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PANEL OF EXPERTS ON ENVIRONMENTAL MANAGEMENT FOR VECTOR CONTROL (PEEM)

Report of the Eighth Meeting
Nairobi, 5-9 September 1988

PART I: TECHNICAL DISCUSSION – Education and training for the planning, design and implementation of environment management for vector control

PART II: GENERAL PROGRAMME AND POLICY

PEEM Secretariat
World Health Organization
Geneva, 1988

WHO FAO UNEP

JOINT WHO/FAO/UNEP PANEL OF EXPERTS
ON ENVIRONMENTAL MANAGEMENT FOR VECTOR CONTROL

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PEEM SECRETARIAT
World Health Organization
Geneva 1988

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OPENING CEREMONY

The eighth meeting of the WHO/FAO/UNEP Panel of Experts on Environmental Management for Vector Control was held at the headquarters of the United Nations Environment Programme, Nairobi, from 5 to 9 September 1988.

In his opening statement Dr Mostafa K. Tolba, Executive Director of UNEP, first pointed out that the Panel was meeting at a significant moment for global environmental management: there was new progress to report, but there were also new problems to confront, including new and more intense challenges in the field of control of vectors of major environment-based diseases. The political and scientific communities were trying to respond to the most important environmental policy statements of the decade: the Environmental Perspective to the Year 2000 and Beyond, and the Report of the World Commission on Environment and Development.

Dr Tolba strongly supported the Panel in its wish to become more field- and action-oriented, now that its expertise had been established and matured through the generation, collection, assessment and dissemination of relevant information. It might be timely for the co-sponsors of PEEM to consider in what ways its mandate could be amended to permit new directions. Current health statistics and estimates, and new policy directions suggested an increased scope for action. The dramatic resurgence of malaria, with an estimated 2000 million people currently at risk, and the close association between irrigation and schistosomiasis, with which an estimated 200 million people were infected, should be considered in the light of predictions of irrigation development in the next decade: from 90 million to 180 million hectares under irrigation in the developing countries.

The two above-mentioned policy documents, Environmental Perspective to the Year 2000 and Beyond and the Report of the World Commission on Environment and Development, drew attention to these problems and called for the type of public health action that could be promoted and demonstrated through PEEM. The Panel was reminded of two new development programmes in Africa, which were based on strict environmental management principles and which would provide specific scope for PEEM-recommended pilot and demonstration projects in the field. These were the Cairo Programme for African Cooperation and the Zambesi Action Plan. It was suggested that the Panel review the practical considerations that arose from the two policy documents and the two action plans, and that it recommend how and in what form PEEM could take the opportunities they offered.[1]

In conclusion, Dr Tolba alluded to the apparent discrepancy between what was known in terms of techniques and methods for vector-borne disease prevention and control, and the level of their application, which was indeed very limited. This situation was avoidable and intolerable. It was PEEM's challenge to take the knowledge and know-how out of the experimental phase and into the field far more extensively and intensively than had been done so far.

On behalf of the Government of Kenya, a welcome address was delivered by the Minister for Environment and Natural Resources, the Hon. J.J.M. Nyagah, EGH, MP. In his speech, the Minister recalled the several stages in the history of vector control activities in Kenya, which dated back without interruption to 1921. The current state of malaria (3.68 million cases reported in 1985, 4.57 million in 1986) and schistosomiasis (6873 cases recorded in 1985, 29360 in 1986) was a matter of grave concern to the Kenyan health authorities. As the Panel would be able to observe

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[1] The observations and recommendations resulting from the Panel's review of the Report of the World Commission on Environment and Development are presented in Annex 1 of this report; those resulting from the review of the two programmes in Annex 2.

directly during its field visit to the Mwea Rice Irrigation Scheme,[1] health education was a major tool for the prevention and control of the two diseases.

The role of water resource development in the observed increases was clearly recognized, and the Minister expressed his doubt with respect to the wide-spread notion that socio-economic development would automatically lead to a decrease in malaria. In fact, most rural economic development in Kenya had shown that quite the reverse was true. Furthermore, associated resettlement had contributed to the introduction of non-immune populations in malarious areas, and the spread of drug-resistant Plasmodium strains. Now that insecticide spraying had been shown not to be a sustainable option for disease vector control, environmental management was emerging in Kenya as a possible alternative, particularly in new water resource developments. The Minister noted with appreciation the practical follow-up by the Panel immediately after its annual meeting, when a two-day seminar for Kenyan government planners in health, agriculture, irrigation, water resources and environment would take place in Kisumu.[2]

On behalf of the Food and Agriculture Organization of the United Nations, Mr U.J.H. Grieb, FAO Representative in Kenya, referred to the various important links existing between agricultural development and vector-borne disease transmission. These had been highlighted in extenso at the seventh PEEM meeting. In the context of agricultural development in Kenya it was noted that some 200 000 hectares of arid and semi-arid land could be made arable through perennial irrigation. Schistosomiasis would be one of the major health hazards associated with this development. With a current estimated 10% prevalence of the infection, and a projected population size of 38.5 million by the year 2000, it could be predicted that, assuming no change in the transmission pattern, by then nearly 3.9 million Kenyans would suffer from the infection.

The Kenyan authorities were aware of the task ahead of them and were determined to fight the problem. It was the responsibility of WHO, FAO and UNEP to provide the best advice and material assistance they could afford to help strengthen Government efforts in the fight against vector-borne diseases, and to assist in the construction of irrigation projects that were productive, sustainable and environmentally sound.

On behalf of the Director-General of WHO, and the Director of the WHO Regional Office for Africa, Mr R. Bos, Scientist in the Division of Vector Biology and Control and Secretary of the Panel, emphasized the double significance of Nairobi as the venue for the Panel's eighth meeting: it underlined UNEP's continued commitment and support to PEEM's original objectives, and it focused on the African continent. In view of the huge irrigation potential of Africa, an accelerated development of water resources could be expected in the coming decades, with environmental and demographic consequences that were likely to have a serious impact on human health.

The World Commission on Environment and Development in its report "Our Common Future" had strongly rejected development policies leading to the need for "after-the-fact" repair of damage. Its recommendations to develop effective impact assessment and monitoring tools, and to establish appropriate institutional arrangements were of utmost relevance to the Panel's objectives. Another element of sustainable development strategies was human resource development, which had for a long time been a crucial component of WHO's programme of work. It was hoped that the Panel would formulate concrete and realistic recommendations on the basis of its technical discussion on education and training, so that the three organizations could act properly upon them.

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[1] A brief report of this visit is attached as Annex 3.

[2] The report of the seminar on water resource development planning and vector-borne disease control in Kenya (Kisumu, 11-13 September 1988) will be published by PEEM in the course of 1989.

PART I. TECHNICAL DISCUSSION

EDUCATION AND TRAINING FOR THE PLANNING, DESIGN AND IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT FOR VECTOR CONTROL

The eighth annual PEEM meeting included a one-and-a-half day technical discussion on the above theme. Thirteen working papers were presented and served as a basis for the discussion. One was a general introductory paper, six addressed training and the remaining six focused on education, there being both issues papers and case studies on each of these topics. Titles and authors of the working papers are listed at the end of Part I of this report.

1. INTRODUCTION

The challenge

The environmental control of disease vectors is remarkable among public health activities in that it involves a very wide range of disciplines and levels of skill, yet requires full-time commitment from only a small proportion of the varied manpower involved. The educational issues to which this gives rise were explored by the Panel in relation to vector control in both water resource development and primary health care. The Panel concluded that different approaches were needed in each context but in either case there is a hierarchical gradient from an emphasis on changing attitudes at the higher levels down to increasingly technical education for those more closely involved at lower levels.

Education at different levels

Those involved in vector control

The Panel identified a wide range of categories of people involved in environmental management in one way or another, from politicians, to ministerial decision makers, senior officials of international development and donor agencies, professionals, technicians, manual workers, community leaders, and farmers and their families. It was recognized that the main activities in decision making and in implementing environmental management for vector control in water resource development are required from those for whom human health is a side-issue. The necessary education is thus not merely a matter of transmitting relevant factual information but rather an emphasis on affecting attitudes and perceptions. Any water resource development is a multidisciplinary activity, requiring input from hydrologists, engineers, agronomists, sociologists and others. To introduce vector control in these projects requires the addition of entomologists and epidemiologists, and appears to raise no new fundamental issues. The introduction, however, of environmental control of vectors raises important problems because it requires action by different professions and is not implementable by health staff and entomologists alone. It requires inter-disciplinary as well as multidisciplinary activity, and a change in perception and in values on the part of several groups of professional workers. Having several different goals in an enterprise tends to reduce the efficiency of attaining those goals, as compared to seeking the achievement of one single objective. This notion underlies the resistance encountered in most established professionals to accepting the necessary changes towards adopting new goals.

Education for understanding, attitudes and perception

Intersectoral and interprofessional collaboration, and active participation by local communities were seen as the key factors for the successful application of environmental measures for vector control in water resource developments.

Aims of education and training

The aims of education and training in this connection were that environmental management approaches to vector control would be properly considered in all relevant situations, would be adopted and effectively implemented where appropriate.

It followed that more specific aims of education would ensure that opportunities were perceived, that they were rationally considered by the professionals involved who would fairly assess the relative claims of vector control and other objectives in each situation as appropriate, that the technical means used to control vectors by environmental management were known and correctly applied, and that all members of the community affected by the environmental measures would co-operate sufficiently for their effective implementation.

For non-professional decision makers

For non-professional decision makers and administrators in the field of water resource development, an educational programme needs to include a raising of general "health awareness". Because so diverse an audience needs to be reached, continuing media coverage of vector control as well as interdepartmental conferences and circulation of documentation within government departments is needed to maintain awareness. To ensure a general level of concern with vector control, it is necessary, at national and regional level, to employ small numbers of specialist entomologists and epidemiologists who can provide expert advice to planners and decision makers outside the health sector.

For professionals not belonging to the health sector, such as engineers, agricultural scientists and hydrologists, the key need is for a limited amount of education on environmental management for vector control to be provided relatively early in their education. This education should specifically emphasize in which way each category of professionals, of those that may become involved in the planning, organization and management of water resource developments, can contribute to effective environmental management. Teaching and teaching materials must be designed to interest and excite the students, so that they will acquire a positive attitude towards considering human health aspects of their future work.

For professional staff

The educational requirements of professional staff involved in water resource development include a need (a) to raise the status of interdisciplinary work and multiple purpose projects, (b) to raise their perception of health and vector control, (c) to provide a very small cadre of specialists in environmental management of vectors within each discipline, and (d) to provide some basic technical or professional information on vector control to each cadre of professional.

The education of professional staff involved in the operations of vector control programmes should, in the context of environmental measures as part of water resource development, (a) encourage intersectoral collaboration with the water resource sector, (b) create a basic understanding of hydrological

engineering and agronomic aspects of water resource development and (c) provide the skill to carry out a sound cost-effectiveness analysis of the use of environmental management as compared to that of other vector control measures.

For the community

In general, the main successes of environmental control of vector-borne disease have been recorded under circumstances of a strongly enforced discipline: schistosomiasis in the early days of the Gezira, in Sudan; Anopheles gambiae eradication in Brazil; sleeping sickness control at the beginning of the century in Uganda. Where compulsion is applied, there are few or no educational implications. But where a similar goal is sought with the active co-operation and support of the community, it is clear that a fairly full understanding of the health problems is needed by the community. This will make substantial demands on any health education or agricultural extension programme and, unless it can build on an appropriate primary school education, its outlook is not promising.

Constraints

There are numerous locally conditioned constraints on education for vector control, but also many major problems which are likely to be more specific for a given level of staff. In relation to water resources development, the two major impediments to progress at the political and decision-making level are likely to be the long timescale for certain health problems to arise as compared with the time in which politicians seek returns, and the widespread notion that improvements in human health will automatically follow the socio-economic progress that will be achieved through resource development. The need to inculcate awareness of health and vector issues in non-professionals of varying backgrounds is particularly intractable. The next level down in water resources development, the professional engineers, agricultural scientists and hydrologists, are crucial to the success of environmental management for vector control but they are likely to be resistant to education in this area during degree courses on the grounds that health and vector issues are peripheral to their key subjects, their examinations and the interests of their teachers.

Remedies in educating professionals

To overcome these constraints requires high quality teaching methods that will open minds to options rather than teaching specific knowledge. The teaching will need to be relatively early in university courses before too many professional "blinkers" have been acquired. An approach using case studies and prepared material on multipurpose water resource developments is preferable. The practical constraint of fitting any new component into an educational programme, especially if it is viewed as peripheral to the core discipline of the course, should, however, be born in mind.

Factual guidance

At the next level, the education of technical workers, the more technical aspects of project design, the relative lack of standard procedures and rules of thumb will be a constraint, together with the limited amount of cost-benefit data available to guide costing and to defend decisions.

Constraints in educating communities

The main constraints at the community level are related to the general educational background of the population and the large numbers of people to be educated. The case studies reviewed by the Panel illustrated different approaches, and two

issues were identified as particularly important in solving the problem. One is to engender a basic understanding of vectors, their importance and environmental control, as part of routine primary school education. The other is to have appropriate teachers and teaching materials available in the field with due concern for local customs and traditions.

Concentrate education on key personnel

The large variety of workers involved in environmental control is a constraint in itself, as there is a real risk that resources may be spread too thinly. There is a need to focus on key personnel. For water resources development this may best be the professional engineer, usually the single most influential person at design and construction stages, whose sympathetic involvement is crucial. The professional engineer, together with colleagues from other professions, can inform and influence politicians, administrators and other decision makers, for example those representing donor agencies. Over the last decade considerable progress has been made in incorporating health and vector control issues in the training of engineers in some countries, but much remains to be done before such teaching becomes universally accepted and effectively implemented.

For vector control in primary health care, the key staff member is the environmental health officer. To include vector control in their education raises no special problems, the main difficulty being to ensure that they are adequately supported by the medically qualified staff. The traditional, limited vision of clinicians and their lack of enthusiasm for entomology needs to be sensitively overcome through teaching with case studies.

Need for effective training material

There are three areas in which training material is not readily available but is needed, particularly where there is a dearth of subject experts. The problem is not simply the lack of educationally well presented information but the absence of fully worked up material on which to base it. The needs are:

(i) Case studies showing the need to consider environmental and health effects on a long timescale at the planning stage of a single or multipurpose water resource development, and to familiarize professionals with the environmental management approach to vector control in this context.

(ii) Texts for engineers and other professionals giving standard approaches and solutions for vector control in natural resource development. With all the epidemiological reservations so often expressed, engineering professionals still need some type of manual of what to do.

(iii) A thorough financial and economic analysis of environmental management of vectors. There is too little material for the professional to assess the likely costs and benefits of modifying the environment.

The aim of (i) and (iii) is to simplify the task of the engineering or other professional who has a positive attitude towards vector control but needs standard information in order to implement anything in the field.

It was clear from the discussions of the Panel that there are no simple solutions or short cuts to achieving the type of education needed at all levels for environmental management of

vectors to succeed. Conversely, it is extremely easy to ruin an attempt at such education. It is, however, also clear from the progress that has been achieved in education of engineers, for example, and from some of the presented case studies that success is possible.

Emphasis on intersectoral collaboration and community participation

The meeting accepted the call for action embodied in the report of the World Commission on Environment and Development, Our common future, and considered ways and means by which proper education and training could contribute to establishing intersectoral and interprofessional collaboration, as well as informed community collaboration in sustainable development.

For reasons of clarity the remainder of the discussion has been divided into two main sections: awareness-building, education and training in environmental management; and community health education for environmental management.

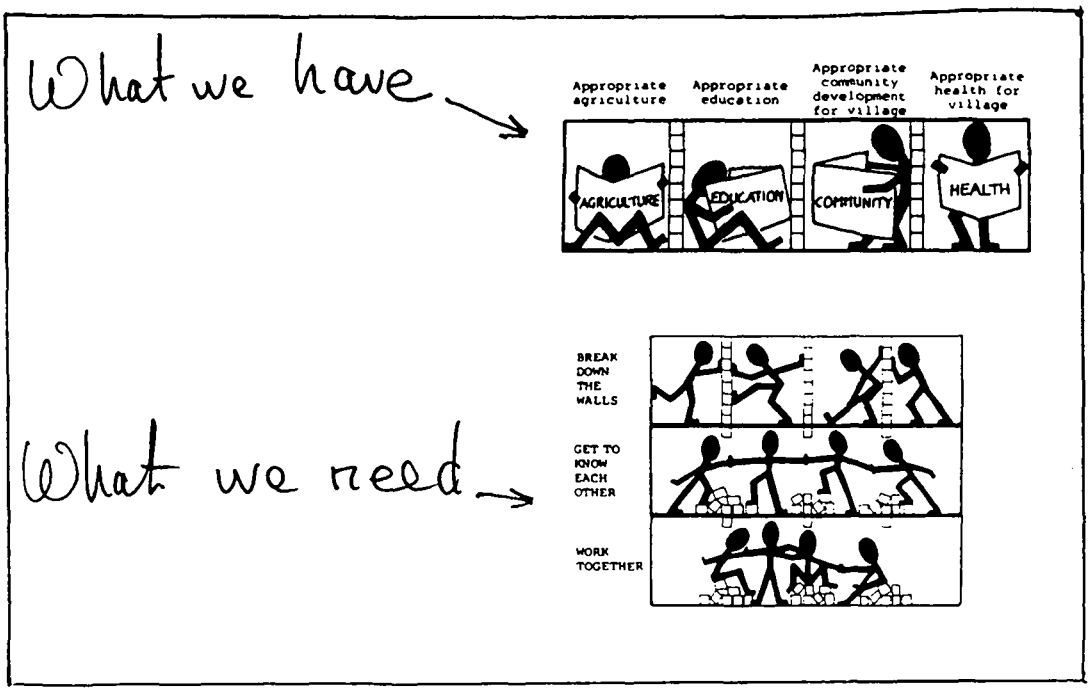

Figure 1. The case for integration. Source: Atchia, M. Working paper PEEM/8/WP/88.15

2. AWARENESS-BUILDING, EDUCATION AND TRAINING IN ENVIRONMENTAL MANAGEMENT

Topics discussed

In its discussion the Panel examined a number of questions:

- What distinguishes education from training?
- Who is to be educated and trained in environmental management for vector control with special reference to water resources development?
- What are the major constraints in intersectoral and interprofessional collaboration and how can they be overcome by proper education and training?

- How do adults learn best and how should they be assisted?
- What is problem-based learning?
- What kind of resources for learning and what further research are needed?
- What is being done already?
- What might be done to advance education and training?

What distinguishes education from training?

