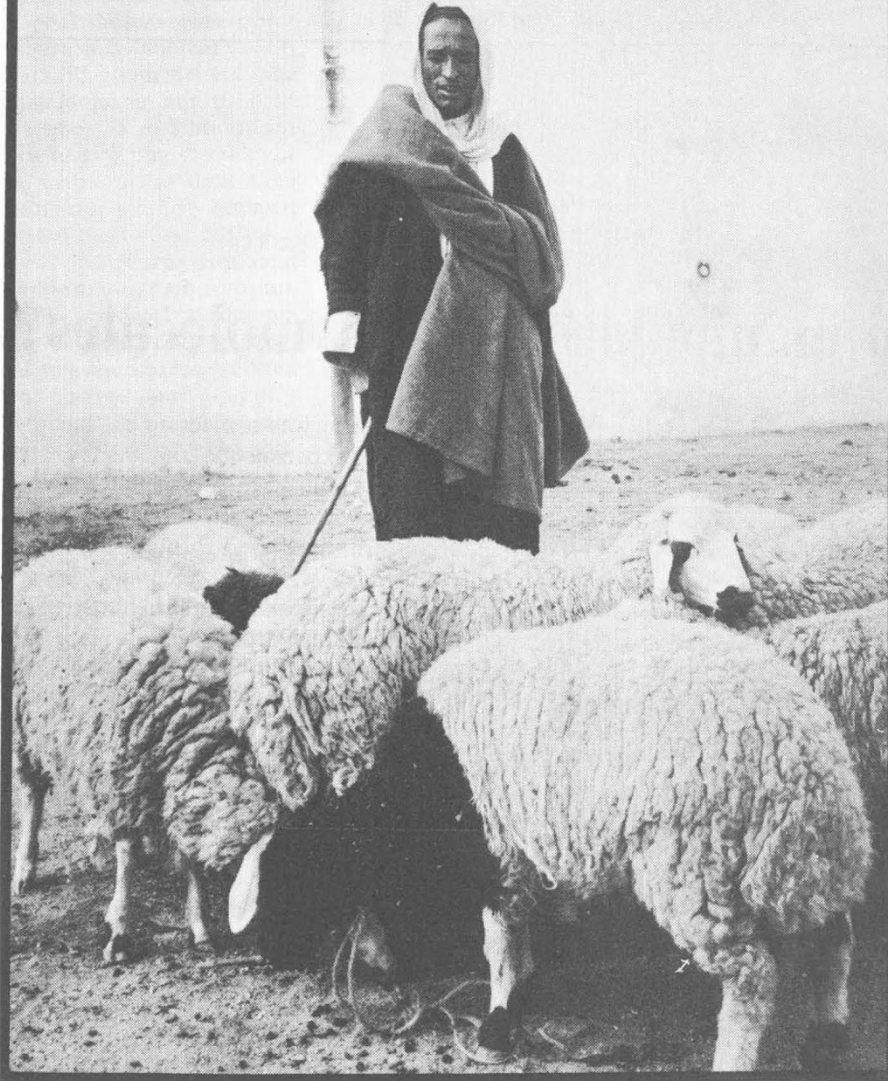


Man and the Biosphere



When a conscientious government department requests advice on the potential environmental effects of a proposed agricultural development scheme for an area of tropical forest or of the construction of an irrigation dam in an arid area, it is a chastening experience for the "scientist" to have to admit that he has no hard and fast advice to give. Contrary to what most people believe, we neither know for sure what should be done nor, equally important perhaps, what should not be done in these kinds of situations. For, paradoxically, although a great wealth of scientific information is available, much of it is not used and, in fact, in the mono-disciplinary form in which it has been compiled, is unusable within the context of development planning. In spite of the years of work that have gone into the study of forests, deltas and estuaries, arid zone grazing land and irrigation problems, and so on, the findings that have emerged, valuable as they are, do not provide practical answers to the sort of questions governments and decision-makers are asking, because the research approach has not been geared to consideration of the man/environment system involved. It was precisely to resolve this paradox that UNESCO's Man and the Biosphere (MAB) Programme was conceived in an attempt to develop an integrated research approach to the management problems arising from the interactions between human activities and natural systems. Michel Batisse, Director, Department of Environmental Sciences and Natural Resources Research, UNESCO, reports.

THE response to MAB at government level, particularly from the developing countries, was favourable from the start, yet it requires a very long time and much patient effort to get any project moving on a reasonably harmonious front at the international level. The reasons for this inertia are easy to understand. They relate to the traditional suspicion in the older countries of anything 'supranational', to the difficulties of fully conveying the concepts underlying a common objective in a multilingual and multicultural world, and to the mere fact that not all countries are, to put it mildly, at the same stage of development and at the same level of capability. For those with no experience of the intricacies of international cooperation, this slow movement is thoroughly frustrating. For those aware of the problems, it is always a pleasant surprise when some progress is actually made.

