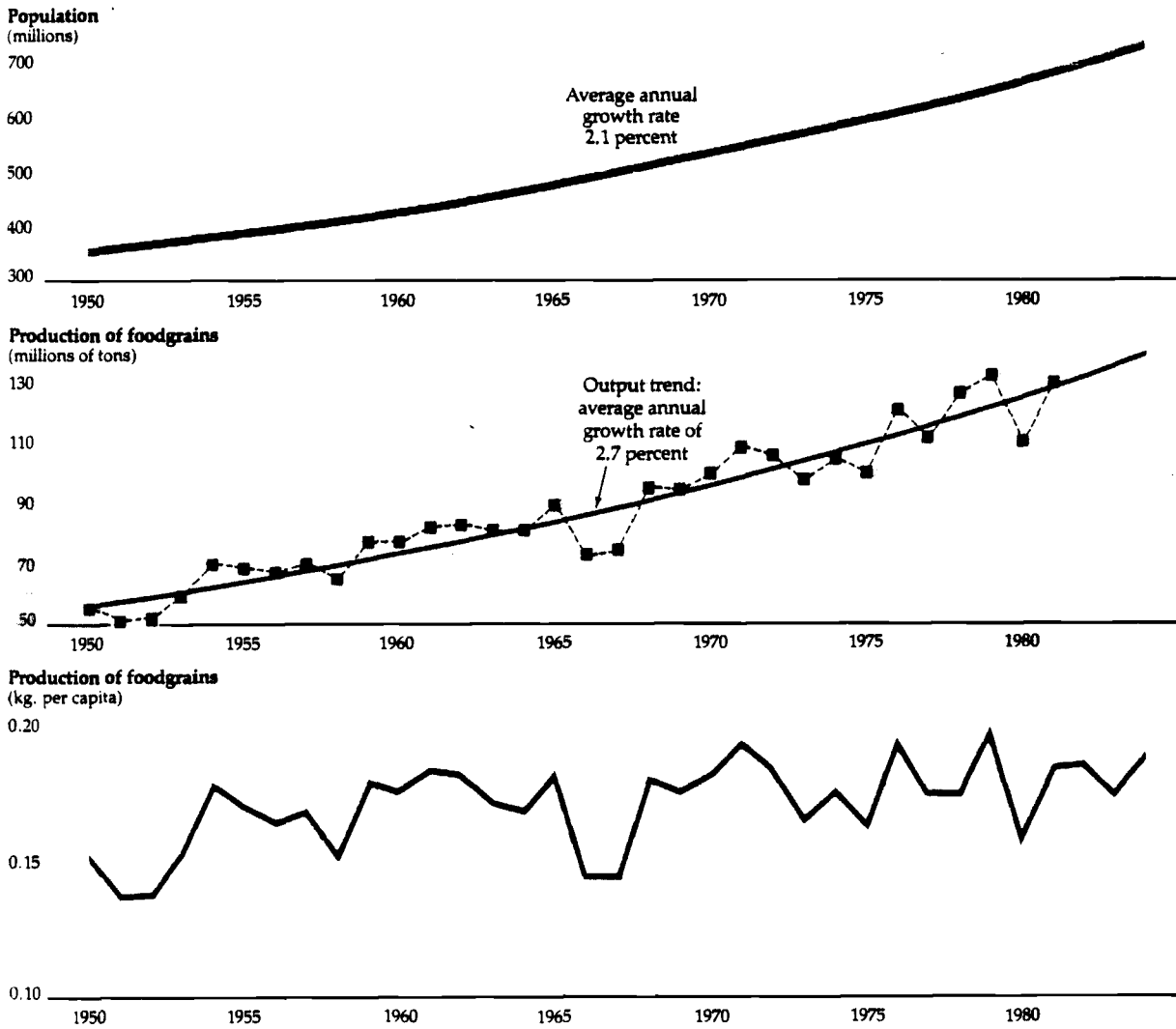
3. Fallacies and explanations of the food crisis

This brief summary of the so-called "food crisis" from the beginning of the last decade shows that the "explanations" still being purveyed in international forms are untenable. For all that, the number of fallacies they reflect have gone on to command a surprising consensus and become a part of "public opinion" about food problems. In their crudest form these fallacies have been denounced by various analysts and publications. Today, therefore, people are becoming aware of the "scapegoat" character of the factors bundled about in the "official version" at the international level. Despite these encouraging signs, no full, consistent and sound explanation has yet emerged to highlight the manifold roots of the problems and provide an incontestable alternative to the "official version".