Role of education and training

Effective environmental management, undoubtedly, depends on a well-informed public. It follows, therefore, that education and training have a crucial contribution to make to the vital task of improving the management of our common heritage, the Earth. Besides alerting all sections of the population to the pressing problems confronting them, well-planned environmental education and training programmes can also suggest relevant concepts and approaches for understanding these problems. Above all, environmental education and training can impart the knowledge and skills necessary for anticipating and resolving a given set of environmental problems.

Education aims to establish sensitivity to problems, to raise the level of awareness and to generate commitment. Training sets out to develop and master skills for solving practical problems and for specialized action.

The two processes form a continuous spectrum with a broad middle band in which they overlap.

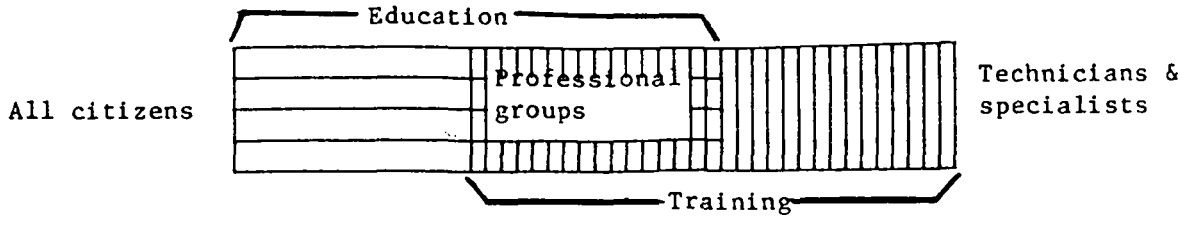

Figure 2. The education-training continuum. Source: Ponniah, W.D. Working paper PEEM/8/WP/88.02.

Education

Environmental education is applicable as part of the education of all citizens and is directed at people of all ages, in all types and categories of formal education (including pre-school, primary, secondary and tertiary) and non-formal education for out-of-school youth and adults. The purpose of such education is to produce an environmentally literate citizenry who will have the basic knowledge of, and concern for, environmental problems, awareness of the implications of these problems, basic skills to cope with and initiate elementary solutions, and motivation and commitment to the measures of environmental management.

General training

General training lies in that overlapping portion of the education-training continuum where education for increased understanding of environmental problems is just as important as,

and takes place simultaneously with, training for competence in those areas of technical and professional practice which carry important implications for environmental concerns. The target groups for this type of integrated education and training include policy and decision makers, administrators, town planners, engineers, architects, industrialists, economists, medical doctors and lawyers.

Specialized training

Specialized training is applicable to specialists and technicians who have to undertake assessment and management tasks. For these people it provides specialized knowledge, advanced skills and expertise necessary to handle and solve environmental problems. The target population includes biologists, ecologists, entomologists, hydrologists, engineers, toxicologists, soil scientists, foresters, oceanographers, landscape architects, and limnologists.

Who is to be educated and trained in environmental management for vector control in water resources development?

Decision makers

As indicated in the introduction, it is important that politicians and decision makers in managerial and financial positions should be sensitized to the health implications of changes in the environment, such as water resources development, and that any plan for development should be closely examined for all its implications. It is equally important that these decision makers should have a general familiarity with the various professions and their areas of expertise, and thus be able to decide who should be consulted for specialist advice.

Professionals

The next important group are the professionals who occupy the middle ground, as it were, between those who determine the general policy and financial constraints for a development and those who are expected to implement the details of the development. On the one hand, the professionals are in a position to inform, advise and thus influence the decision makers. On the other hand, the professionals can supervise the training and work of technicians and manual workers, as well as the health education of members of the local community.

Technicians

The training of technicians concerned with water resources development will be incomplete unless it includes specific elements of health and vector control. These technicians, in turn, can then ensure that their workforce is sufficiently well informed to be able to implement health related arrangements.

Selective attention by PEEM

Education and training for all these groups is important, if vector control is to be managed effectively, and none of these groups should be neglected in favour of any other. It would, however, be difficult to foster development of education for all these groups simultaneously within the Panel's programme of work, and it may, therefore, be advisable to be selective.

It has been suggested that special attention to engineers and their education in aspects of health could be of most immediate benefit in the environmental management of vector control. While this idea has some merit, it should be examined in its total perspective.

Pressures on the engineering curriculum

Since water development projects have many implications, engineers are now being asked by various groups and disciplines to be trained in many new fields - in addition to developing their own expertise. Thus, economists want them to know more about cost-benefit and cost recovery approaches, sociologists would like them to be trained in community participation, environmentalists in environmental issues, management specialists to improve their management skills, computer technologists and systems analysts to know more about these areas, and health professionals would like to see more emphasis on health issues. While individually it is easy to make a case for the necessity of any of these competences, the fact remains that the time available for training engineers has remained the same. The educational programme of engineers, in terms of available time, has always been tight. Clearly it cannot be expanded to take care of all the above requirements. In any event, it would be physically impossible for an engineer to master all these "new" areas.

Sensitize perception of engineers

Sensitize perception of other professionals

The best that might be attempted is perhaps to sensitize engineers in some specific areas, so that they will recognize a problem, when a particular specialist should become involved, and which intersectoral contacts would be beneficial. For specialists from other sectors to be effective, however, they must be sensitive to engineering issues as well. This is an area that needs immediate attention. While there is much talk about "training" engineers in health issues, health experts seldom mention their own training in engineering issues. Without mutual awareness of each other's problems and constraints, inter-professional collaboration is likely to remain limited. The analysis of a survey of a network of community-oriented educational institutions for health sciences provided detailed information on the training curricula of the institutions involved, which are mainly schools of medicine. This demonstrated a content based on intrasectoral rather than intersectoral action. Indeed, Table 1 illustrates that even recently established medical schools with overtly innovative curricula appear to allocate little importance to intersectoral linkages (WHO, 1987).

Link education to specific tasks and related professional competences

A rational approach would be to identify the actual tasks that need to be undertaken in relation to environmental management for vector control, and who is to be responsible for any one of these tasks. It would than be possible to determine what education or training is needed by particular professionals, so that they can confidently be expected to carry out their assigned responsibilities with due sensitivity and effectiveness.

What are the major constraints in intersectoral and inter-professional collaboration?

Professional bias

A review of the types of professional staff engaged in water resources management in developing countries indicates that the field is overwhelmingly dominated by civil engineers. The situation is not much different in developed countries, except that a few more geologists, geographers and economists, as well as other types of engineers may be involved. It would be

Table 1. Analysis of the tendencies at ten institutions in applying important educational concepts.

CONCEPTS	INSTITUTIONS 1	2	3	4	5	6	7	8	9	10
Commitment to the philosophy of community oriented education by emphasizing community content	+	+	+	+	+	+	+	+	+	+
The use of problem-based learning	+	+	+	+	-	+	+	+	+	+
Provision for valid performance assessment	+	+	+	+	+	+	+	+	-	+
A balanced distribution of learning activities between primary, secondary and tertiary care settings	+	-	+	+	+	+	+	+	-	+
The distribution of community-based learning activities throughout the curriculum	+	+	+	+	+	+	-	-	+	-
The use of competency-based learning	+	+	+	+	+	+	o	+	o	-
Coordination between the educational programme and the health services	+	+	+	-	+	+	+	-	-	-
The formation of workers into health teams	+	+	+	+	+	-	-	-	+	-
The involvement of the community in managing the educational process	+	+	-	o	-	-	+	-	-	-
The establishment of intersectoral linkages	+	o	-	o	-	-	-	-	o	-

+ positive tendency - negative tendency o no information

Source: WHO, 1987.

difficult to find health specialists, sociologists, lawyers, mathematicians or political scientists in water departments in any country.

Much lip-service is paid to the need for a multidisciplinary approach to integrated water resource planning and management. What exists are primarily engineering-orientated and engineer-dominated institutions, which generally believe they can perform satisfactorily the tasks entrusted to them, without much assistance from other disciplines. There are some indications that this thinking is changing, but the changes are often slow and may not necessarily be permanent.

Sectoral approach

All governments, in order to have departments that are manageable, look at issues sectorally. To a great extent, this sectoral approach has created the dominance of engineers in ministries of irrigation or water resources, or in river basin development authorities who are responsible for water resource development projects. Exceptions are community water supply and sanitation projects which are mostly the concern of ministries of health or public works. Equally, ministries of health are theoretically responsible for all health issues associated with water projects, including health education. In addition, ministries of agriculture may be concerned with drainage, ministries of energy with hydroelectric power, ministries of

transport with navigation, ministries of fisheries with aquaculture, and ministries of environment with environmental implications which invariably overlap with health.

Lack of cross-fertilization

Such sectoral approaches imply that, just as a ministry of irrigation is dominated by engineers, a health ministry is in the domain of medical specialists. Cross-fertilization between the two ministries and the two dominant disciplines seldom occurs. The problem is frequently compounded by years or even decades of rivalry over budgets and empire-building. It is not unusual to find ministries which are reluctant to share with one another any data that are available and analyses that have been carried out, even though these are essential for a proper management process in both sectors.

Even in those few cases where enlightened water ministries have attempted to employ a few medical professionals, the results have not been very encouraging. Recruitment of adequately qualified and experienced medical professionals has been a difficult task under the best of circumstances. Competent staff members tend to leave after a short period because of a lack of career structure for health professionals in the engineering-dominated ministries.

Legitimize and institutionalize collaboration

There is thus a strong case for creating a political will that legitimizes intersectoral and interprofessional collaboration and that ensures that the managerial environment in organizations and institutions provides explicit support for such collaboration.

How do adults learn best and how should they be assisted?

Consider learners as one would patients

The Panel recognized that modern educational practice postulates that any educational intervention should be planned, implemented and evaluated on the basis of an understanding of the person who is to benefit from the intervention. Equally fundamental would be a clear definition of what the learner is expected to be able to do that he or she could not do, or do as well, before this educational experience. In these aspects, good educational practice may be said to emulate precepts of clinical medicine, where diagnosis defines the gap between the patient's present and his or her normal state, where management is designed to bridge the gap, monitoring reviews progress and if necessary adjusts management, and where eventual assessment of the extent of recovery by the patient evaluates the success of the treatment. It would thus be prudent to assume from the outset that those who are primarily concerned with water resources development are neither familiar with, nor especially interested in related aspects of health. Environmental management for vector control is not normally uppermost in the minds of policy makers, financial decision makers, administrators, water engineers or managers. How, then, can they be persuaded and helped during their professional education and as qualified practitioners to acquire sufficient awareness and familiarity with relevant aspects of human health?

Little knowledge or interest can be assumed

How to create sufficient awareness?

Prescription for effective education

The answer to this question may be summarized as follows:

* Learners need to be told what is expected of them, that is, what they are to achieve and what they should be able to do as a result of learning.

* What is to be studied should appear to be relevant to the professional interests and goals of the learner.

* The result of learning is reflected in a growing familiarity with facts, concepts, principles, skills or attitudes. Learning is, therefore, a cumulative, progressive building process that extends over a period of time. Effective, long lasting changes in attitudes and skills should not be expected to result from a single educational exposure, however intense this may have been.

* Learners should be given opportunities to:

  - build on their existing knowledge and experience;
  - formulate their own questions to direct their studies;
  - actively think through what they have learned, in order to integrate such new knowledge, understanding, skills and attitudes in their long term memory;
  - receive an early indication (feedback) of how well they have learned;
  - practise the application of their learning in an actual professional context, first in a controlled and protected environment, then in a real situation;
  - reinforce and continue to practise what they have learned.

Adult learning should be assisted through:

How to assist effective learning

* A clear specification of learning objectives. These are statements that describe what learners will be expected to be able to do in order to demonstrate that they have learned successfully. Such statements can be examined for their relevance in relation to the actual tasks which the professionals will be expected to carry out. Once an objective has been justified in terms of professional responsibilities it can serve as an important criterion for assessing the relevance of what is to be learned and thus constrain information overload. Objectives will also serve as criteria for the selection of the process of learning - how learning is to be facilitated and conducted. Objectives also act as criteria for the construction of valid tests for the assessment of the learners' progress and achievement. It should be acknowledged, however, that these uses of objectives require careful specification of intent in the objectives. Where imprecise expressions are used, such as "students should have an understanding, an appreciation, a knowledge of ...", they should be followed by an example that illustrates how students will be expected to demonstrate that they "understand, appreciate, know".

Use of objectives

* Relevance of what is to be studied and the ability to transfer specific items of knowledge and understanding from long term to short term memory for rapid retrieval and use will be materially supported if the learning is placed in the context in which it is subsequently to be applied.

Learning in the context in which it is to be applied

* Active learning and rapid feedback, as well as integrated learning in a relevant context, will be assured if problem-based learning (see below) is instituted.

Active, integrated learning

Examination must support student's learning

* Assessment of progress towards, and achievement of the objectives must be seen to be valid; that is, a test must give the learners a genuine opportunity to demonstrate their level of competence in the task as described by the objective. Thus, a multiple choice questionnaire is unlikely to be a valid test for an objective that calls for the demonstration of communication skills or for competence in making self-generated, reasoned decisions in the face of a complex problem. As success in passing examinations constitutes so strong an extrinsic influence on learning, it is mandatory that the characteristics, content and conduct of assessments should be seen to mirror and reinforce the intentions of the educational objectives.

What is problem-based learning?

Competence to make informed decisions

Competence to adapt to change and participate in change

The professional target groups considered by the Panel will be expected to make responsible judgements and reasoned decisions which are likely to have far reaching health, social and economic consequences. Their decisions will frequently be made in unfamiliar and ambiguous circumstances. They will need to consult and collaborate with experts in other fields. Inevitably, they will be involved in change - scientific, technical, environmental, social, political and economic change. Not only will they need to be capable of acting in an informed, responsible manner in relation to health as it affects or is affected by the development of water resources. They will also have to be able to adapt themselves to changes and be able to participate in introducing and implementing changes (Engel & Clarke, 1986; Engel, 1988).

Development of complex competences calls for problem-based learning

The attainment of this level of professional capability and the ability to cope with change will call for rather more than a reliance on factual information through lectures, demonstrations, laboratory exercises and field visits. Active participation in their own learning is a sine qua non for professionals to acquire the necessary competences for problem solving, critical reasoning for the assessment of reports, objective evaluation of extrinsic and intrinsic factors that may have a bearing on a given problem, and creative design of novel solutions. A problem-based approach to learning is most likely to satisfy these exacting requirements.

The process of problem-based learning

This form of learning can be used by an individual student working alone. Collaboration within a group will, however, materially enhance the value of problem-based learning (Engel, 1982). A typical sequence of problem-based learning begins when a group confronts a problem that is unfamiliar to them (Barrows & Tamblyn, 1980; Kaufman et al., 1985). They will brainstorm, using their existing knowledge and experience, in order to attempt to identify the nature of the problem and its underlying cause or causes. Once they proceed to examine critically the result of their brainstorming they will also identify what they do not understand or do not know. They will formulate questions to be followed up through individual study. The students may find that there are too many questions to be tackled by every student, and some of the questions will be taken up by individuals who undertake to discuss their findings with the rest of the group at the next meeting. At this stage the tutor, who does not "teach" but guides, corrects and facilitates the

students' own process of learning, may wish to intervene. He may decide to focus the students' learning on specific aspects from the wide spectrum of topics within the problem.

Second group session

At the next meeting the students will compare their experiences in researching the questions: which approach proved most effective and which resources were found most useful. They will proceed to apply newly acquired facts and insights to the original problem. During this phase of problem-based learning students share information with each other and think actively about the information they transmit to each other. Not only does this provide them with feedback on the success of their own learning, it also confirms and organizes new information in their memory. At the same time, the group practises the skills of critical, analytical and creative reasoning, cooperative sharing of information, clear presentation, as well as critical listening and productive, non-hurtful debate. Lastly, the group will practise the use of what they have learned by applying it to the problem in hand.

Problem-based learning vs. the case study method

It became clear in the Panel's discussion that confronting an unfamiliar problem in order to identify the need for new learning is quite different from the often advocated case study method which provides practice for application of what has already been learned. Problem-based learning can be used equally successfully for the development of professional skills (Morgan, 1980), and not only in undergraduate but also for postgraduate and continuing education (Jack & Engel, 1976; Cole & Engel, 1975).

Problem-based learning assessed

Appropriate test instruments have been developed for the assessment of students' progress and achievement in problem-based learning which leads to the acquisition of competences in an integrated application of basic and applied sciences, critical reasoning, collaboration in teams and the ability to plan and conduct self-directed learning (Feletti et al., 1983; 1984).

What kind of resources for learning and what further research are needed?

Avoidance of special pleading

Assuming that students and practitioners of other professions have little basic knowledge, interest or need of specific skills in the health sciences, it is reasonable to accept that a demand for study of detailed knowledge and skills in aspects of the health sciences by members of another profession might be regarded as "special pleading" and, therefore, less readily accepted into existing courses. This might apply especially to undergraduate curricula which tend to have overcrowded timetables and thus resistance might be expected to the addition of new topics.

Health related problems as a means for developing generally applicable competences

It might well, however, be possible to achieve adequate awareness and familiarity by suggesting that aspects of health, such as problems in the development of water resources, be used as the context in which more generally applicable skills can be practised, for example, collaboration in teams, communication among peers, problem identification and resolution, critical reasoning and rational evaluation, as well as skills for life-long self-directed learning. Just as a ball is necessary for learning the skills of a game, so the study of problems of health, related to water resources development, might be used as the context for the acquisition of more generally valid

competences. This concept is not as far-fetched as it might seem; at least one medical school has adopted this approach as an integral part of its philosophy (Feletti et al., 1983).

Health related problems in a postgraduate course

Where the study of health problems in relation to water resources development is to be a significant part of a further degree or diploma course, postgraduate studies will set a higher level of expectation than would be reasonable in an undergraduate course. Even here the objectives would presumably concentrate on ability to make informed decisions rather than on scholarship for its own sake. This would suggest that the objectives, and thus the process and content of the course, should be carefully tailored to the actual responsibilities which the graduate is expected to assume, and a problem-based learning approach would here, too, seem eminently appropriate.

Problem-based learning in continuing education

In the context of continuing education, graduates might be encouraged to take an interest in aspects of their professional work that they have never come across or at least not frequently. An overtly practical, rather then academic treatment would here be virtually obligatory. A problem-based approach would appeal to mature professionals with extensive practical experience who will be intrigued by the challenge of quite new problems and by the opportunity to decide for themselves what new information and insights to seek in order to deal with them.