The MAB Programme provides a good illustration of this. It originated from the conference in September 1968 on "the scientific basis for rational use and conservation of the resources of the biosphere", which could hardly have dealt with a subject of greater concern to all men and countries. Yet it took some two years before the programme could be actually formulated and officially launched—in November 1970—by the General Conference of UNESCO. And it took another two years of misunderstandings and foot-dragging before it was unanimously endorsed by the Stockholm Conference on the human environment. What had been initiated through the enthusiasm of working scientists had to find its way through the tortuous pathways of politics and the minefields of official science before it could be presented to the world with all the necessary visas and blessings.

This has now been done, and another major step forward has since been achieved; last September, in Washington, DC, the International Coordinating Council which supervises the Programme recognised that the preparatory phase was over and that MAB could now enter its operational phase.

Although MAB was discussed during the summit talks between the USA and the USSR last year—to the great bewilderment of the chancelleries when they discovered this strange acronym in the official communiqué—little publicity has so far been given to the Programme in the scientific press and its actual scientific content is not known to many people potentially interested in it. The general objective has been formulated as follows: "to develop within the natural and social sciences a basis for the rational use and conservation of the resources of the biosphere and for the improvement of the relationship be-

Tunisia: MAB project area No. 3 (grazing lands) examines the problems of rangelands supporting three million 'sheep units'.

tween man and the environment; to predict the consequences of today's actions on tomorrow's world and thereby to increase man's ability to manage efficiently the natural resources of the biosphere".

To achieve this ambitious objective MAB has adopted an integrated, global approach to the analysis of ecological systems, their structure and functioning and their mode of reaction when exposed to human intervention. This approach stresses the impact of man on the environment but also the impact of the environment on man.

The MAB Programme comprises fourteen project areas forming a kind of research matrix in which the main ecological systems and physiographical units (tropical forests, grazing lands, mountains, islands, river basins and estuaries, and so on) interact with major activities or processes such as conservation of genetic resources, use of pesticides and fertilisers, major engineering works or demographic changes.

The MAB Programme is intergovernmental in structure: it is controlled by an International Coordinating Council consisting of representatives of 25 member countries, sitting together with representatives of the organisations of the UN system interested in the Programme (UNEP, the FAO, the WHO, the WMO and UNESCO) and representatives of ICSU and the IUCN. The contribution of each country to the international programme is developed through National Committees, where normally scientists from universities and research institutions sit alongside representatives of government departments. The general secretariat is provided by UNESCO.

Today, after the somewhat tedious but all-important period of preparation during which working groups and expert panels hammered out research guidelines for all projects, the stage is set for actual implementation of co-operative programmes at the regional and international level. Some 80 MAB National Committees have been established, not all of them perfect but most of them keen to move ahead.

Underlying the Programme are three concepts on which its approach to research is based: MAB is problem-oriented, it is interdisciplinary and it aims to provide both immediate and long term scientific, economic and social benefits, in particular to the developing countries.

A problem-oriented approach to research has the twin advantages of projecting the practical face of science to government leaders and of involving decision-makers in the formulation and implementation of projects. Within MAB, the scientist who has traditionally been concerned with the question

"what happens?" in an ecosystem is asked to go a step further and attempt to answer the question on which the decision maker will base his judgement, that is, "what would happen if . . . ?"

Work now being undertaken in Tunisia within the framework of MAB Project Area No. 3 (grazing lands) provides a good example of this problem-oriented approach. The arid and semi-arid areas of southern and central Tunisia cover 65,000 square kilometres and account for some 40% of the national territory. Intense pressure is being exerted on this area by the 3 million "sheep units" it harbours (the various categories of domestic animals being statistically accounted for in terms of sheep equivalents) and by a human population of 1 million urban and 2 million rural inhabitants. The sort of information Tunisian planners want is: what is the carrying capacity of the rangelands and how can it be improved? How far should the development of intensive farming be improved? How far should the development of intensive farming be encouraged? What would be the ecological effects of the introduction of improved fodder crops? The answers provided will have a major bearing on the ecological, economic and social future of the country, and will be of obvious interest to other countries in the Mediterranean area having similar conditions.

The interdisciplinary approach is, by the very nature of things, essential to the MAB programme, but there are considerable difficulties in creating interdisciplinary research teams and in integrating fully the results achieved.