One possible interpretation of the curious widespread acceptance of such a misleading, inconsistent and easily refutable explanation may be that the public hardly ever looks at the international context of the problems. Attention is generally focused on the national, regional - or even purely local - level and, what is more, confined specifically to the food sector. When problems are approached in this way, the fallacious explanations in the "official version" take on even greater plausibility. This explains why, in many countries affected by serious food problems, the national explanations that prevail are attenuated forms of the international "official version", with certain variations.

At the national level, a number of countries in the third world have reacted to the deterioration in their food systems by seeking solutions which will alleviate the most pressing problems fairly promptly. Generally speaking, the following steps are taken: first, the foodstuffs which are or should be the staple elements in a minimum acceptable diet for the people are identified; then comes a detailed survey of how they are produced and distributed and what should be done to achieve more effective production and

Foodgrains and population in India, 1950-83



Years shown are end years for the agricultural season. Data for 1983-84 are estimates.
 Sources: World Bank data; adapted from Cassen, 1978.

by PIER'S BLAKELY.

Pages 56 + 57.

Overpopulation

Another problem identified in the classic approach is that of overpopulation.

Any solution to the problem of (environmental) deterioration must first cope with the basic cause; overpopulation. (FAO 1980: 57)

The whole issue of the politics of population growth rates in relation to natural resources and production technology is a highly complex one, and not discussed in any great detail here. However, it is enough to point out that there are similarities between the 'overpopulation' view and the view that farmers and pastoralists should be educated out of their ignorant, lethargic and traditional ways. Both identify the cause of the problem as beginning and ending with the land-users themselves ... they should change their habits of production and reproduction, and the problem of soil erosion would be largely solved. In some policies the two problems are seen to be combined where the systems of farming collectively called shifting cultivation have reached a point where their carrying capacity has been exceeded, and fallow periods have become so short that degradation and erosion have set in (Allan 1967). The policy implication here is that family planning programmes are linked strongly with conservation programmes (as in Kenya or in India in Sanjay Gandhi's Four (and later Five) Point Programme which included both family planning and reforestation).

Involvement in the market economy.

The last problem identified in the classic or colonial model is that cultivators and pastoralists who cause soil erosion are insufficiently involved in the market economy. Involvement in the production of surpluses for sale in the market implies modern methods of cultivation and improved productivity, so alleviating the 'population problem', and the awareness of financial inducements, and incentive to undertake soil conserving agronomic practices and/or erosion works.

The policy implication of this view is a programme to help those farmers who can help themselves to grow cash crops.

A quotation (provided by Randall Baker, private communication) from a recent Australian funded cattle ranching scheme in Fiji illustrates both the unquestioned assumption that development must imply modern commercial development and the disparaging attitude towards existing social and economic organisation:

The Fijian traditional communal system of livelihood has a tendency to restrict initiative for commercial expansion and development so that there is a need to modify commercial values to meet with the demands of modern commercialism. This, in a nutshell, is what the Yalavou project sets out to do. (Fiji Government 1982: 7)

A case study of Kenya (Baker 1981) admirably illustrates many of these points, and Fig. 4.1 from Baker is reproduced summarising many of the points made above.

The political and economic origins of this approach to soil conservation go a long way to explaining it. It was an approach not of the land-users themselves but of their rulers, and therefore it is necessary to discuss briefly what the colonial rulers' political and economic interests were, and in what way they related to the people of colonised areas and to the natural resources they found there.

Fig. 4.1 The technocratic perception: environmental protection (from Baker 1981)

| PROBLEM | SYMPTOMS | CAUSES | SOLUTIONS | CONSEQUENCES |
|-----------------------------------|--------------------------|--|---|---|
| Kenya has an Environmental Crisis | Desertification | Overpopulation (overgrazing / overcultivation) | Family planning → | Lack of response |
| | Deforestation | | | |
| | Soil erosion | Ignorance → (tradition / culture / inapp. practices) | Education → Change attitudes | Inappropriate knowledge = frustration |
| | Catchment loss | | Demonstrate → new ideas | Short-term palliatives |
| | Silting | | | |
| | Decline of rivers | Lack of → environmental awareness | Environmental education and EIA | Rationalising oppression |
| Decline of food production | Inadequate → legislation | Tougher legislation → | Oppression and polarisation Protect environment against people | |
| | | Institutional → weaknesses | Integration Min. of the → Environment | New and more efficient ways of avoiding problem |