Study of paper problems is cost-effective vs. field experience

"In the process of solving environmental problems, there are three categories of information to which students should be exposed: 1) background knowledge about the issue; 2) knowledge of the variety of ways in which environmental problems have been solved; and 3) specific information about the types of actions that have been used to resolve similar cases. Although participating in an actual project can be an appropriate strategy to help students understand this information, reading and discussing a wider variety of case studies and experiences seems to be more closely linked to success, because it increases students' familiarity with solving environmental problems".[1]

Need for packaged case studies for classroom use

If the above conclusion is to apply to the general topic of intersectoral training, one of the obvious problems is the lack of background knowledge conveniently packaged for use in the classroom. In the area of "development projects and health", there is a growing call for case studies based on retrospective analyses of the health-related impact of major projects, e.g., the construction of dams, to be used to update our analytical methods as well as to learn which approaches were used to mitigate the negative impact of these projects and actually worked in practice. The Panel realized that further work needed to be undertaken to assemble case studies that illustrate the requirements for long time-scale planning, and the multipurpose development of water resources. Standard approaches and solutions for vector control in natural resource development need to be assembled in a way which is not specific to particular localities. Retrospective case studies should be complemented by material on projections for future developments and trend assessment. With respect to water resource development the Panel drew attention to three relevant FAO publications:

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[1] from: M.C. Monroe and S. Kaplan, When words speak louder than actions: environmental problem solving in the classroom, unpublished document, College of Natural Resources, Wisconsin

Three relevant FAO publications

* African agriculture: the next 25 years, 1986, FAO, Rome (Annex IV: Irrigation and water control)

* Consultation on irrigation in Africa. Irrigation and Drainage Paper no. 42, 1987, FAO, Rome.

* Water resources and irrigation potential in Africa, 1988, FAO, Rome.

In addition, there continued to be a clear need for standard methods allowing a critical financial and economic analysis of environmental management for vector control, with an assessment of the likely costs and benefits of modifying the environment. This gap was likely to be filled in part by the cost-effectiveness analysis guidelines under preparation under the auspices of the Panel.

Materials must be tailored to audience and local conditions

A common error is to assume that the mere availability of a particular item of teaching material will automatically guarantee its widescale use. Of special consideration is the appropriateness of the material to the actual situations facing the health workers to be trained. In many manuals, for example, situation analyses include questions related to land tenure and power structure, i.e., politically sensitive issues which are well beyond the students' ability to handle constructively and which, in certain circumstances, may prove dangerous to include explicitly in any analyses carried out in the field. The link with equity implies that many aspects of intersectoral thinking face similar problems. If a conclusion is to be drawn, it is that the content of materials must be judiciously chosen so as to be at the leading edge of the progressive reforms being carried out in a country. The domain of intersectoral action is one where the basic principles of health, as part of social and economic development advocated by the PHC approach, can be expressed effectively.

Dearth of expert tutors

A major obstacle to education in a holistic approach to problems is the dearth of expert tutors in so wide a range of subjects. Particularly in developing countries it would be unrealistic to expect that every faculty of engineering, for example, would have ready access to expert tutors in the health sciences. Experience with problem-based learning materials in medical schools, as well as colleges of agriculture, and with similar materials for distance learning in postgraduate and continuing medical education may point towards an interim solution. "Problem boxes", or problem-based learning packages, could be assembled for use at institutions that lack expert staff. These boxes or packages would contain a tutor guide, pre- and post-tests with separately packed model answers, and learning objectives. The main component would consist of descriptions of a number of realistic problems, each accompanied by a set of tasks to be carried out in order to deal with the problem. Each problem would also have a separately packed set of model answers. Lastly, the box or package would contain appropriate texts, reprints and other materials which students might want to study, in order to accomplish the tasks set for the various problems. The very flexibility of such packages should make them adaptable to a wide range of local differences and specific needs. Local teachers would be able to modify the problems on which the problem-based learning is to be based. They would be able to direct their students towards particular tasks and they would be able to introduce additional or alternative study materials.

"Problem boxes" as an interim solution

While the absence of expert tutors would make supervised field work impracticable, the students' own teachers could act as supervisors of problem-based learning when they had been given an opportunity to familiarize themselves with the fundamental aspects of education for capability and change.

Caveat

There is, however, a serious caveat which should not be ignored. The preparation and use of training materials will not necessarily lead to any dramatic change, if the education is not actively supported by appropriate policies and implementation strategies. If health workers, trained to think in intersectoral terms, find that their respective supervisors are indifferent or actively antagonistic to such initiatives, the average health worker will quickly get the message that the prevailing status quo is acceptable and not to be challenged.

What is being done already?

International Environmental Education Programme

Shortly after the establishment of the United Nations Environment Programme in 1974, UNEP and UNESCO jointly created the International Environmental Education Programme (IEEP). This programme was designed to:

(a) facilitate the co-ordination, joint planning and pre-planning of activities essential to the development of an international programme in environmental education;
(b) promote the international exchange of ideas and information pertaining to environmental education;
(c) co-ordinate research to understand better the various phenomena involved in teaching and learning;
(d) formulate and assess new methods, materials and programmes (both in-school and out-of-school, youth and adult) in environmental education:
(e) educate and train personnel adequately to staff environmental education programmes; and
(f) provide advisory services to Member States relating to environmental education.

Intergovernmental Conference on Environmental Education

Out of the first Intergovernmental Conference on Environmental Education (Tbilisi, Georgia, USSR, 1977) emerged the Tbilisi Declaration which defined the nature, objectives and pedagogical principles of environmental education.

International Congress on Environmental Education and Training

In August 1987 the IEEP convened the International UNESCO-UNEP Congress on Environmental Education and Training, in Moscow, where delegations agreed on the international strategy for action in the field of environmental education and training for the 1990s. This will serve as the major blueprint for governments and local and international organizations in the orientation of their environmental education and training policies and actions.

Promotion of environmental education

Currently, the main domains of action of the IEEP include (i) exchange of information and experience; (ii) research and experimentation; (iii) training of personnel; and (iv) preparation of education materials. The output under (iv) includes the development of regionally adaptable prototype curricular modules on the use and management of natural resources, pollution, desertification, health and nutrition, and urban environmental problems.

Collaboration by UNEP in the Americas

In 1983 UNEP supported the establishment in South America and the Caribbean of a regional network of environmental training and research institutions to enable governments to implement a cooperative training programme. To date, several courses and seminars have been developed, joint research projects have been undertaken, and various educational materials have been published. Training has also been provided for over 500 persons through regional courses and seminars on such topics as technology and the environment, environmental impact assessment, life and development, traditional practices and management of natural resources.

Collaboration by UNEP in other regions

To complement the activities of this highly successful network of tertiary-level institutions, three new training networks were recently launched in the regions of Africa, Asia and the Pacific, and West Asia. Several centres of excellence will be identified in each region to catalyse training activities and provide support for other institutions.

UNEP workshops

In October 1987, UNEP organized an environmental awareness-building workshop on "Integrated resources management for sustainable development" for 36 high-level officials from ministries of planning and the environment of 17 anglophone African countries. It aimed to increase the awareness of the participants to the need for promoting sustainable development as well as to teach the means to achieve this through rational environmental action. A second workshop has been planned for late 1988 in Morocco for high-level officials of ministries of planning, environment and education.

Integration into tertiary courses

In November 1987, 50 staff members of African faculties of engineering, law, natural sciences, agriculture and education attended a week-long workshop on "Environmental education and resource management in African tertiary-level institutions". This workshop, which was jointly organized by the Agency for Technical Cooperation of the Federal Republic of Germany (GTZ), UNESCO-ANSTI and UNEP, aimed at incorporating the environmental dimension into tertiary-level curricula.

Marga Institute

As already pointed out above, changes in attitude are also needed in the health sector. Health sector staff have to be taught to think and act intersectorally. Health is not the exclusive domain of the health sector. Other sectors will have to adjust their policies to accommodate health considerations in their targets. Health promotion should be perceived as a common endeavour, coordinated by the health sector. A comprehensive approach to developing training materials on "intersectoral action for health" is part of an initiative of the Marga Institute in Sri Lanka (Sri Lanka Centre for Development Studies), one of the institutions participating in WHO's programme on intersectoral cooperation. A training manual is in preparation to provide guidance for curriculum contents to be used by "District administrations for the training of their personnel from all key socio-economic sectors of Government and their NGO counterparts, in planning and implementing intersectoral action programmes for the promotion of the health status and well-being of the population". The manual is designed principally for the training of sub-district level officials, such as the assistant government agent, planning officer, agricultural officer, development officer, education officer,

local government officer, housing officer, youth services officerand community development officer, and health officials such as medical officer of health, public health inspector and public health nursing sister. It is worth noting that it is proposed to train health personnel following the same outline that will be used for training personnel of other sectors.

The outline of the topics to be covered in the training manual is shown in Table 2. For each of the topics specific performance objectives have been identified along with a content outline. The broad range of topics reflects the scope of studies carried out by this Institute. The approach has evolved from the Institute's experience in presenting their findings to staff of the various sectors involved.

Table 2. Topics covered in the Marga Institute training manual on intersectoral action for health

MODULE ONE: CONCEPT OF HEALTH AND TRANSITION IN HEALTH	
Topic 1.	Concept of health
Topic 2.	Transition in health
Topic 3.	Major health risks in the developing countries
Topic 4.	The groups most affected by health risks
Topic 5.	Global strategy for health for all and primary health care
Topic 6.	Intersectoral action for health

MODULE TWO: HEALTH AND DEVELOPMENT	
Topic 7.	Relationship between health and socio-economic development
Topic 8.	Health and food and nutrition
Topic 9.	Health and agriculture
Topic 10.	Food availability and food utilization
Topic 11.	Health and environment (water supply, sanitation, housing and environment protection)
Topic 12.	Health and education, culture and media-information
Topic 13.	Health and other major socio-economic sectors (employment, industry, transport, urbanization)

MODULE THREE: HEALTH COMPONENT IN MAJOR SOCIO-ECONOMIC SECTOR PROGRAMMES	
Topic 14.	Health sector programmes
Topic 15.	Role of traditional medicine in health development
Topic 16.	Method of identifying health-related activities in the non-health sector programmes - agriculture
Topic 17.	Identification of health-related activities in the major socio-economic sector programmes

MODULE FOUR: PROGRAMME PLANNING, IMPLEMENTATION AND EVALUATION

Topic 18. Plan formulation, implementation and evaluation
Topic 19. Community participation
Topic 20. Group dynamics and inter-personal communication

MODULE FIVE: DEVELOPMENT OF AN INTERSECTORAL ACTION FOR HEALTH PLAN

Topic 21. Collection and analysis of data and information
Topic 22. Identification of the major health risks and the vulnerable groups in the district
Topic 23. Preparation of an intersectoral action plan for health
Topic 24. Implementation and evaluation of the intersectoral action for health (IAH) plan

District level training in Ghana

There have been district level training programmes which have attempted in a less ambitious way than the one described above to introduce the importance of intersectoral action for health. One such experience was the District Health Management Team Training Programme in Ghana in 1979. One of the broad objectives of this programme was "to promote closer cooperation and collaboration between the health sector and the other sectors of the economy". While the importance of intersectoral action is still recognized, first priority is being given to building up a strong team which can promote health through the activities directly controllable by the Ministry of Health. The training modules fall into two categories: management and technology. The management series covers items such as improved communications, planning and budgeting programmes, managing financial resources and managing time, while six technical skill modules are under development: malaria, high maternal and perinatal mortality, immunisable childhood disease (expanded programme on immunization, EPI), malnutrition, diarrhoeal diseases in children and high pregnancy rate (family planning). It is anticipated that specific intersectoral issues will be introduced as required in each of these draft training modules.

Intersectoral programmes

Not surprisingly, an examination of individual programmes with subject matter closely related to intersectoral concerns shows that the intersectoral dimension has entered into their training programmes to one degree or another. For example, malaria control has been associated with intersectoral action for as long as there have existed organized approaches to the malaria problem. One illustration of how intersectoral thinking is promoted is provided by the course organized by WHO on malaria and planning malaria control. In this course, which lasts around 16 weeks, one of the major activities of the participants is to prepare a plan for malaria control for their country or a part thereof. A series of learning sessions are used to cover the essential elements of the planning process. Items which introduce the relevance of intersectorally related aspects include: analysis of the malaria situation, stratification for planning malaria control and the social and economic aspects of malaria control.

Problem-based learning materials

Materials for problem-based learning are worth mentioning here. The Educational handbook for nutritionists[2] is aimed at helping educators to increase their skills to make learning easier for their students. Intersectoral aspects enter in the first phase of learning in which the priority problems and educational objectives are determined. An explicit reference is made to the need to describe the factors which are related to the food and nutritional situation of the community such as health and food problems, national food policy goals, supportive systems, institutional goals and actors involved in nutrition related work.

Another approach, promoted by the WHO Family Health Division (FHE), is District team problem-solving.[3] It is a combination of management training, actual project formulation and action health systems research. The complete process encompasses: an analytical and planning workshop including proposal formulation (9 days); a period of implementation (approximately 9-12 months); and a post-implementation evaluation workshop (3 days).

The Panel emphasized the need to study the above examples and to use experience gained in the development of training courses on subjects with intersectoral implications. This expertise was highly relevant for the development of courses on the subject of water resource development associated health problems, both for health and non-health professionals.

Educational programmes in Nigeria

As an example of changes in awareness in the various sectors at a national level, following increased education and training efforts focusing on the environmental aspects of development, the Panel reviewed in detail recent developments in Nigeria. The past decade has seen profound changes in the attitudes of Nigerian government officials and certain groups in society. The demands of users of scientific knowledge, both in the public and private sectors, has led to a number of degree and diploma programmes in various universities and polytechnics. The major types of training may be summarized as follows:

- environmental programmes for undergraduate and post-graduate courses in various fields such as biology, geography, sociology, and economics;

- environmental education in professional fields, such as engineering, agriculture, medicine, and public health, in which techniques are taught in the different disciplines and in interdisciplinary fields.

Training managers of water projects

The National Water Resources Institute (NWRI), which prepares managers for water projects, complements the above more general efforts through programmes aimed at the development of practical skills. The teaching at the NWRI includes lessons on

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[2] WHO/NUT, 1988. Educational handbook for nutritionists, Technical Document NUT/88.1.

[3] FHE/WHO, 1987. District team problem-solving. Report of a workshop organized by the Family Health Services Department of the Ministry of Health of the Republic of Malawi, in collaboration with the World Health Organization and the United Nations Fund for Population Activities, Technical Document FHE/87.8.

water policy, planning and management, assessment of water resources, community water supply, water for agriculture, water for industry, financial arrangements for international cooperation in the development of water resources, and inter-basin water transfer schemes. Technical cooperation among developing countries in the water sector is also covered.

In recent months, a number of special ad hoc workshops have been run by NWRI to promote the training of managers of water resources in the techniques of integrated environmental research.

Familiarization of decision makers and managers

In an attempt to foster indigenous development and to promote environmental research efforts aimed at self-sufficiency and self-reliance, the Institute of Ecology, Obafemi Awolowo University, Ile Ife, in collaboration with other national institutes and with international agencies, organized a series of three workshops on various aspects of environmental education for water resources managers in Nigeria, designed to inform high government officials, administrators, and managers of water resource projects of the profound environmental, scientific and socio-economic implications of development projects. Of these three, one (April, 1985) was concerned with the role of remote sensing technology in national development, the second (August, 1985) with remote sensing applications to agro-meteorology, hydrology and water resources, and the third (March, 1987) with the control of disease vector problems in river basin development in Nigeria.

Intensive, short course in the United States of America

The Panel reviewed an interesting example of a two-week intensive university course in the United States of America, reported by one of the Panel members. In the summers of 1984 and 1985, Rutgers University organized a two-week short course entitled "Human welfare and irrigation". The course was designed to help participants develop an awareness of the multi-dimensional welfare implications of irrigation and to think about how to overcome obstacles to a more holistic consideration of these implications in the development and implementation of irrigation projects. The target audience consisted of students from developing nations who were engaged in graduate studies in North America in some water-related field and who had professional ties with government agencies or universities in their home countries. The course consisted of one week of presentations and discussions which examined a wide range of potential consequences of irrigation, and one week in which each participant examined in some depth one of two major case studies.

At the end of each course, both staff and student participants were very positive in their evaluations. To evaluate to what extent this course had affected the students' views on a more permanent basis, a questionnaire was developed and mailed to all 34 student participants of the course. The eleven respondents remained positive in their views of the course. They stated that it had broadened their outlook on water resource development and human wellbeing. Most of these respondents were working in their home countries on assignments related to the course topics and were using ideas from the course in their jobs.

The Panel agreed that this short-course approach was, in principle, very valuable and should be encouraged wherever the conditions are appropriate. It reiterated, however, that a lasting effect on attitudes and skills should not be expected from such a single exposure. It recognized the constraints observed by the organizers to establishing the short course on a permanent basis. It is not enough to have a group of enthusiastic faculty from different disciplinary backgrounds. The key subjects covered in such a course should be firmly rooted in ongoing research activities at the university in question.

Evaluation towards improving intersectoral education

In a more general vein, it was concluded that the development of appropriate education and training activities and related educational materials is a complex and difficult process. Its successful evolution will depend on regular and constructive evaluation, so that the activities can be modified and progressively improved. Objective evaluations are somewhat rare, although there are numerous pseudo-evaluations. There is frequently a built-in institutional inertia and sometimes even opposition to an objective evaluation. Proper mechanisms to evaluate a training course must be defined at the inception of the course and should be directly linked to the course objectives.

What might be done to advance education and training?

Under the conditions discussed earlier, what can realistically be achieved in terms of improving knowledge about health for water professionals? First, it should be understood that it may not be an easy task to improve the situation to any significant extent in most countries. Secondly, there is no one single "best" solution, but rather a series of potential solutions which should be considered. These solutions are not necessarily mutually exclusive.

No single best solution

Courses on aspects of health

One promising approach may be to identify forward-looking educational institutions in developing countries which could be persuaded to organize courses on health aspects of water development at both undergraduate and graduate levels. These institutions should ideally be among the acknowledged leaders in engineering education in their countries. If the course succeeds, the probability of other institutions following the "leader" is likely to be favourable. Possible candidates for such institutions could be any of the Indian Institutes of Technology or the University of Roorkee in India; the Asian Institute of Technology, Bangkok; the University of Cairo and Ain-Shams University in Egypt; and the University of Zimbabwe in Harare.

PEEM proposal for a curriculum

A significant start has already been made by PEEM through commissioning the specification of a curriculum and a syllabus guide which offers aspects of health, related to water resources development, for use in engineering courses. The proposed curriculum and syllabus guide is at present under consideration for its practicability and acceptability at five institutions in Malaysia, India, Pakistan, Sudan and Kenya (see section 1.4, training activities, in part II of this report). In addition, FAO has initiated a survey among fourteen schools of engineering to add further information on the usefulness of the proposed curriculum and syllabus.