It is easy enough to talk about the need to break down the barriers between disciplines, but many of these divisions have a logical and practical basis. The units of analysis employed often differ from one discipline to another. Socio-cultural studies are usually based on social units—kin groups, tribes, communities—whereas ecological studies may be based on sample areas of a few hectares or even less. Problems of the duration of research also arise. A botanist may be interested in the problem of biomass changes in a plant community during a single growing season, whereas the sociologist may need to examine migration trends over a number of years. If an interdisciplinary effort is to succeed it must be planned as such from the start; each research worker must be prepared to adapt to the methods of others and all must possess the flexibility of mind and the team spirit that this approach implies.

The vital importance of interdisciplinarity is well exemplified in two current MAB projects. In the study on population and environment in the eastern

islands of Fiji (MAB Project Area No. 7—*island ecosystems*) the research team consists of ecologists, pedologists, a nutrition expert, human geographers, a biogeographer and marine biologists. The objective is to understand the actual relationships between population levels and natural resource use under well established conditions. In Hong Kong, where an integrated ecological study of a large urban settlement is being carried out with Australian support (MAB Project Area No. 11—*urban systems*), the spread of disciplines is even wider; the fifty-strong research team ranges from biologists and hydrologists to sanitary engineers, architects and town planners, physicians and psychologists, cultural anthropologists and sociologists. The team also includes a small unit which specialises in the study of the problems of research integration. The objective is, of course, to understand the functioning of the urban system as a particular kind of ecosystem, in order to provide a sounder basis for its planning and management.

It is interesting to note that—in contrast with most previous international research efforts—the MAB Programme stimulates a particularly strong interest in the Third World countries. Determined to shake off the vestiges and constraints of their past, they are eager to exploit their natural resources for their direct benefit. But they are more aware than one thinks of the difficulties involved in changing traditional methods of land use or introducing foreign technologies. They seem therefore to have quickly realised that MAB can offer them tools with which to formulate important aspects of their development planning. A typical example is the problem of the tropical forests. About half the world's forest area is located in three main regions: tropical Africa, tropical America and South-east Asia. Tropical forests are estimated to cover an area of some 2,000 million hectares, of which some 850 million hectares can be regarded as tropical rain forests. Forests are seen by developing countries of the tropics as largely unexploited areas for colonisation and agricultural development as well as a potential source of foreign exchange. For the developed countries they represent a readily available source of relatively cheap timber.

Widespread modification or destruction of tropical forests is of concern to scientists because of their ecological diversity, complexity of structure and richness in species. Within the tropical region, intimate relationships exist between the indigenous populations and the forest, and the forest is important for soil and water conservation. Because of their extent, biomass and dynamics, tropical forests also play an important yet little understood role in the global

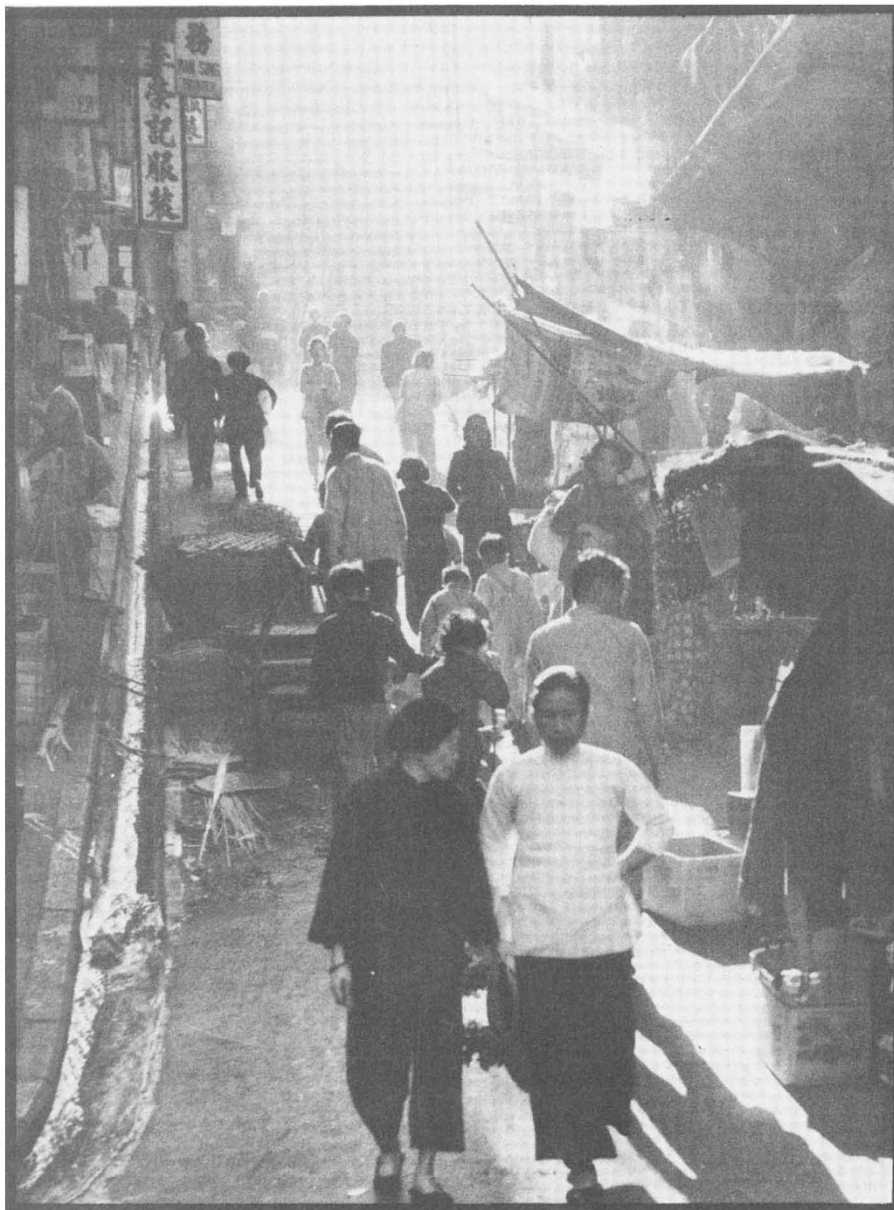
ecological and atmospheric balance of the biosphere.