Introduction of health issues into existing courses

At the postgraduate level it may be well worth while to explore the possibility of introducing aspects of health into courses dealing with water resources development. At present several training courses on water exist in developed and developing countries for the training of water professionals from developing countries. None of these training courses deals with health issues to any significant extent. One possibility is to consider some of the well recognized courses like the one at the University of Lund, Sweden, or those at various locations run by the Centre de Formation Internationale à la Gestion des Ressources en Eau (CEFIGRE), and provide lecturers to deal with health issues. The course at Lund is unique in the sense that it is rigorously evaluated by the senior to middle level water professionals who attend it each year. Unless lecturers know about both water and health and deal with practical rather than theoretical issues, they are highly unlikely to be invited back the next year. Thus, availability of funds and good lecturers are both important. This will apply as much to basic as well as to advanced courses.

Addition of a short, intensive course on health issues

An alternative to the insertion of aspects of health into a postgraduate course in a specialized field of engineering may be the addition of a short but intensive exposure to health related aspects, following the example set by the two week course on human welfare and irrigation at Rutgers university.

Introduction of health issues into textbooks

Yet another approach to the problem may be to introduce health issues into textbooks for engineers. It may be possible to identify the main undergraduate texts on irrigation, for example, in a major developing country like India, and to see whether the authors can be persuaded to add one or more chapters on environmental and health issues. The texts used in India are all indigenous, and the probability of success is likely to be higher if health is viewed to be one of the environmental factors to be considered. A further possibility is to see whether health issues can be realistically integrated in new textbooks that are currently being prepared. For example, the "Manual on sustainable water development" that is now being prepared by CEFIGRE, or the text on "Lake management" by ILEC, are likely to have an impact on training in developing countries. As both these texts are expected to be finalized in the first three months of 1989, there may still be time to expand them.

Problems to stimulate holistic thinking

There may be another way to tackle the problem by making use of expanded textbooks to support classroom or small group work as part of a scheduled course of study. "Problem boxes" could be designed to stimulate students to examine all the factors that play a role in the problems and thus to acquire a holistic approach to problem solving. The problems would be taken from real life and relate closely to the interests and professional career goals of the students.

Acquisition of generally applicable skills

As the students would be encouraged to identify for themselves and search out what needs to be learned in order to be able to deal with each problem, they would also acquire useful skills in planning and conducting their own studies. Not least, working in groups, having to listen to each others' arguments and ideas, and assisting each other in their learning would contribute to the acquisition of critical reasoning, collaboration and communication skills.

Creating a favourable climate of opinion

Education for intersectoral thinking and collaboration is unlikely to become universal or indeed to be entirely effective until a favourable climate of opinion has been established. Fostering such opinion may, indeed, be the most important task for PEEM to undertake. Not only would it be a continuation of its fundamental aim and programme -to promote intersectoral collaboration- but it would contribute to meeting the universally acknowledged needs identified in the Report of the World Commission on Environment and Development.

Promoting intersectoral collaboration

In its discussion, the Panel identified four means of fostering a favourable climate of opinion in relation to intersectoral collaboration, where the safeguarding and promotion of health in water resources development is used as a concrete example of intersectoral collaboration.

Inclusion of intersectoral aspects in professional examinations

(i) Academic institutions and organizations that are responsible for conducting examinations could be encouraged and, where appropriate, assisted to include intersectoral aspects in their examinations. Once students discover that they will be tested for their ability to make reasoned decisions in an intersectoral context, they will clamour for appropriate teaching and thus influence their institutions to provide intersectoral education.

Short intersectoral workshops for top level decision makers

(ii) Through its participating organizations PEEM could exert considerably wider influence if it were to organize one- or two-day workshops offering challenging opportunities for opinion leaders to discuss the broader implications of intersectoral decision making and collaboration. Such workshops might attract politicians, financial planners and donor agencies, and a team of international experts might contribute at such meetings arranged on a regional basis. A useful prototype, though somewhat longer, was the South East Asia Ministries of Education Organization for Tropical Medicine (SEAMEO TROPMED) Seminar on the Impact of Water Resource Development on the Health of Communities and Preventive Measures for Adverse Effects, (Surat Thani, Thailand, 13-16 June, 1988).

Conferences with intersectoral participation

(iii) Organizers of national and international conferences could, with advantage, be encouraged to seek intersectoral participation and thus enrich the scope and true value of their meetings and contribute to a growing climate of opinion in favour of intersectoral collaboration. That there is a clear need to promote more active interprofessional collaboration was well illustrated by the World Water Congress of the International Water Resources Association, held in Ottawa in June 1988, attended by more than 700 water specialists from some 68 countries countries. Bilateral and multilateral agencies provided around US$500,000 to bring some 160 participants from developing countries. In addition to engineers, the Congress was attended by geographers, geologists, lawyers, economists, sociologists, administrators and political scientists. But not a single medical specialist was present at this important Congress, which is held only once every three years. Similarly at the tenth anniversary of the United Nations Water Conference, convened by the United Nations in New York in January 1987, the subject of vector-borne disease aspects of water resource development was conspicuous by its absence. If health issues are to be taken seriously by water specialists, it is essential that

health professionals participate in such important gatherings and sensitize water experts. Preaching only to the converted will have very limited impact.

Wider distribution of important agency reports

(iv) Lastly, but no less importantly, international agencies could be enabled to effect truly universal dissemination of their reports and publications. These would then come to the attention of a greatly expanded readership, well beyond the confines of ministries and institutional libraries. An important corollary is the need for more interesting and less formal presentation of expert reports.

Health professionals, too, need to act intersectorally

In closing this section of the discussion two issues were stressed. The first was that much has been said about the need to educate and persuade engineers in matters of health as it affects their responsibilities. In practical terms this means that the target groups identified for training in environmental management should be exposed, in the early stages of their professional training, to the possible health aspects of their future work. At a later stage, building on this awareness, specific technical skills should be taught for the application of environmental management techniques; and finally the training should emphasize that problems requiring multidisciplinary solutions are best solved through effective intersectoral collaboration. It is equally important to impress on the medical and other health professions that they, too, would do well to interest themselves in the concerns of colleagues in other professions, particularly when their work affects the environment and thus the welfare of the population.

We need to document what is being done already

The second matter that merits particular emphasis is that we should practise what we preach. It is highly desirable to document through wide-ranging investigations all those activities, worldwide, that are already in operation and are proving to be successful in creating a favourable climate of opinion and in educating professionals and technologists in intersectoral concerns, particularly in health and its relationship with water resources development. For example, it will be important to learn from those that have included these issues in their curriculum, what their approach has been and what they feel their successes have been. It is equally important to learn if major training programmes have avoided addressing intersectoral issues as such and if so why.

3. COMMUNITY HEALTH EDUCATION FOR ENVIRONMENTAL MANAGEMENT

Education alone cannot achieve community involvement

Vector control cannot be truly effective without the participation of the local community. This is true in the specific context of water resource development; it is also true in the framework of incorporating vector control operations into the general health services. Any discussion of the role of education and training in vector control would, therefore, be incomplete, unless their role in motivating and informing local communities is also considered. It would, however, be wise to bear in mind that community education and training alone are unlikely to achieve full and continuing collaboration by the community. Other influences, such as financial and material assistance, and moral support from local opinion leaders and district authorities are likely to be at least of equal importance.

The Panel set out to identify the various elements that should be considered in planning, implementing and evaluating education and training for members of the community. Using several examples of actual programmes of health education which served to balance theory with the practical constraints of implementation in the field, the following issues were considered: objectives and approaches in community health education, methods to measure community perceptions, field research aspects, and the possible role of agricultural extension programmes in education on environmental management for vector control. Four case studies from Malawi, Saint Lucia, Thailand and Brazil were reviewed.

The tasks of community health education

Variables in health education

The tasks and, therefore, the objectives of health education in the context of disease vector control will differ according to the target group, for example farmers, villagers, town dwellers, school children. A further important variable will be local cultural and religious customs that affect the roles assumed by different members of the community - how they act and react under different circumstances. In most countries, people vary so widely in their traditions, attitudes, beliefs and knowledge that a uniform approach to community education would be impossible to attain and would not yield the desired results. Even so, it is possible to classify general approaches according to whether such education is to be addressed, say, to individuals and families, small groups, the wider community, patients at health centres, organized groups in the community or workers at their place of employment (Pisharoti, 1975).

Individuals and their families

An approach which uses personal face to face discussions can be adapted to the individual's needs. As the individual is part of a family unit, it is often desirable to approach the individual in the context of the family. This approach may not be practicable in sparsely populated rural areas, as it may need frequent family visits. It may be particularly suitable for promoting personal protection measures such as the use of bednets and screens, especially in urban areas or even in densely populated rural areas.

Small groups

The small-group approach allows individuals to interact, exchange ideas and obtain a feeling of group support. The approach calls for considerable skill in its use, lest a few participants misdirect the group, as may happen particularly in industrial settings. Because rural populations are often homogeneous and usually respect traditional social settings, they are more likely to benefit from this type of approach. With skilled educators, this approach should be adaptable to urban dwellers.

The wider community

In the mass approach, the health educator aims to reach a large audience in a very short time, usually relying on newspapers, magazines, exhibits, display signs, posters, direct mailing, films, radio and television. Although the short term effect of the media may not be great, this can be improved considerably in special campaigns, especially where the mass media are coupled with mass meetings and followed up with small group visits. Some authorities have questioned the effectiveness of the mass media <u>per se</u> in changing attitudes and practices.

The choice of a particular medium for a specific target group is crucial. It is absolutely essential to begin by undertaking surveys to determine, for example, which medium has the largest audience or readership. In many rural areas literacy may be low, and the local language may differ from the national language. This may preclude the use of nationally prepared communication materials and necessitate the preparation of area-specific materials. Under those circumstances it may be desirable to resort to traditional media such as folk theatre, which would be familiar, credible and accessible to rural people (Path, 1987). In Tanzania, short and simple health messages are quite often carried on popular women's clothing thus ensuring country-wide distribution. In Kenya, some health messages have been printed on batiks. Traditional folk media merit careful consideration if health education programmes are to be integrated with everyday life, especially in rural areas.

Patients at health centres, clinics and hospitals

Patients attending health facilities for treatment of diseases resulting from environmental mismanagement may be especially receptive to being educated and instructed to adopt preventive measures against these diseases. Here the individual or the small group approach will be useful.

Organized groups in the community

Health educators should also aim at existing organized groups in the community, as most communities have organized groups of teachers, parents and mothers, as well as religious, political, sport and occupational groups. These groups may frequently assist in further disseminating the educational message. In this context, health education in schools should be mentioned as a potentially powerful influence on the family and hence on the wider community.

Workers at their place of employment

Many industries are genuinely concerned with the welfare of their workers. Many go to the extent of instituting programmes of education where health education may well be included. For example, personal protection measures against schistosomiasis may be conveniently included in workers' educational programmes where workers are employed in irrigated fields, and they may be advised to avoid working in Anopheles infested fields after dusk.

Measuring community perceptions and behaviour

As mentioned above, attention was drawn to the influence of cultural and religious factors on behaviour and the need to establish local differences, before effective health education can be planned. The Panel was also conscious of the importance of evaluating the conduct and outcome of health education programmes. Both the initial exploration and subsequent evaluation should make extensive use of data related to perception and behaviour of members of the target community. It was, therefore, thought useful to review the validity and reliability of available methods for obtaining data on perception and behaviour.

Structured interviews

Structured interviews can be used to collect information on general characteristics of the population under study such as age, sex, marital status, education, occupation, levels of income, place of origin. Other information, more specifically oriented towards the project's objectives, can also be collected through structured interviews. In relation to schistosomiasis, for example, the following data might be gathered:

- Levels of awareness in terms of whether the people know about the aetiology, symptomatology and treatment of schistosomiasis, as well as consequences of the infection on daily life;

- Hygiene in terms of whether the people boil their drinking water, how they store water, whether they have a bathroom or toilet, the general conditions of these places, etc;

- Water-contact patterns in terms of the type of source they visit, what they do at the source, times of day when they visit the source, and an estimate of time spent at each source;

- Views of the people toward a control programme.

The disadvantage is that questionnaires are not easy to construct. They involve many stages in item selection (what should be included in the questionnaire), item testing (are the questions embarrassing or vague), reliability testing (do the questions give accurate information) as well as developing proper methods of analyzing the data. In addition, the sample to be used for the administration of the interviews must be properly chosen in advance. These stages involve a lot of time, thought and effort but they must be followed at all costs in order to ensure reasonably valid and reliable data.

Another problem with structured interviews is that they can lead to the omission of important data or to selective recall, because the respondents have forgotten, are anxious to make a good impression, or simply because they do not have the necessary skills to articulate what is required of them. Hence the need for trained interviewers who can "probe" whenever necessary (Hoffman, 1967).

In order to yield valid data, structured interviews should be properly constructed by using carefully selected and pre-tested items on which a reliability test has been carried out. They should be administered by trained interviewers on a carefully selected sample. If all these steps are followed, structured interviews can be used to collect large amounts of data on a wide range of topics indicative of community perceptions and behaviour.

The nominal group process

The nominal group process is an additional means for collecting information on the perceptions, views, or concerns of a quite large group, where all members of the group can feel that they are able to contribute without interference or influence from other members of the group. It is a particularly useful method for establishing rapidly the spectrum or range of perceptions, views or concerns within a group and of ranking the responses in order of the degree of support accorded by the group to each individual response (Delbecq et al., 1975).

The process is as follows: the group elects its own chairman and scribe. The chairman then invites each member of the group to write down or, if illiterate, just to think of their own response to a particular topic or question, for example, "Please decide what you find particularly difficult (or unpleasant) in relation to ....; you may wish to think of up to five difficulties (unpleasant aspects)", or "What do you do when

....; and why do you think you do that?" After a few minutes to allow participants to think of their responses, the chairman will ask each member in turn to give his or her answer or one of his or her responses. Members are not expected to explain or justify their responses or answers, and the remainder of the group are not permitted to comment, criticize or argue about the responses of others. As the responses are recorded in abbreviated form, fewer and fewer new responses will be offered until no more are forthcoming. A rank order can then be established by a show of hands for each response.

Direct observation

Direct observation involves observing behaviour which has been specified in advance. As with interviews, the observers must be trained in what to observe and how to time and record the observed behaviour.

By observing the behaviour directly, this method avoids the problem of selective recall found in structured interviews. There is also some attempt at objectivity in this method, as the observer is seeing the behaviour at first hand and in its natural setting (Bee, 1978; Rheingold, 1967; Smith, 1967). It will also be possible to record the behaviour on film or video tape for cross-checking the observer's record of the event. It will be clear that such filming must not interfere with the behaviour in any way.

One of the disadvantages of direct observations, as in structured interviews, is that important information may be omitted, but for different reasons. In this method, it is practically impossible to observe all the specified behaviours at once, so that selectivity introduces an element of subjectivity and, to some degree, a lack of comprehensiveness, which may have important consequences. Again in connection with schistosomiasis control direct observation can, for example, be used to find out about water-contact activities at important water-sites in the village. It is apparent that, if a water source is busy, the observer cannot observe all persons using the source. Instead, only one individual can be observed at any one time. This means that only a partial picture of what happens at a water source can be obtained.

Another limiting factor of direct observation is that only behaviour can be observed. Attitudes, beliefs, knowledge, as well as past and future events are difficult to study using this method (Smith, 1967). In addition, direct observation is not easy to conduct; the observer has to see the behaviour and write/record notes at the same time.

Direct observation of behaviour in communities is necessary if first hand information is to be obtained. It must, however, be conducted by a trained observer, and the behaviour to be observed must be specified in advance. As direct observation can be limited in scope, it should be used in conjunction with other methods.

Participant observation

Participant observation is a qualitative approach to measuring community perception and behaviour. It is usually carried out under the supervision of an anthropologist, and the information is not analyzed statistically. It uses observations and interviews to investigate aspects of community life relevant to a research problem.

Participant observation can be used to collect information on a wide range of topics; for example, lineage relationships within the village, daily events relevant to the research problem, and views of elderly people on the causes and treatment of schistosomiasis. The cultural system of the village, in terms of beliefs concerning health and disease, can also be investigated.

Participant observation is not easy to conduct. The research assistants have to be trained in what to observe and record and how to live in the village. It requires close supervision by the anthropologist. The data can be difficult to analyze.

Participant observation, if used with the close supervision of an anthropologist and with trained assistants, can yield large amounts of data on various aspects of village life relevant to a research problem. Methods of how these data will be interpreted must, however, be worked out in advance.

Some notes on field research

Ethical and psychological considerations

Both ethical and psychological considerations play a crucial role in the design and execution of any field study. In particular, where direct or participant observation is involved, the community must be made aware that such observation is planned, and they must give their "informed" consent; in other words, they must consent knowing and understanding what is to happen, what this implies, and what will be done with the data. Needless to say, the use of questionnaires and interviews must be cleared beforehand in a similar manner.

Empathic approach

Great care must be taken to practice sensitive empathy in relation to the self-image, not only of members of the target community, but also of their leaders. So, for example, the district commissioner may have to be approached for an introductory letter to the chiefs concerned. The traditional authority may then call other chiefs in the relevant villages to a general meeting at which the objectives of the study can be explained. The people, therefore, would be aware that a study was going to be conducted in their village. In addition, if research assistants actually stay in the village for the period of data collection, the people would feel familiar with them, as they would have become part of the local scene.

Define sampling and statistics

Samples and types of statistics must be carefully defined beforehand. It is suggested that a statistician and possibly a demographer should be part of the research team from the very beginning of the project. Professionals would need to check methods of interviewing and observation, as well as how the data are being recorded.

Establish a realistic timetable

It is important that the workplan include a proper timetable. The preliminaries take a lot of time, and so do statistical analyses and report writing. A research project planned to last for one year may take three years to complete. Researchers should remember to include the preliminaries (finding research assistants, getting to know communities, etc.) in the project timetable. In addition, more time should be allowed for if the professional investigators have full-time jobs.

Agricultural extension programmes and environmental health education

The prevention of environmental degradation relies heavily on a myriad of human actions and group activities. It requires the enhancement of understanding by the community for the proper development and management of natural resources. Rural institutions and organizations, with their far-reaching potential for vector control through active involvement and participation, are particularly relevant in the context of agricultural extension.

Agricultural extension education is a determinant factor in the total spectrum of agricultural and rural development simply because it is guided by the needs and objectives of the people. It inspires, motivates and trains them to undertake this development.

In general terms, agricultural and rural development leads to changes or alterations in the basic environmental conditions, landscape, domestic plants and animals, hydrology (irrigation project), farming methods, agronomic and animal husbandry and agricultural production methods. Present agricultural extension programmes in developing countries may have indirectly alleviated the outbreaks of some vector-born diseases, although they are production-oriented rather than health-oriented programmes.

Agricultural extension organizations in developing countries have evolved to suit the diversity of social, cultural and geopolitical conditions in these countries. They are included as a function of ministries of agriculture or other institutions, such as universities, commodity-centred organizations or authorities for integrated rural development projects.

Definition and aims

Agricultural extension offers educational opportunities where teaching and learning are planned and carried out with great relevance to the immediate needs of farmers. Accordingly, it is defined as a voluntary out-of-school and community-based educational programme for adult men and women and young farmers (youth), consisting of relevant technical contents derived from research recommendations in the physical, biological and social sciences which have been synthesized into an applicable form. At field level it influences rural people to make desirable changes in their behaviour that will contribute to increased production and better family and community living through the application of scientific knowledge and modern technology. Just as this covers agricultural pest management, it should also include integrated vector control activities.

Through learning and related behavioural changes farmers come to understand the reasons for change, the value of change, the results that can be achieved, the risk inherent in change and the process of bringing it about.

Stages in the learning process

The stages in the learning process which contribute to behavioural changes have been identified as the adoption process, as follows:

1. The availability of the innovation/idea - information, knowledge and technological inputs to be used by farmers.

2. Awareness - farmers are exposed to the innovation/idea and find out that it exists.

3. Interest - farmers become interested in the innovation/idea and recognize that it has merits.

4. Evaluation - farmers apply the idea to their own situations and reject it or decide to try it.

5. Testing - farmers try out the innovation on a small scale.

6. Adoption - farmers decide to apply the innovation or practice on a large scale and ratify its sustained application.

7. Integration - farmers apply the innovation as part of their cultural practices.

8. Institutional continuity of the flow of innovations - society secures the continuity for all farmers.

Use of objectives

In designing and implementing an extension programme that includes disease vector management, the educational objective should be a broad-based community use of vector control measures. The educational objective should give clear directions for the implementation of the programme. The educational objective should thus define the behaviour desired, the context in which the behaviour is believed to be appropriate, the people who are expected to change, the training methods which are likely to be used and the sort of audio-visual aids and training materials that are to be employed.

Planning, implementing, evaluating

Five stages have been identified for the planning, conduct and evaluation of extension training programmes:

Stage 1 - identification of the problem. The significant needs and interests of the people are identified. The needs and interests, where improvement can be accomplished, then become the foundation for the programme.

Stage 2 - determination of programme objectives. The people, with the help of extension personnel, decide their objectives, what is to be accomplished, how and through whom.

Stage 3 - development of a plan of work. Sound principles of social action must be followed in developing such a plan, including the specific tasks to be carried out, the training methods to be used, allocation of responsibilities and the timetable.

Stage 4 - follow through of the plan of work.

Stage 5 - determination of progress. The extent to which objectives are being accomplished is the basis for determining how well a programme succeeds. Evaluation of progress helps to determine what remains to be done.

Optimal use of extension workers

As the ratio of extension workers to farmers in most developing countries is approximately 1:1 800-10 000, a one to one consultative relationship is not normally practicable. Instead, meetings with groups of farmers, who participate

actively in demonstrations, and field visits are suggested as practicable and effective. The role of the extension worker is that of a catalyst, stimulating constructive discussion and guiding the logical development of the learning process. The training of farmers through farmers' training centres or district farm institutes serves the extension purposes through providing training in short residential courses of one day to one week for groups of farmers.

Need for action

Present agricultural education programmes in most developing countries do not respond to health problems and needs. Agricultural and rural extension training should also be based on health assessment studies. The lack of institutional and functional coordination between agricultural extension systems and health authorities and services in developing countries makes it difficult for extension workers to initiate health-oriented activities.

Education systems in developing countries have not yet reached the entire farming population. Basic training schemes should take place in existing or self-help structures in the villages. Large numbers of trainers will have to be found among the local population, thus drawing on indigenous information and understanding. Furthermore, there is a need to promote mass education programmes to bring about a general understanding of the role of the people in environmental management. Educational modules may need to be designed for elementary and secondary schools to expose young people to environmental problems and to sensitize them to participate actively in the development process, including vector control management.

WHO/FAO collaboration in this area recommended

In conclusion, the Panel particularly called the attention of WHO and FAO to the need to seize this opportunity and promote the incorporation of a health education component in agricultural extension programmes. A first step would be the development of a manual on this subject for extension workers, which would form the basis for the development of pilot project to test the feasibility of this approach.

Four examples of community health education

Examples

The Panel had at its disposal four well documented examples of projects where health education was a vital factor in soliciting community collaboration. As the discussion made frequent reference to these illustrative case reports they are here reported in summary.

Schistosomiasis in Malawi

Enquiry into community perception and health status

A rigorously designed and executed study in three villages, with the use of observation and interview, yielded rich data on the perception and behaviour of the villagers[1]. The prevalence of Schistosoma haematobium infection ranged from 36% to 51%, with rates of over 50% for children and adolescents.

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[1] The study was carried out with support from the Social and Economic Research Scientific Working Group of the UNDP/WHO/World Bank Special Programme on Research and Training in Tropical Diseases (TDR).

Limited awareness and lack of hygiene

People were found to have limited awareness of the disease, to practice poor hygiene (e.g., they did not boil their drinking water) and to expose themselves to contaminated water in snail infested streams through fetching water, wading, fishing, washing and swimming. About half of the population in all three villages did not attend control operations; but those who did felt that they had benefited from them. Improvements in the control programme were seen in terms of "more treatment and involvement of the people in future programmes to be done through the chiefs".

Target those most at risk

Use local social structure

A community education programme should aim at raising the people's level of awareness and change hygienic habits and water-contact patterns. The target group should be the children and adolescents who were found to expose themselves more to infective water than the adults. The people in these villages felt that the chiefs must take an active part in future programmes. This indicated how such a programme should approach communities by using existing institutions like the chiefs, healers and traditional birth attendants. It was found through participant observation that some people believed schistosomiasis to be sexually transmitted, and observing sexual taboos was thought to be the "surest way" to avoid getting the disease. This is where traditional birth attendants would come in as they already deal with advising mothers and young girls on sexual and other matters.

Guidance for Ministry's programme

These findings have been submitted to the Ministry of Health for consideration in its programme for the control of schistosomiasis.

Vector and rodent control in Saint Lucia

Coupled with concern about Aedes aegypti in Saint Lucia there was anxiety about the growing rodent population which was estimated at four to every individual. Rodents create their own particular problems: apart from the diseases they spread (leptospirosis, plague, etc.), they damage crops, damage and contaminate foodstuffs and damage property.

Pilot project

A pilot project[1] on community-based vector control was undertaken in 1986 in two rural communities near the capital, Castries, each with approximately 500 dwellings, a health centre and a dormant health committee among other forms of community organization.

First approach community leaders

As a first move, the project team identified community leaders in order to get to know them, to get community leaders to know and accept the team, to learn from the community leaders their general perception of the community, to appraise leaders of the projects and gain their approval and support, and to develop a working relationship with the leaders.

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[1] The project was carried out with support from the Division of Vector Biology and Control of the World Health Organization

Next approach to existing groups in the community

Community leaders would discuss the project proposal with to members of their community and arrange for meetings of the groups project leader with a representative group of community members. Sensitization of the community and existing groups in the community was important because participation of these established groups could be essential for the success of the project. The majority of these groups have annual events which usually include a health component, indicating their potential interest in health programmes. The sensitization process consisted of lectures, meetings and discussions with the members of the groups. The objective was similar to that for the sensitization of community leaders.

Setting up a community committee

The next important aspect of setting up a community-based project was the establishment of a core committee to mobilize community support and relate community feeling, perceptions, interest and concerns to the project coordinator, to enable him to assess the response in the community and to assist in organizing the community for action. Candidates for committee membership should show a positive attitude towards community activities and have an interest in community health issues. Members of the committee were drawn from sports clubs, mothers' groups, fathers' groups, school and parents' groups, community volunteers and other existing groups. All health personnel at the community health centre and members of the existing health committee were made members automatically.

Potential conflict between groups

Persons put forward by community groups and organizations may themselves not be interested and may not be an asset to the project. It is worth remembering, though, that there are schools of thought that feel that if organizational structures already exist within the community, it may not be wise to start a new group. The risk of organizational conflict between community groups is real, and working with one group and not another may affect a programme severely. Even so, there are some people who have the potential and are willing to assist but have kept out of organizations for various reasons.

Training for committee members

The committee was given a period of theoretical training which highlighted the main vector problems in the communities. The practical component of the training programme included the preparation of survey instruments, pre-testing of the questionnaire, carrying out the survey (collection of baseline data) and analysis of data. The training also included interviewing techniques.

Fact finding

For the purpose of the initial fact-finding survey, the community was divided into zones; the committee was divided into groups, and each group was given responsibility for a zone. The house to house survey was also part of the effort to meet the community and to sensitize them to the project. Initially the groups were supported in the field by the environmental health aides (Aedes inspectors); later they continued on their own. Each member of the group was given questionnaires, clip boards, pencils, eraser, sharpener, rubber boots, pipettes, mirrors, sample bottles, flash light/batteries, dippers (spoons) and a bag for carrying equipment.

Analysis and planning

Following the survey, a number of sessions were held with the committee during which the data were analyzed. Based on the the outcome of this analysis committee members began their preparations for the next phase of the programme.

Participation by schools

During the entire project, the schools were used for community meetings, film shows, training programmes and also for the launching and award ceremonies. Meetings and discussions were held with the principals and staff to acquaint them with the project, to enlist their support and participation and to develop a school programme which included lectures to students, a poster competition, a school clean-up campaign and cultural presentations at the launching and award ceremonies.

Launching ceremony

The Bocage/Ti Rocher project launching ceremonies were held in both communities to maximize community awareness and interest in the programme. Having as many VIPs as possible at the launching ceremony gave the project some importance and made the people more willing to be associated with it. The launching was the first formal approach to the whole community, and the exercise was used to bring the community up to date with the objectives and activities of the project, introduce the members of the committee, highlight the efforts of the committee, present the results of the survey, and secure the interest of the community in participating in the source-reduction campaign. Apart from the official speeches and presentations, an important part of the ceremony was made up of songs, dances and plays by the school children, highlighting the problems of vectors and other community problems. The source-reduction and beautification exercises were the main elements of the programme.

Community education

The community education programme included lectures, meetings at the schools and at other public places, distribution of leaflets to each household, posting of health slogans at strategic points,and announcements through a public address system. The public address system seemed to have been the most effective of the various strategies.

Clean-up campaign

The source reduction and beautification included: collection of rubbish and cleaning of premises by householders; cleaning up of indiscriminate dump sites; clean-up around the schools by teachers and pupils; removal of old vehicles and other appliances; cutlassing and cleaning of roadsides and removal of refuse.

Construction work

Additional activities not directly aimed at source reduction included public facilities, i.e., showers, laundry, standpipes and the preparation and erection of signs within the communities such as "no dumping of refuse" signs, and maps of the communities.

Extension of the campaign

The clean-up campaign was scheduled to be carried out over a one week period. Because of its tremendous impact on the community it was extended to two weeks and even beyond.

Evaluation follow-up

An evaluation exercise undertaken by the committee immediately after the clean-up campaign showed significant impact on the rodent harbourage and small mosquito breeding containers, e.g. tyres, cans. The larger containers (drums, tanks) still

posed a serious problem in the breeding of Aedes aegypti. A campaign was undertaken by the committees to ensure that all drums used for domestic water storage would be properly covered. An important result of the campaign was a change in attitude of people who were accustomed to dumping rubbish in their backyard. They were now contemplating setting up a refuse disposal service for the community. There was a reduction of the Aedes aegypti index from 16% to 1% between March and December of the same year.

Liver Fluke control - Thailand

Aims

This study addressed the problem of how to make people come for treatment as scheduled and, perhaps even more important, how to modify human behaviour in order to prevent transmission. The study took the view that health education should not only aim to increase knowledge but also to show people that the problem does exist and to motivate them to change their risk behaviour. Existing conventional practices of health education were judged to be inappropriate and ineffective. Liver fluke infection, caused by the trematode Opisthorchis viverrini, was taken as a case study to explore alternative approaches to health education.

Objectives

In view of the liver fluke problem and the discovery of an ideal drug for its treatment, a pilot project to control Opisthorchiasis was launched in 1982 to last for a period of five years. The objectives were to control liver fluke infection in rural communities with chemotherapy and to prevent infection by changing people's behaviour. As O. viverrini can invade the human host only by the consumption of raw fish, health education was used as a change agent to modify human eating habits.

Education as an agent for change

Eating habits are considered to be one of the most difficult types of behaviour to change. This project demonstrated that health education, properly applied, can overcome the community's resistance to change.

Outcome

The pilot project was conducted in Khon Kaen, in the north eastern province of Thailand, where liver fluke infection is highly endemic. In two experimental villages, annual treatments were given to the stool-positive cases of O. viverrini, followed by a new strategy in health education. The prevalence and incidence rates of infection were brought down to the level of nil public health significance within three years. In the control village, where the annual treatment was given without health education, the prevalence and incidence rates were only slightly decreased.

Strategy for education

The strategy in health education in this project was based on the concept of community mobilization with the use of "prime movers" to trigger the activity. The essential elements that contributed to the success of the project were: community participation with the use of prime movers, socio-cultural understanding, simple and efficient educational tools, and school health education programmes and regular supervision.

Use of the media

Radio, newspapers and television were used to report the discovery of the drug and how people were coming for treatment. The infection and its pathology were also covered. At the same

time village headmen, committees and other local leaders - teachers, monks, senior citizens - were contacted, and meetings, exhibitions, education programmes, posters and village loudspeaker addresses were organized. The leaders were used as prime movers to help organize community participation. They acted as good examples, they were the first to stop eating raw fish and to construct latrines. They also monitored the behaviour of the villagers and influenced them to maintain their new behaviour.

Leaders as trendsetters

It is normally difficult to convince people that they should change their habits, unless their socio-cultural background is well understood. In order to reduce liver fluke infection, a study was made of the traditions, cultural beliefs and taboos connected with eating habits. From the study, it is now understood that people prefer small cyprinoid fish to the larger ones. Koi-pla, a popular dish made from this fish, has social value as the food to show social intimacy and as the food to serve during celebrations.

Cultural background to eating habits

The education programme was planned with this information in mind. For instance, the Department of Fishery was advised to raise fish other than cyprinoid. Communities were advised to grill fish before making koi-pla, and committees were advised to intensify the education programme before any celebration.

Intervention

An investigation of communication systems and habits in the villages demonstrated that small group discussions at night, after the day's work, demonstration of worms and infected fish, and the village loudspeaker system were effective means of communication. Selected villagers were trained to educate others by using educational tools that were simple enough for them to manipulate. Cassette tapes were supplied for the loudspeaker system, and a newsletter was produced and distributed in the villages. The village newsletter was produced bimonthly by the central office, care being taken to write it in simple language.

Social habits and access to the community

Using this strategy, it was found that health education can be delivered to the community as often as seems desirable. People can learn at home without wasting their time at a meeting. It was cheap because it was done by the local people; no per diem nor travel costs were needed. The only expenses were the production of a master tape and the printing cost of the newsletters and posters.

Simple and inexpensive

Once a habit is formed it is very difficult to change, particularly in the older age groups. One component of the health education programme was designed to promote healthy eating habits among the younger generation. School teachers were first educated about the problem of liver fluke infection in the community. Once they realized the significance of the problem, the regular health education lesson was modified to fit in with local health problems. "Health education corners" were set up in the schools, displaying the snails and fish intermediate hosts collected around the villages, and the parasites purged from the patients. Such "corners" were used as laboratories for health education of students and the adult community.

Educating the young

Examination and treatment lead to eradication

The activities included stool examination of all students and treatment where necessary. Within one to two years, all the students were free from liver fluke infection and the schools were finally declared to be liver fluke free.

Students influence parents

The schools exerted direct and indirect pressure on the community. Since the students wanted to be free of the parasite, they tried to persuade their parents not to prepare raw fish dishes at home. The schools moreover participated in the health education programme; they helped in organizing the exhibition, and students and teachers served as announcers using the village loudspeaker systems.

Eating raw food was a habit and a tradition. The change in this behaviour could easily have been a temporary one, and people's awareness and perception of the disease might have faded as time passed. Educational activities which had to be carried out by villagers, such as the use of the village loudspeaker system and the organization of meetings, might have become sluggish after the project had run for some time. Regular visits were, therefore, made with supplies of educational materials such as cassette tapes and newsletters. General topics, as well as the problems of changing behaviour, eating practice, and the method of community education were frequently brought up for informal discussion. Refresher courses were organized for particular activities such as the use and maintenance of the loudspeaker systems, and cooking lessons were held for mothers' clubs.

Malaria vector control - Brazil

Malaria control with new settlers

This study was concerned with stimulating community participation in malaria transmission control in a new settlement area in Amazonas State. When the colonists arrived in the area, they were housed in communal huts for one week. After they had received their plots they were supposed to construct temporary houses as soon as possible. Generally, the houses were near the forest and small rivers and had no proper walls. The colonists started by cutting the trees on their land, burning them and planting rice. The local weather conditions were good for the multiplication of mosquitos because of high temperature and humidity.

Information gathering

A social worker and a malaria control team started by collecting data for the project: geographical, social, economic, cultural and sanitary information. The information was obtained using a questionnaire for interviews with 385 family groups. Four Superintendencia de Campanhas de Saude Publica - SUCAM workers, one person from the Brazilian Alphabetization Movement (MOBRAL), one person from the State Health Department and one from the community of settlers were trained in working with the questionnaire and interviewing the people. The director of the Jumas School collaborated in the training. During the interviews, basic concepts of malaria transmission and control measures were presented to the settlers. Information on the work of SUCAM and the best way of using it were discussed.

Role of community leaders

Other community leaders, including religious leaders, were ready to participate in health education and to facilitate contact with the settlers. Notification posts for malaria cases

were established under the responsibility of the community leaders.

Intervention

The results of an entomological survey and a map with the main mosquito breeding places were presented to the population. DDT spraying and microscopical diagnosis, as well as treatment of positive cases were organized.

Education

Health education was based on knowledge of disease transmission, local factors and available measures for malaria control in the colonization area. The need for houses with proper walls was emphasized. The spraying of used oil in identified mosquito breeding places each 10-15 days was recommended. All fever cases were to be identified early for confirmation by blood smear and for subsequent treatment.