The importance of research in this field was recognised from the inception of MAB and a general formulation of the practical research problems involved was made in November 1971 under MAB Project Area No. 1 (tropical and sub-tropical forest ecosystems). The next step was to convene in May 1972 an *ad hoc* panel of experts to elaborate the scientific content of research in this area and to consider approaches and plans of studies that could be recommended to the MAB National Committees concerned. This was followed up by an international working group meeting held in Rio de Janeiro in February 1974 which was given the task of identifying problems of common concern and of examining research proposals presented by the different governments that would involve international cooperation. The working group was also asked to discuss the requirements for regional coordination of research, harmonisation of methods and measurements, the exchange of information, experience and personnel, the training of specialists and technicians, and the sharing, storage and processing of data. Finally, regional meetings have been organised in Kuala Lumpur and Mexico City at which national representatives proposed specific pilot field projects for the regions concerned. Similar regional meetings are to be held in Kinshasa and Varanasi later this year.

At the same time regional long term training courses on tropical ecology have been organised in Venezuela, the Philippines and Kenya to contribute to the training of ecologists who could be used in the development of research and management programmes in the three regions concerned. Finally, a world-wide synthesis of knowledge on the tropical forest ecosystems and their rational use and conservation is being prepared for publication in 1976 so as to provide a common background and conceptual basis for MAB Project No. 1.

As a result of this strategy, one can envisage within the near future the development of a network of pilot schemes for integrated ecological research in the three tropical forest regions of the world, involving the exchange of research personnel, providing field training, and forming part of an inter-regional co-ordinated effort to help master one of the most challenging problems of the tropical world. A similar 'strategy' is being applied for other MAB project areas, particularly those on grazing lands and urban systems.

Is MAB now really going to take off? At the last session of the UNESCO General Conference, where some 130



Hong Kong: chosen by MAB for an integrated ecological study.

governments represented were sharply divided on several issues, MAB received unanimous support. The political obstacles therefore seem minimal. Governments, particularly those of the developing countries, are very interested and those scientists already involved in the Programme are committed to its success. The major difficulties are probably elsewhere. They lie primarily in the difficulties—lack of scientific infrastructure and of personnel—developing countries face in playing their role in a world-wide programme, which would be meaningless without their participation. This can only be mitigated through a vigorous training and technical assistance back-up effort in which all donor countries and international organisations concerned should give a hand.

The role already played by UNEP in support of MAB has already been significant, particularly for the regional

activities which are undertaken.

But ultimately the key to the whole operation probably lies in the hands of scientists from the industrialised countries. For them, the programme offers access to areas of the world in which challenging research projects are being developed, either through direct co-operation between MAB National Committees or through multilateral channels. It offers also the interest of adapting to new interdisciplinary methods and to a spectrum of research, the social value of which is beyond question.

Times are difficult everywhere for research funding, but the case for an environmental research programme such as MAB is unanswerable. The scientific community could, if it so wished, demand and obtain the necessary facilities which it alone can mobilise and utilise to make MAB a true and lasting success. □