Health education activities

A community group was formed to coordinate health education activities. An action plan was prepared with allocation of responsibilities in the fight against malaria. Slides, maps, tables and figures with local malaria data, as well as brochures and booklets about malaria were shown or distributed to the settlers. During community meetings, discussion groups were encouraged to ask questions. As a result of these meetings, health education measures were proposed with community involvement. These included informing new settlers about malaria transmission and control as soon as possible after their arrival, presentations for school children about malaria, promotion of the use of mosquito-nets, prevention of new mosquito breeding sites, urgency in construction of houses with complete walls, removing parts of felled trees from small rivers, and referring fever cases for diagnosis.

Evaluation

The incidence of 100 cases of malaria per thousand was reduced to around 70 cases per thousand. In general, however, data were scarce, and comparative figures for the communities where health education was practised and for control communities were not available. The Jumas project was a first, and so far unique experience of health education in colonization projects in Amazonas. In all other colonization projects malaria incidence has, as a rule, increased during the first five years.

4. CONCLUSIONS

The technical discussion took particular note of the report of the World Commission on Environment and Development (Brundtland Report), its emphasis on the relationship between the environment and sustainable development and the consequent need for intersectoral and interprofessional collaboration. While the discussion ranged across the full spectrum of educational needs and associated methods for political and financial decision makers, including donor agencies, professionals and managers, technicians, labourers and local communities, particular attention focused on the need to engender attitudes and competences necessary for effective intersectoral and interprofessional collaboration. In this endeavour the Panel felt justified to claim, on behalf of the three participating organizations, that the aims, activities and plans of PEEM constitute an important model for intersectoral collaboration in relation to the environment.

The Panel recognized that change in attitude and perception would have to be brought about if intersectoral collaboration favouring the incorporation of

environmental management measures as health safeguards in water resource development projects was to become accepted practice at all levels of political and financial decision making, as well as professional and managerial planning and implementation. There is thus a challenge to foster a favourable climate of opinion for intersectoral and interprofessional collaboration and to ensure that such collaboration becomes firmly embedded as an essential component of everyday practice.

In order to develop appropriate education and training for decision makers, professionals, technicians, labourers and local communities, there is a need for further research into the mechanisms for intersectoral collaboration which will ensure practical measures for environmental control, and the areas in which PEEM can give a lead, especially in creating awareness of the issues and the need for intersectoral collaboration. PEEM could also explore the possibility of producing manuals for guidance in the solution of technical problems, including health aspects of water resource developments.

Furthermore, there is a need to assemble a coherent body of substantial expertise and experience in appropriate educational methods and related use of the media to foster attitudes and specific competences in the different categories of people involved in safeguarding health in relation to water resource development. This will include, in particular, ways and means of encouraging community participation and the imaginative use of all the media, from health slogans printed on dress material and school notebooks, to posters, plays and mass media, such as newspapers and radio.

The Panel expressed the view that such experimentation and accumulation of experience might usefully be linked to ongoing programmes, such as the Zambesi project, and be linked up with existing facilities, such as agricultural extension programmes. The latter have been conspicuously successful in achieving acceptance of innovative practices by farmer communities. It would, therefore, be a distinct advantage if existing agricultural extension facilities could be made available to assist in achieving health related behaviour changes in communities that are affected by water resource developments.

5. RECOMMENDATIONS

Further to the above conclusions, the Panel formulated a number of recommendations aimed at promoting changes in perceptions and attitudes, and at developing materials and tools for improved multidisciplinary education and training. The Panel anticipated that the successful execution of these recommendations would not only constitute an important example of the endeavour necessary to achieve intersectoral collaboration, but would also contribute significantly to improved health status of communities exposed to vector-borne disease in water resource development areas.

(1) The specialized agencies of the United Nations should, when appropriate, encourage training components and practical experience in multidisciplinary collaboration in their field projects.

(2) WHO, FAO and UNEP should encourage governments and financing agencies to increase intersectoral and interprofessional collaboration in the control of vector-borne diseases by establishing specific policies in relation to the education of personnel involved in the planning, implementation and operation of water resource development projects.

(3) WHO, FAO and UNEP should collaborate in the development of strategies to incorporate environmental management for vector control into agricultural extension programmes.

(4) WHO, FAO and UNEP should coordinate the collection of information about ongoing education directed towards attitudes and competences in intersectoral collaboration. This would include analysis of evaluation data in order to gain a better understanding of the acceptability, practicability, effectiveness and efficiency of various approaches to the organization and delivery of such education. The survey would also include professional bodies that offer educational programmes or examinations.

(5) The Panel should collaborate with the authors and publishers of a number of future hydraulic engineering textbooks in order to include material on health-related aspects. This collaboration should include a follow-up to establish the impact of such additional material in standard textbooks.

(6) The Panel should collaborate with appropriate agencies in commissioning general guides for those who are asked to organize or implement educational sessions or entire programmes relating to intersectoral collaboration in vector-borne disease aspects related to water resource development. Each guide would concentrate on education or training of a specific audience (e.g., professionals, technicians, community). Educational principles and their suggested application would be presented with illustrative examples from real life experiences.

(7) The Panel should commission and field test a number of educational packages designed to foster attitudes and general competence for intersectoral collaboration in institutes, such as schools of medicine and faculties of engineering, where the spectrum of interdisciplinary expertise may be limited.

(8) The Panel should encourage organizers of international water resources conferences to include multisectoral participation on health issues and environmental management for vector control.

(9) The Panel should consider ways and means to organize, on a regional basis, short, international workshops for high-level decision makers including financial planners. In addition, PEEM should explore the desirability and practicability of developing a travelling seminar in collaboration with SEAMEO TROPMED. The audience and aims of the seminars would be the same as those for the regional workshop.

6. WORKING PAPERS PREPARED FOR THE TECHNICAL DISCUSSION

Atchia, M. Programmes and strategies for awareness building and training in the field of environmental management, with specific reference to vector control. PEEM/8/WP/88.15.

Biswas, A.K. and Nakayama, M. Health aspects of water resources education and training. PEEM/8/WP/88.03.

Bradley, D.J. Objectives, needs and constraints with respect to training in environmental management for vector control. PEEM/8/WP/88.01.

El-Zoobi, A.M. Educational approaches in agricultural extension programmes and their applicability to environmental management for vector control. PEEM/8/WP/88.11.

Engel, C.E. Innovative approaches towards the training of planners, decision makers and economists on the health aspects of water resources development. PEEM/8/WP/88.04.

Février, M. Community participation in environmental management for vector and rodent control in Saint Lucia. PEEM/8/WP/88.12.

Imevbore, A.M.A. Environmental management training of managers of water resource development projects in Nigeria. PEEM/8/WP/88.06.

Kamwendo, A. Techniques for measuring community perceptions and behaviour with a view to developing a community education programme. PEEM/8/WP/88.10.

Kilama, W.L. Community health education for environmental management for vector control: a comparison of approaches for rural and urban communities. PEEM/8/WP/88.09.

Litsios, S. Approaches to training health sector staff in thinking intersectorally. PEEM/8/WP/88.05.

Ponniah, W.D. UNEP's programmes and strategies for awareness-building and training in the field of environmental management. PEEM/8/WP/88.02.

Santasiri Sornmani. Essential elements in community health education in Thailand, with special reference to environmental management. PEEM/8/WP/88.13.

Small, L. and Roundy, R. Evaluation of short courses on "Human welfare and irrigation" for a multidisciplinary target audience. PEEM/8/WP/88.07.

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PART II. GENERAL PROGRAMME AND POLICY

1. REVIEW OF ACTIVITIES, 1987-1988

1.1. Promotion

Publications. The Panel's regular promotional publications, the report of the Panel's meeting and the PEEM Newsletter, were complemented by the publication by FAO of a document containing edited versions of all the working papers prepared for the technical discussion at the seventh meeting. Of the other two scheduled promotional publications, a document containing selected working papers of previous PEEM meetings, and a case studies document, the former was now in print. The Panel asked the Secretariat to expedite the preparation of the case studies document. It was suggested that a set of three articles on health requirements of engineering works, recently published in the Journal of Tropical Medicine and Hygiene, 91:3, be incorporated in this document. Similarly, material from a recently published WHO/VBC document presenting an historical case study of environmental management in Malaysia in the 1920s could be included.

The Panel noted the following progress made in the preparation of the technical publications:

- Guidelines for forecasting the vector-borne disease implications of water development projects. Based on a review of the results of a survey for the evaluation of the preliminary draft version of these guidelines (carried out among approximately 250 professionals in health, agriculture and engineering), the Steering Committee had recommended a further revision of the document, based on the comments received, before final publication. The extent and schedule for this revision would be discussed with the author in October 1988.

- Guidelines for the incorporation of safeguards against vector-borne diseases into irrigation projects through intersectoral collaboration. The revision and finalization of these guidelines had been commissioned from Dr M. Tiffen of the Overseas Development Institute. The preparation was on schedule, with a first draft received in August 1988.

- Guidelines for carrying out cost-effectiveness studies of vector control programmes. These guidelines were under preparation by Ms Mills and Ms Phillips of the Evaluation and Planning Centre of the London School of Hygiene and Tropical Medicine. A first draft would be ready by October 1988, and arrangements had been made for short feasibility studies in Ethiopia, India and El Salvador.

The Panel agreed to the suggestion that these guidelines, contrary to earlier intentions to put them out as official publications by one of the three agencies, should be published as PEEM documents. Such a course of action would speed up publication and ensure greater visibility of PEEM, as well as according equal recognition to the three agencies. The Secretariat was asked to explore possibilities for external funding.

Professor Santasiri informed the Panel of the recent publication "Water resources development and its impact on socio-economics and health with reference to Thailand", co-authored by himself and Professor Chamlong Harinasuta. It was available from the Information Centre of the Faculty of Tropical Medicine, Mahidol University, Bangkok.

Concerning other publications in its programme, the Panel noted the revised target date of October 1988 for the publication of the proceedings of the

IRRI/PEEM/USDA Riceland Vector Control Workshop. It expressed its dissatisfaction with the further delay in submission of the final report by the principal investigator of the study on the nature and magnitude of irrigation development associated vector-borne disease problems in Sri Lanka.

Other promotional activities. With support from WHO and UNEP, a successful inter-regional travelling seminar on environmental management measures for vector control in water resources development projects had been organized from 16 November to 6 December 1987 in the USSR and India. The Secretariat announced that the report of that seminar was now available from WHO's VBC Division.

The presentations of the Panel's objectives and work at a Seminar on Water Resources and Water Quality Management (Amman, 28 May-2 June 1988) and at a seminar on the Impact of Water Resource Development on the Health of Communities and Preventive Measures for Adverse Effects (Surat Thani, Thailand, 13-16 June 1988) were also reported.

1.2. Establishment of an International Information System

Collaborating Centres. The status of the network of Collaborating Centres was reported to be as follows:

* The Institute of Land Improvement, ETH, Zurich, Switzerland, and the London School of Hygiene and Tropical Medicine, UK, had been redesignated as Collaborating Centres in June 1988.

* Redesignation procedures were underway for the Tennessee Valley Authority, Knoxville, Tennessee, and the International Institute for Land Reclamation and Improvement, Wageningen, Netherlands.

* Designation procedures were being carried out through the WHO Regional Offices for the following institutions:

- Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand;

- International Irrigation Management Institute, Kandy, Sri Lanka;

- Liverpool School of Tropical Medicine, Liverpool, UK;

- Osvaldo Cruz Institute, Rio de Janeiro, Brazil;

- Queensland Institute of Medical Research, Brisbane, Australia.

The Secretariat informed the Panel that when the designation procedures were completed, a system of regular planning, coordination and reporting would be proposed to the Centres. This should lead to a more effective exchange of information, in support of the proposed International Reference Centre for Environmental Management. With respect to the geographical distribution of the Centres, the Panel noted the absence of a Collaborating Centre on the African continent. The Steering Committee was asked to explore the possibilities of adding an African institute to the network.

National water resource development and coordination boards. The Panel noted with satisfaction the establishment in Costa Rica of a multidisciplinary group to address vector-borne disease hazards of planned irrigation development.

International Reference Centre for Environmental Management (IRCEM). Attempts by the Secretariat to obtain the services of an Associate Professional Officer to initiate the work for this reference centre had failed so far. The Secretary

informed the Panel members of a recent communication from the Dutch authorities, that within the Netherlands' APO programme there was room for support of suitable candidates from developing countries. The establishment of the IRCEM had gained new importance in the light of the recommendations of the World Commission on Environment and Development. The three agencies were therefore asked to step up their efforts to set up the reference centre.

Dr Abu-Zied informed the Panel that, following the Cairo Conference of African Ministers of the Environment, it had been decided to set up a resource data base for Africa. Of eight information exchange networks proposed, one handled water resources and was coordinated by the Water Research Centre in Cairo. Dr Abu-Zied would regularly report to the Panel on the network's progress.

1.3. Research activities

Field studies on the effect of Azolla on mosquito breeding in rice fields. The continuation of the field studies on the effect of Azolla on mosquito vector breeding in rice fields in China was approved.

The second phase of the Azolla studies underway in China envisaged experimental studies in rice fields in Jiangsu province (1988) and Hunan province (1989). In the experimental fields (and an equal number of control fields) physical and chemical parameters were measured at regular intervals; larval densities were measured by conventional dipping, and adult densities were assessed using emergence exit traps. In the experimental fields the percentage coverage with Azolla was determined during the course of the study. Professor Lu Bao Lin had ensured the collaboration of the Jiangsu Provincial Hygienic and Antiepidemic Station in Nanking and the Hunan Provincial Hygienic and Antiepidemic Station in Zhangsha for the implementation of the fieldwork. Laboratory studies on the possible toxic effect of macerated Azolla on mosquito larvae were also carried out.

Demonstration project on community-based environmental management for vector and rodent control in Saint Lucia. After the successful completion of the first phase of this project in the communities of Ti Rocher and Bocage in December 1986, the implementation of the second phase of the project was initiated in January 1988. The main objectives of the second phase, which was to run until 31 December 1988, were: (a) consolidation of the achievements of phase one; (b) selection of suitable communities to which the project can be extended, based on vector/rodent surveys and on a survey on health perceptions in candidate communities; (c) implementation of a programme of environmental management for insect-vector and rodent control in, and with the participation of, the selected communities; (d) evaluation of the programme's feasibility and effectiveness on this expanded basis.

A proposal for a similar project had been received from another country in the eastern Caribbean, Dominica. Possibilities were being explored of organizing a workshop in the Caribbean region in 1989 on the subject of community-based approaches to vector and rodent control.

The draft proposal for a study on the effectiveness of integrated malaria and schistosomiasis control in the Wonji Sugar Estate in Ethiopia had been circulated for comments. These would be consolidated in the next few months and forwarded to the Committee for Interinstitutional Collaboration in Ethiopia.

For a number of reasons, no progress had been made in the implementation of two proposals endorsed by the Panel at its seventh meeting: evaluation of agronomic practices in rice fields in relation to the production of mosquito vectors, with special reference to neem; and environmental management using livestock for the reduction of malaria and Japanese encephalitis virus transmission in the irrigated areas of the Mahaweli System in Sri Lanka.

1.4. Training activities

The visual training aids on environmental management would be available before the end of 1988; the accompanying text was in print, and slides of the overhead transparencies were being made. The whole set would consist of 80 slides, 25 overhead transparencies and accompanying text with annexes and would be sold as an item in the WHO/VBC series of visual training aids.

The feasibility testing of the proposed curriculum and syllabus guide had been initiated in five engineering schools:

- The Faculty of Engineering and Architecture, University of Khartoum, Sudan;
- Centre of Excellence in Water Resources Engineering, University of Engineering and Technology, Lahore, Pakistan;
- Faculty of Engineering, University of Malaya, Kuala Lumpur, Malaysia;
- Department of Sanitary Engineering, All India Institute of Hygiene and Public Health, Calcutta, India;
- Department of Civil Engineering, University of Nairobi, Nairobi, Kenya.

FAO had initiated a complementary survey among fourteen schools of engineering world-wide, and the Panel member at IRRI, Dr S.I. Bhuiyan, had written to deans of schools of engineering in an attempt to identify alternative ways of including a health component in engineering curricula.

The Panel observed that a lot of progress had been made in awareness creation and education of engineers, and that it was time to explore possibilities of addressing agricultural scientists. Another group that continued to deserve the Panel's attention were the high-level planners and decision makers who could perhaps be addressed in short "executive" courses.

2. REPORT OF THE STEERING COMMITTEE

2.1. Election of the new Steering Committee

A vote by correspondence for members of the Steering Committee had been carried out prior to the eighth Panel meeting. Thirty of the thirty-nine ballot forms sent out were returned to the Secretariat. The new Steering Committee is composed of: Professor D.J. Bradley, Dr S.I. Bhuiyan, Professor A.M.A. Imevbore, Professor J.K. Olson and, ex officio, the elected chairman of the Panel, Dr B.H. Kay.

2.2. Report of the out-going Steering Committee

The Steering Committee held its tenth meeting on 13 and 14 April 1988 at the headquarters of the World Health Organization in Geneva. At this meeting, the Steering Committee considered the reactions of the executive heads of the three participating organizations to the external evaluation of the Panel's programme of work and achievements, to the evaluators' recommendations and to the Panel's recommendations formulated at its fifth meeting.

The observations of the Steering Committee in relation to the questions raised concerning the future strategies of the Panel and, in particular, the mechanisms to

facilitate the process of field orientation which is to take place in the next phase of development of the Panel were endorsed by the Panel and are presented in section 3, below.

The Steering Committee made the following decisions:

(a) The Steering Committee selected "Policies and programmes of governments, bilateral and multilateral agencies and development banks for environmental management in the context of natural resources, agricultural and health development" as the subject for the technical discussion of the ninth PEEM meeting (1989).

(b) The Steering Committee reviewed the revised terms of reference of the three redesignated Collaborating Centres, and the terms of reference of the five new Collaborating Centres agreed on by the Panel. The Committee instructed the Secretariat to go ahead with the designation and redesignation procedures on the basis of those terms of reference.

(c) The Steering Committee agreed on the redesignation of the International Institute for Land Reclamation and Improvement (ILRI), in Wageningen, the Netherlands, following the expiry of its designation in 1988.

(d) The Steering Committee approved the revised objectives and scope of a proposal for the organization in the USSR of a workshop on the state-of-the-art of forecasting methodologies, and decided that the Secretariat should go ahead with the finalization of project formulation and submission of the proposal to UNEP.

The Steering Committee also made the following recommendations which were subsequently endorsed by the Panel:

(a) On the basis of the analysis of the results of a survey carried out among the potential readership of the guidelines for forecasting the vector-borne disease implications of water resource development projects (preliminary edition: document VBC/86.3), the Steering Committee recommended that these guidelines should be further developed before it was decided to publish them. Technical additions and modifications in the presentation of the document were needed and feasibility-testing by the author and field-testing by independent engineers working in water resource development projects were required to achieve guidelines that were good enough to be used without the need for immediate revision.

(b) With respect to the field-testing of the proposed curriculum and syllabus,[1] the Steering Committee recommended that priority be given to carry out a survey among those in charge of curriculum development in engineering schools, to assess the practical value of the proposed approaches.

(c) The Steering Committee discussed the responses of the three participating agencies to the report of the external evaluators. Its general considerations regarding field-orientation were endorsed by the Panel and are presented below in section 3.

As part of its response to the external evaluation, the World Health Organization had suggested that the field orientation of the Panel's programme of work be enhanced by carrying out studies in three interested countries. The Steering Committee recommended criteria for the selection of countries. These criteria were endorsed by the Panel and are listed in section 3.5 below.

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[1] Proposed curriculum and syllabus on disease vector management in water resources development projects for inclusion in engineering courses, document VBC/87.1, WHO, Geneva

3. CONSIDERATIONS OF THE PANEL'S FUTURE STRATEGY WITH SPECIAL REFERENCE TO FIELD ORIENTATION

The three participating agencies responded to the report of the external evaluators on the Panel's programme and achievements during the 1987/1988 period. While concurring with the evaluators' view that PEEM carried out a valid and vital function, and was worthy of continued support by the three agencies, the agencies asked for clarifications of a number of issues related to the Panel's future strategy, in particular the mechanisms for the proposed field orientation.

The Steering Committee had discussed these issues and formulated a set of considerations for the Panel's future strategy, which were endorsed by the Panel and are summarized below.

3.1 Framework

On the premise that the Panel was to continue in its present form, the Panel reaffirmed that it would continue to be a coordinating and advisory body, in the spirit of the objectives of its three participating agencies, and that it would continue to operate within the original scope of its mandate, i.e., environmental management for vector control in relation to the development of natural resources, agriculture and health. It would adhere to the objectives formulated in the arrangements between WHO, FAO and UNEP for its establishment. That implied that the strengthening of inter-agency collaboration with a view to promoting environmental management would continue to be its main goal. While that policy-making function had been carried out to some extent by the Panel during the past years, the review of the internal programmes and policies of the three organizations in connection with the Panel's mandate deserved a greater emphasis in the coming years.

Such reviews should prepare and maintain an inventory of the relevant policies endorsed by the policy-making organs of each of the participating agencies. They should monitor the translation of those policies into activities in the programme and budget of each agency, and evaluate whether the results of the activities met the original objectives. They should provide the Panel with adequate information based on which recommendations for new policies or policy adjustment could be formulated. While the three participating agencies, WHO, FAO and UNEP, should be their principal focus, such reviews should by no means be restricted to them. Policies and programmes of multilateral and bilateral donors and of development banks should also be scrutinized as regards the possible vector-borne disease impacts that might result from water resource development projects they supported, The development of a common policy with respect to that problem throughout the United Nations system should be the ultimate objective.

Finally, the development of national policies promoting adequate intersectoral collaboration between health, agriculture, water resource development and environment authorities would need to be further encouraged and monitored.

3.2. Definition of field orientation

In the past seven years the Panel's programme of work has predominantly consisted of promotional activities, information collection and dissemination, knowledge generation and identification of knowledge gaps. The need for the Panel to enter into a phase of increased field orientation was first recommended by the external evaluators, and was endorsed by the Panel at its fifth meeting. Field orientation was also addressed in the response by the three participating agencies as a major element to be considered for the Panel's future strategy.

The Panel felt that its field orientation needed a broad definition and should not be restricted to the execution of environmental management related activities in water resource development projects. It should rather include:

- policy development, adjustment and assessment at the national level;
- development of tools (the Panel has already initiated a substantial amount of work in this category with the preparation of the various guidelines);
- feasibility testing and field testing of the developed tools;
- promotion of tools through national and regional workshops, seminars etc.;
- promoting or conducting research to fill the identified knowledge gaps;
- promoting or conducting field activities to strengthen the cause of environmental management;
- promoting or conducting training activities.

3.3. Financial aspects

In the discussion of the mechanisms to achieve an increased level of field orientation, securing the necessary financial support was the central issue. Several suggested sources of funding were reviewed and suggestions were made for their further exploration.

One way to secure financial support would be to broaden the basis of the Panel by establishing some type of formal linkage with the two major development agencies in the UN system: UNDP and the World Bank. Such a link could also profitably exploit the excellent infrastructure at the country level of these agencies, particularly UNDP. Middle-level negotiations should lay the groundwork for the establishment of such links. It was proposed that a three-agency mission be organized for discussions with UNDP and the World Bank. If successful, these negotiations could subsequently be concluded at the highest administrative levels. Within the collaborative framework thus created, support could be sought for Panel-recommended field activities.

Within each of the three participating agencies themselves official channels and formal mechanisms exist for contacts with multi- and bilateral donors. As PEEM is a separate item in the Medium Term Programmes of WHO, FAO and UNEP, it should be possible, in principle, to obtain financial support for activities recommended by the Panel. As these channels and mechanisms will differ from one organization to the other, the Panel suggested that individual Secretariat members investigate this matter further and report on possibilities.

Five of the six diseases within the mandate of the UNDP/WHO/World Bank Special Programme on Research and Training in Tropical Diseases (TDR) are vector-borne (malaria, schistosomiasis, the filariases, the trypanosomiases and leishmaniasis). Several of the programme's Scientific Working Groups would, in principle, be able to address research aspects of the Panel's programme of work. In this connection, the fact that TDR is also moving towards increased field orientation is worth considering. The Scientific Working Groups on the Biological Control of Vectors and on Social and Economic Research are of particular interest. Two possible ways of integrating environmental management for vector control into the TDR structure were suggested: broadening the mandate of the Scientific Working Group on the Biological Control of Vectors, and earmarking a lump sum of TDR funds for field-oriented research activities in environmental management.

Finally, the Panel emphasized that, in accordance with their terms of reference, the members of the Steering Committee themselves should pursue high-level contacts which would facilitate financial support for the Panel as a whole, or for individual activities within its programme of work.

3.4. Collaborating Centres

The possible role of Collaborating Centres in the process of field orientation had been discussed at the seventh PEEM meeting. In brief, this would entail the promotion of environmental management activities in the regular programmes of the Collaborating Centres at a significant level, proportionate to each Centre's possibilities in terms of budget and manpower, assisting the Centres in their contacts with potential donors, and increasing the level of networking between the Centres by changing from the current pattern of annual Panel meetings to a pattern of alternating Panel and Collaborating Centre meetings.

The Panel felt that a proper balance should be found in which there was sufficient active collaboration between the Panel and the Centres to allow for a significant contribution of the latter towards the achievement of the Panel's principal objective, while at the same time satisfying each of the Centres' individual interests in the research and training areas related to environmental management for vector control.

The Panel, however, also felt that changing the original arrangements between the three agencies to allow for alternate Panel and Collaborating Centre meetings steered too far away from the Panel's objectives and functions. Instead, the Panel recommended shifting the emphasis in Panel meetings alternately on policy and on technical subjects and, for the meetings with a technical emphasis, giving preference to inviting members who at the same time represented a Collaborating Centre.

3.5. Country studies

The suggestion by the Director-General of the World Health Organization to carry out studies in three interested countries as part of the process of field orientation was welcomed by the Panel. Such an approach would provide a valid reason for donor support. The studies should particularly address questions related to the mechanisms and linkages required for environmental management in water resource development, rather than technical issues concerning vector control. It was considered important at this stage to define selection criteria for countries (see below). This could be followed by an official approach through fact-finding and project formulation missions to candidate countries. The activities involved in such studies should be carried out by nationals, under the guidance of the Panel and the three agencies.

The following selection criteria for countries were established:

- water resource development had to be an important component of the countries' overall national development programmes;
- rather than one large-scale project, the development of water resources should be implemented through a number of smaller projects;
- there should be significant risks of the spread or exacerbation of one or more vector-borne diseases from water resource development;
- national authorities in the relevant sectors should have a real interest in the issue;

- there should be local institutions capable of implementing the project, and involvement of local Panel members would be an asset;

- cost-effectiveness considerations should be incorporated in the project from the very beginning.

Once sound proposals have been developed, these should be channeled through the regular contacts between WHO/FAO/UNEP and donor/funding organizations.

4. PROGRAMME OF WORK AND ESTIMATED BUDGET FOR 1988/1989

4.1. Programme of work

Next meeting of the Panel. It was decided to hold the ninth meeting of the Panel at the headquarters of the World Health Organization in Geneva, from 11 to 15 September 1989. The over-riding argument for the selection of Geneva was the need to ensure maximal representation of all relevant multi- and bilateral agencies at the meeting. This was desirable in view of the subject selected for the technical discussion "Policies and programmes of governments, bilateral and multilateral agencies and development banks for environmental management in the context of natural resources, agriculture and health development." As for the other items of the proposed agenda, the Panel decided to add a review of the implementation of its recommendations in connection with the Report of the World Commission on Environment and Development, the Zambesi Action Plan and the Cairo Programme for African Cooperation, as well as an item to review individual Panel members' activities in connection with PEEM. The proposed agenda for the ninth meeting is given in Annex 4.

It was agreed that the subject of the technical discussion required an approach that would be significantly different from that of previous years. The ultimate goal of this discussion was to come to a common policy on the incorporation of environmental management for vector control as a health safeguard in water resource development projects. Based on a survey among all Panel members prior to the meeting, a schedule for preparations for the technical discussion had been developed by the Secretariat, which was adopted by the Panel as follows:

October 1988 - March 1989 : information collection. Several channels were available to the Secretariat through which to obtain information on existing policies and on organizational, institutional, financial and other relevant aspects of decision-making and evaluation processes and interactions between governments and agencies, as well as perceived constraints to policy adjustments. It is proposed that all channels be utilized:

- a direct approach by the Secretariat to the multi- and bilateral donor agencies and development banks;

- approaches by Panel members who have contacts at government level, or with the above-mentioned agencies;

- a literature and document study, including a scrutiny of programme/budgets, donor profile studies, OECD documents; the Panel assigned the Panel member from the Netherlands, Dr R.J.H. Kruisinga, to scrutinize the programme/budget of the three participating agencies.

- the collection of information through the official channels of WHO, FAO and UNEP to their Member States.

The first announcement of the meeting should be forwarded immediately to all relevant agencies.

March-April 1989: analysis of the information collected, and preparation of a single document for the technical discussion. Rather than preparing individual working papers, all information should be analysed by a consultant and compiled in a single document. This document should point out, inter alia, any discrepancies found. The consultant should be a high level policy expert.

May 1989: production and publication of the document. The document should be ready two months before the meeting, for timely distribution and perusal by all participants

September 1989: ninth PEEM meeting. The programme for the technical discussion sessions should be planned in collaboration with the consultant, but the following sessions could be envisaged:

- Policies and programmes of WHO, FAO and UNEP

- Policies and programmes of multilateral and bilateral donor agencies (health, agriculture, environment)

- Policies and programmes of development banks (WB, ADB, AFDB, IADB, etc.) (health, agriculture, environment)

- Policies and programmes of a few major nongovernmental organizations (health, agriculture, environment)

- Interactions between governments, donor agencies and nongovernmental organizations: responsibilities and constraints.

Organization of Steering Committee and Secretariat meetings. The twelfth meeting of the Steering Committee was scheduled to be held in Moscow, prior to the workshop on forecasting and monitoring methodologies. One Secretariat meeting was scheduled to be held immediately after the eighth Panel meeting and the other in conjunction with the twelfth Steering Committee meeting.

Promotional activities. A two day seminar on water resource development and vector-borne diseases in Kenya was to be held in Kisumu, immediately following the eighth Panel meeting. Fifteen national participants and eight Panel members were to participate. The Panel agreed that a proposal be prepared by its Indian member, Dr V.P. Sharma, for a meeting of Directors of Indian Institutes of Technology, to review the proposed curriculum and syllabus document, and to make recommendations for the incorporation of a health component in their curricula.

Workshop on forecasting and monitoring methods applicable to health risk assessment and health surveillance in resource development projects. The organization of this workshop had been approved, in principle, by the Panel at its seventh meeting. A detailed proposal had been prepared by the Secretariat and submitted to UNEP for support. WHO and FAO had already allocated amounts of US$9000 and US$5000, respectively, to this activity. The Panel was informed of the expanded set of objectives of this workshop, which now read as follows:

(a) To review the need for, past experience with and current state-of-the- art of health risk assessment methods, as part of the planning activities of irrigation and other water resource development projects.

(b) To review forecasting and prediction methods applied in fields other than health, and to determine the usefulness of their concepts and approaches for the further refinement of health risk assessment; to assess the value of predictions in other fields as parameters in health risk assessment.

(c) To review recent developments in monitoring and evaluation techniques for health surveillance during the construction and early operational phases of water resource development projects.

(d) To define research priorities for the further advancement of forecasting methods and monitoring and evaluation techniques, and for their field testing with a view to establishing improved health risk assessment and health surveillance practices.

(e) To formulate recommendations for the proper application of the available methods in the feasibility and planning stages of water resource development projects.

The Panel made suggestions concerning the workshop's programme of work, in particular for authors for some of the working papers. It is proposed to hold the workshop at the Institute of Zoology, Kazakh Academy of Sciences, Alma-Ata, on a date later to be agreed on with the USSR authorities and UNEP.

Publications. The Panel's decisions with respect to the technical publications under preparation are reflected in the revised PEEM publication programme, contained in Annex 5. As for its promotional publications, the Panel asked the Secretariat urgently to explore possibilities for the production of an introductory brochure. While appreciative of the fact that the Panel's work will be highlighted in one of the flyers under preparation by WHO/VBC, it stressed the need to present PEEM as an interagency activity with its own identity. A PEEM brochure would be the only means by which all sectors (health, agriculture, environment) and all disciplines relevant to the Panel's mandate could be reached. The Panel stressed the importance of the PEEM Newsletter for its promotional work and approved its continued publication in English, French and Spanish, if possible in an enlarged format of six pages. The Panel therefore urged the three participating agencies to give the utmost priority to supporting this activity in the coming years.

Other activities. The Panel approved two new proposals : (a) the development of a set of visual training aids on the subject "Agricultural development and vector-borne disease transmission", and (b) the organization of regional training courses.

The Panel considered the first proposal to be a most useful follow-up of the technical discussions at its seventh meeting, and very much in line with the recommendation made at the IRRI/PEEM/USDA workshop that there was a need to address agricultural scientists as a target audience for education in the subject of vector-borne disease control.

The second proposal entailed a programme for regional training courses, to be organized at the regional environmental health centres of WHO, with an input from Panel members and Collaborating Centres. While the Panel felt that all major issues were well represented in the draft programme (i.e., introduction of the nature and magnitude of the problem, integrated vector-borne disease control, health risk assessment, intersectoral collaboration and financial and economic aspects), it also felt that the proposed duration of the course (two weeks) was too long for the target audience (planners and decision makers from relevant sectors). It reformulated the target audience to be "professionals from the relevant sectors." The Panel noted with satisfaction that case studies and simulation games were included in the proposed programme, but felt that it could be reduced to one week, incorporating the latter two items in the first week of the programme. It also recommended that problem-based learning materials, including a simulation game, be prepared and that the concept of sustainable development be incorporated in the course.

4.2. Estimated budget

		US$
*(a)	Organization 9th Panel meeting	52 500
*(b)	Organization 12th Steering Committee meeting	7 500
(c)	Secretariat meetings	-
(d)	Kisumu seminar	11 430
(e)	Meeting of Indian Institutes of Technology	5 000
**(f)	Forecasting and monitoring workshop	[75 000]
(g)	Technical publications	10 000
(h)	PEEM Newsletter	27 500
(i)	Cost-effectiveness guidelines	10 280
(j)	Forecasting guidelines	5 000
(k)	Case studies document	7 500
(l)	International Information System	10 000
(m)	Strengthening secretariat	25 000
(n)	Azolla studies	5 000
(o)	Visual training aids	10 000
	Total US$	186 710

*Funds from regular annual contributions by WHO, FAO and UNEP

**Predominantly in non-convertible currencies and therefore not reflected in the total amount of US$186 710

Funds for the remaining items will have to be sought from the regular budgets of the three agencies or from external sources.

ANNEX 1

THE PANEL AND THE REPORT OF THE WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT

The Panel was asked to examine the Report of the World Commission on Environment and Development (WCED) and to present its comments to the three participating Agencies. Having carefully considered the Report, the Panel was especially happy to give its views as the Report reflects the concept and the philosophy that have guided the Panel since its inception.

The basic argument contained in the Report may be summarized as follows: both poverty and economic growth have led to environmental damage, from necessity and short-sighted action, respectively; the consequences are increasingly catastrophic for the world as a whole and can only be combated by changing over to types of development that are sustainable over long periods without environmental exploitation or damage, while paying due attention to social equity, and involve a different approach to the economics of development.

The Report centres around sustainable development, on the assumption that "we have the power to reconcile human affairs with natural laws" and that decisions are needed now "to secure the resources to sustain this and coming generations". The Panel, similarly, has sought to ensure that water resource developments incorporate in their design and operation features that will control the proliferation of disease vectors by environmental means, so that development does not lead to increased disease transmission and will be sustainable in the long term. The objectives and activities of the Panel are thus an instance of the application to a specific area of the broad principles contained in the Report.

The Panel reflects, in its title as well as in all its activities, the Report's key statement that "it is impossible to separate economic development issues from environment issues", as well as the Report's recognition that traditionally separate sectors of the economy and areas of concern are, in fact, interlocked and that the boundaries between them are, or should be, dissolving. Too often, short-term resource development has been carried out without heed to the increase of vectors and subsequently of disease that will follow in the longer term.

The Panel, comprising people of many professional disciplines and involving three international agencies, was established in an attempt to combat the very problems of which the Report complains: "institutions ... tend to be independent, fragmented, working to narrow mandates with closed decision processes". The Panel cannot but comment that the agencies concerned have not yet endowed the Panel with sufficient resources and influence on policies to have the desired impact on their programmes.

On the credit side, however, the Panel's very existence shows that, a decade ago, the three agencies did face up to some of the problems associated with the environmental effects of development even though the Report feels "they have been slow to do so".

The Panel's composition and terms of reference anticipated the Report's conclusion that "all major international ... agencies should ensure that their programmes encourage ... sustainable development and they should greatly improve their coordination and cooperation". The Panel also agreed that "multilateral financial institutions have a crucial role to play" and considered that, in future, the World Bank should be a fully participating agency of the Panel in order to enhance its operational effectiveness. The Panel particularly endorsed the clear statement in the Report that "ability to anticipate and prevent environmental damage requires that the ecological dimensions of policy be considered at the same time as

... other dimensions .... on the same agendas and in the same national and international institutions". While the Report continues that "it will require major institutional development and reform", the Panel ventures to suggest that it is indeed itself an early part of that reform. The Report's further conclusion that "many countries are realizing they have neither the resources nor the time to damage their environments now and clean up later" still more accurately reflects the Panel's position in relation to water resources development.

Since 1981, in recognition that existing decision-making bases were too narrow and were confined to sectoral interests, the Panel has concentrated on promoting multidisciplinary approaches to sustainable water resources development. Such developments should include consideration of health issues as an integral element of the planning stage and should maintain an adequate infrastructure throughout the implementation phase to ensure economic and environmental sustainability.

Of particular relevance to the findings of the World Commission on Environment and Development are the Panel's efforts to minimize vector-borne diseases such as malaria, recognized as "the most important parasitic disease in the tropics" and schistosomiasis, "particularly associated with large dams and irrigation systems". The Panel noted that the greenhouse effect will cause major changes in the world's hydrological system. As one of the consequences not mentioned in the Report, the Panel drew attention to the dramatic repercussions this will have on the global distribution of vector-borne diseases.

In order to provide education and training to donor and intergovernmental agencies, professionals and others involved in water resources management, identified by the Report as in need of broader decision making policies, the Panel has actively promoted environmental management for vector control by producing training aids, sponsoring case studies which have given both positive and negative results, and elaborating a means of forecasting the possible health impacts of water resources projects.

Several on-site workshops have also been convened. In its eight technical discussions to date, the Panel has considered and made recommendations on intersectoral collaboration, institutional arrangements, resettlement, forecasting, education and training, economics and environmental management methodologies. Such discussions have led to conclusions on several issues later brought up by the WCED Report, including pesticide subsidies, community participation, and the need for continued monitoring after the initial environmental health risk assessment.

In line with the Report, the Panel wishes actively to promote sustainable and healthy economic development through increased exchange with development agencies such as the World Bank, United Nations Development Programme (UNDP), regional development banks, international organizations (WHO, UNEP, FAO) and governmental and non-governmental organizations, e.g., agricultural organizations. The Panel felt that full consideration of all intersectoral issues would lead to sustainable and environmentally compatible development but that, at present, too few water resources development projects attained their full social and economic potential.

While the goal of sustainable and environmentally compatible development was realistic, the Panel's activities in the field testing of forecasting systems and the provision of advice had been hampered both by financial constraints and by its lack of status in the United Nations system.

In the light of the views presented in the Report, the following specific recommendations were made for the development of the Panel's programme:

- The World Bank, IFAD (International Fund for Agricultural Development) and other financial institutions and development organizations, including UNDP should be full participants within the Panel's working programme.

- In recognition of the fact that poor environmental conditions exacerbate vector-borne diseases (dengue, filariasis, Chagas' disease) in urban and rural settlements, the United Nations Centre for Human Settlement (HABITAT) should be invited to participate in the Panel's work.

- The Panel should evaluate the practice of intersectoral collaboration at the country level by means of selected case studies.

- A legislative framework should be drafted to ensure the adequate consideration of environmental management issues in water resources projects.

- Workshops and seminars should be organized to bring together high-level planners and decision-makers from the relevant sectors with the objective of redirecting attitudes towards a greater awareness of environmental management for vector control; case-based materials to be utilized by the workshops and seminars should be developed and made available.

- To assist development authorities, a comprehensive data bank should be set up and maintained by the Panel.

In the spirit of sustainable development, the Panel recommended that follow-up be given to water resources development in relation to health risks in order to monitor and, where possible, enforce adequate maintenance, to suggest improvements with respect to design faults and to train staff involved in day-to-day operations. Wishing to build on its experience in monitoring and forecasting the implications of resource development, the Panel proposed, as a first step, to organize a workshop on that subject in Alma-Ata, in 1990, further to define the action needed.

To fulfil the challenge presented by the WCED Report, to implement the above proposals, and indeed to be fully effective the Panel clearly required substantially greater financial backing.

The Panel contained the politicians, engineers, biologists, social scientists, epidemiologists, educators and clinicians necessary to achieve results in one specialized area addressed by the Report. As such, the Panel represented the only sustained joint WHO/FAO/UNEP effort to advance towards the common goal of safe water resources development. With adequate resources, Panel members could support the ideologies espoused by the Report and mobilize other groups to join in making a common investment in our future.

ANNEX 2

THE CAIRO PROGRAMME FOR AFRICAN COOPERATION AND THE ZAMBESI ACTION PLAN

The Panel was asked by the Executive Director of UNEP to review the Cairo Programme for African Cooperation and the Zambesi Action Plan, to comment on those issues that were of relevance to the Panel's mandate, and to make recommendations on how the expertise of the Panel could be applied in support of the Cairo Programme and the Zambesi Plan.

Cairo Programme for African Cooperation

An ad hoc working group was established to carry out the review and formulate the Panel's reaction. Because of time constraints, the review of the Cairo Programme was limited to two basic documents: Report of the First African Ministerial Conference on the Environment (Cairo, 16-18 December 1985) and Report of the African Ministerial Conference on the Environment on the work of its second session (Nairobi, 4-6 June 1987).

The findings of the ad hoc group were presented to the Panel, discussed, modified and subsequently endorsed as follows.

The Panel supported the initiatives taken by those conferences and welcomed the intersectoral emphasis in addressing environmental issues in Africa. The Panel recognized the potential for improvements in human health and welfare in implementing the Cairo programme but was conscious of the risk of increased transmission of vector-borne diseases as a result of water resource development projects on that continent. The Panel therefore wished to urge the various committees and networks, as well as those responsible for the implementation of pilot projects related to water resource development to give due consideration to that potential danger by including health and vector ecology specialists amongst the disciplines involved.

In particular, the Panel suggested that:

- The Panel, as a United Nations inter-agency body, could serve as a scientific and technical advisory body on environmental management for vector control, in the implementation of the Cairo Programme.

- Whenever required, members of the Panel's network (Panel members, staff of Collaborating Centres and Secretariat members) could provide assistance to the relevant networks and committees and to the pilot projects by way of consultancy and training on vector-borne disease control in the context of water resource development.

Zambesi Action Plan

The Panel welcomes the practical proposals contained in the Zambesi Action Plan, based in part on Resolution 1/1 of the first session of the African Ministerial Conference on the Environment (Cairo Programme for African Cooperation) and offers its expertise and capabilities to assist in the implementation of those components of the Plan that concern the Panel's field of activities.

The Panel especially welcomes the mention of specific health-related projects within the Action Plan, but notes the absence of any reference to expected migration patterns and their effect on vector-borne disease distribution, or to the need to establish a uniform monitoring system for vector-borne disease implications of water resource development.

In particular, the Panel can offer the expertise of its members and its Collaborating Centres in:

Category I Projects

ZACPRO 3 and 4: Reviewing survey results on national capabilities in terms of vector-borne disease control, and assisting in institutional strengthening through training and by establishing links with PEEM collaborating centres.

Category II Projects

ZACPRO 13: Reviewing the proposed water management guidelines before their finalization to assess whether vector-borne disease implications have been given sufficient consideration and recommending modifications to the guidelines if necessary.

ZACPRO 14 and 16: Providing guidance and expertise to support activities for the prevention and control of water-related vector-borne diseases such as organizing regional seminars and training to promote proper institutional arrangements for smooth intersectoral collaboration in all the countries involved.

In addition the Panel proposes to investigate the possibility of designating a PEEM Collaborating Centre in the project area.

In view of the potential importance of the Zambezi Action Plan agreement, the Panel wishes to have more detailed information on the operational status of the relevant components of the plan, to be kept informed of the progress of the plan, and to be provided with copies of the diagnostic study for purposes of review and further orientation of the Panel.

If the countries of the Zambezi Action Plan so require and provided funds are made available, the Panel is willing to send a consultant and, subsequently, a multidisciplinary group to assist with the relevant aspects of the implementation of the Plan. In particular, the Panel might be able to assist in four specific "Suggested Actions":

- "Assessment of water-borne and other water related diseases and their effects in human health", (Section C, Environmental assessment, paragraph 28(1).

- "Environmentally sound development of water resources...", (Section D, Environmental Management, paragraph 29(f)).

- "Integration of environmental management components in decision-making on water and water-related projects", (Section D, Environmental management, paragraph 29(i).

- "... Intensive training courses should be formulated ...", (Section F, supporting measures, paragraph 36).

Clearly, if sustained action in the field were supported, the Panel could assist with both the planning of projects and the provision of short multidisciplinary training courses, in close collaboration with national institutions in the Zambezi basin.

ANNEX 3

REPORT OF THE PANEL'S FIELD VISIT
TO THE MWEA RICE IRRIGATION SCHEME

As part of the programme of work of the eighth meeting of the Panel a field visit was organized to the Mwea Rice Irrigation Scheme which is located at a distance of 95 km from Nairobi.

The Mwea Rice Irrigation Scheme (MRIS) is one of the oldest and largest of the irrigation schemes in Kenya and is considered one of the most successful schemes in the sub-Saharan region. The project is operated and managed by the National Irrigation Board, a parastatal body which comes under the Ministry of Regional Development.

The scheme's origin dates back to 1954 when political detainees were taken to the project area by the British Colonial Government of the time and were made to work to develop the land for irrigated rice production. Progress was slow and working conditions were harsh. The two diversion structures were completed in 1958 and irrigated rice production commenced soon after.

Following independence, the Kenyan Government gave high priority to the further development of the scheme by improving both the physical infrastructure and the social and economic conditions of the workers. Farmers were given the facilities to settle in the project area and the land was given to the cultivators on a long-term lease, with the right to pass the lease from one generation to the other within the family.

The following information summarizes the important features of the project at present:

Total area of the scheme	- 12 000 ha
Area under rice crop	- 5 830 ha
Number of farm families settled	- 3 236
Average annual paddy production	- 30 000 tonnes
Average farm yields of paddy:	
Basmati variety	- 4.5 t/ha
Sidano variety	- 5.5 t/ha
Gross cash value of the crop in 1986/87	- K£ 4 476 967
Mean net-income per farm family 1986/87	- K£ 15 400
Total population in the scheme	- 40 000

The people in the scheme are settled in 36 villages. The facilities in the villages include housing, roads, shops, schools and dispensaries. The participants were addressed by the scheme manager at the headquarters of the scheme. They then toured the scheme, visiting (a) one of the head works of the scheme, which diverts water from the Thiba River to the main canal, (b) the Mwea research station, (c) a molluscicide application site, and (d) several paddy fields. The participants observed farm activities such as canal and drain maintenance, land preparation and transplanting of rice seedlings.

The afternoon was spent in learning about the public health and community activities in the project area and visiting the settlement areas and the homes of the settlers. A brief presentation of the public health status of the project area and interventions of the health sector to improve the living conditions of the scheme was given by Mrs M.N. Katsivo, scientist at the Kenya Medical Research Institute. It was reported that at the onset of the interventions the prevalence of Schistosoma

mansoni in children in the age group 5-14 years old had amounted to nearly 100%. Investigations were being carried out to evaluate the impact of certain public health measures through community participation. Results had been encouraging, but more work was still to be done. Some of the improvements achieved in the villages where interventions had been introduced included water supply from wells (as opposed to from irrigation canals), use of handpumps to draw water from wells, improved latrines, improved housing, and improved health services.

An attempt has also been made to provide improved facilities for sanitation at the field sites where the farmers spend most of their time.

Following the presentation, the participants visited two villages, one where interventions had been introduced and another where no intervention had been introduced. They also visited a dispensary in one of these villages.

ANNEX 4

PROPOSED AGENDA FOR THE NINTH MEETING OF
THE JOINT WHO/FAO/UNEP PANEL OF EXPERTS
ON ENVIRONMENTAL MANAGEMENT FOR VECTOR CONTROL

1. Opening of the meeting
2. Election of Officers
3. Adoption of the agenda and approval of the tentative programme of work
4. Review of the Annual Report
5. Review of individual Panel members' PEEM-related activities
6. Report of the Steering Committee
7. Implementation of recommendations made in connection with the Report of the World Commission on Environment and Development, the Cairo Programme of African Ministers of the Environment and the Zambesi Action Plan
8. Proposed programme of work 1989/1990
9. Project proposals
10. Technical discussion
11. Arrangements for the next meeting
12. Other business
13. Approval of the report
14. Closure of the meeting

ANNEX 5

REVISED PEEM PUBLICATIONS PROGRAMME

Title	Current status	Planned action	Pub.date as targeted in 1987	Revised target pub.date
(1) Guidelines for forecasting the vector-borne disease implications of water resource development projects	Steering Committee recommended revision on basis of target-readership survey	Revision first half of 1989	Oct 1988	Dec 1989
(2) Guidelines for the incorporation of safe-guards against vector-borne diseases into irrigation projects through intersectoral collaboration *	Collaboration with ILRI on this terminated; complete re-write commissioned from ODI, London	Submission 1st draft Aug 1988; final draft Dec 88	July 1989	same
(3) Proposed curriculum & syllabus on disease vector management in water resource development projects for inclusion in engineering courses	Prelim. French version published June 1988; feasibility tests on-going in five institutions	Meeting Indian Inst. of Techn. under planning	Final version: 1989	same
(4) PEEM introductory brochure	No further progress since last year; WHO/VBC flyers will highlight PEEM	Explore how PEEM brochure can complement flyers	May 1988	as soon as possible
(5) Case studies on environmental management for vector control	No further progress since last year	Re-structuring & rewrite proposed	May 1988	Dec 1989
(6) Selection working papers prepared for previous PEEM technical discussions	In print	Distribution in Oct 88	Jan 1988	Oct 1988
(7) Proceedings of the IRRI/PEEM/USDA Riceland Vector Control Workshop **	Galley proofs distributed to authors of working papers	Finalization Oct 88	March 1988	Nov 1988
(8) Proceedings technical discussion seventh PEEM meeting	Published		March 1988	Jan 1988
(9) Guidelines for carrying out cost-effectiveness studies of vector control programmes	First draft under preparation	Submission 1st draft Oct 1988; feasibility tests 1st half 1989	1990	1990

* Modified from original title: Guidelines for incorporation of environmental management and other health safeguards in water resource development projects

** these proceedings will be published by the International Rice Research Institute.

ANNEX 6

COMPOSITION OF THE PANEL

Dr Mahmoud Abu-Zied, Chairman, Water Research Centre, Ministry of Irrigation, Cairo, Egypt

Dr A. J. Adames, Rector, University of Panama, Panama

Professor A.N. Alekseev, Senior Scientific Worker, Laboratory of Arboviruses Ecology, Institute of Poliomyelitis and Viral Encephalitis, Moscow, USSR

Dr F.P. Amerasinghe, Senior Lecturer Zoology, Department of Zoology, University of Peradenya, Peradenya, Sri Lanka

Dr Awash Teklehaimanot, Head, Malaria and other Vector-borne Diseases Control Unit, Ministry of Health, Addis Ababa, Ethiopia

Dr S.K. Ault, Public Health Biologist, Davis, California, USA

Dr S.I. Bhuiyan, Head, Irrigation Water Management Department, International Rice Research Institute, Los Banos, Philippines

Dr M.H. Birley, Lecturer, Department of Medical Entomology, Liverpool School of Tropical Medicine, Liverpool, UK

Professor D.J. Bradley, Chairman, Department of Communicable and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, UK

Dr R.H. Brooks, Director, Environmental Quality Staff, Tennessee Valley Authority, Knoxville, Tennessee, USA

Dr P. Carnevale, Head, Medical Entomology Section, Antenne ORSTOM auprès de l'OCEAC, Yaoundé, Cameroon

Dr A.A.M. Chadhary, Senior Scientific Officer (Entomology), Directorate of Malaria Control, Ministry of Health, Islamabad, Pakistan

Dr M. Coosemans, Prince Leopold Institute of Tropical Medicine, Laboratory of Medical Entomology, Antwerp, Belgium

Dr A.A. El Gaddal, Manager, Blue Nile Health Project, Ministry of Health, Wad Medani, Sudan

Dr M.D. El Khalifa, Director, Institute of Environmental Studies, Khartoum, Sudan

Mr Fekade Tsegaye, Head, Public and Environmental Health Unit, Water Resources Development Authority, Addis Ababa, Ethiopia

Mr D. Goe, Project Manager, Bong County Agricultural Development Project, Monrovia, Liberia

Dr Chamlong Harinasuta, Coordinator, SEAMEO TROPMED Project, Tropmed Central Office, Bangkok, Thailand

Professor A.M.A. Imevbore, Director, Institute of Ecology, Obafemi Awolowo University, Ile-Ife, Nigeria

Dr B.H. Kay, Chairman, Parasitology/Entomology, Queensland Institute of Medical Research, Herston, Brisbane, Queensland, Australia

Dr M. Jafer Kazem, former Director, South Asia Co-operative Environment Programme, Colombo, Sri Lanka

Professor S.O. Keya, Vice-Chancellor, Moi University, Eldoret, Kenya

Dr W. Kilama, Director-General, National Institute for Medical Research, Dar-es-Salaam, United Republic of Tanzania

Mrs G. Knight, General Manager, Urban Development Corporation, Kingston, Jamaica

Dr R.J.H. Kruisinga, Member of the Senate and Chairman of the Senate Committee on European Affairs, The Hague, Netherlands

Professor E. Laing, Chairman, Health Committee on Water Resources Development, University of Ghana

Professor Lu Bao Lin, Director, Department of Vector Biology and Control, Institute of Microbiology and Epidemiology, Beijing, China

Mrs G. Peralta, Lecturer, Environmental Engineering Specialist, University of the Philippines, Diliman, Philippines

Dr J. Rabinovitch, Scientist, National Institute for Diagnostics and Research in Chagas' Disease, Buenos Aires, Argentina

Professor Santasiri Sornmani, Dean, Faculty of Tropical Medicine, Mahidol University Bangkok, Thailand

Professor M. Sasa, former President, Toyama Medical and Pharmaceutical University, Tokyo, Japan

Professor W.A. Schmid, Institute for Land Improvement and Water Management, Federal Institute for Technology, Zurich, Switzerland

Dr V.P. Sharma, Director, Malaria Research Centre, Delhi, India

Professor L.S. Small, Agricultural Economist, Cook College, Rutgers University, New Brunswick, New Jersey, USA

Dr P. Tauil, Parliamentary Adviser, Health Area, Federal Senate of Brazil, Brasilia, Brazil

Dr R. Zeledón, Minister of Science and Technology, Programa Nacional de Ciencia y Tecnología, San José, Costa Rica

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