PANEL OF EXPERTS ON
ENVIRONMENTAL MANAGEMENT FOR VECTOR CONTROL

PROMOTION OF ENVIRONMENTAL
MANAGEMENT FOR DISEASE VECTOR CONTROL THROUGH
AGRICULTURAL EXTENSION PROGRAMMES

Report of the Second Inter-Regional Workshop
Bangkok, Thailand, 28-31 October 1991

Organized with support from the

USAID Vector Biology
and Control Project

International Development
Research Centre, Canada
Panel of Experts on Environmental Management for Vector Control (PEEM)

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PEEM Secretariat
World Health Organization
Geneva
ABOUT PEEM

The Panel of Experts on Environmental Management for Vector Control (PEEM) was established in 1981 as a joint activity of the World Health Organization, the Food and Agriculture Organization of the United Nations and the United Nations Environment Programme. The Panel’s objective is to create an institutional framework for effective interagency and intersectoral collaboration by bringing together various organizations and institutions involved in health, land and water development and the protection of the environment, with a view to promoting the extended use of environmental management measures for disease vector control in development projects. The PEEM Secretariat is located in the Division of Operational Support for Environmental Health of WHO in Geneva, Switzerland.

In 1991 the three agencies were joined by the United Nations Centre for Human Settlements (UNCHS/HABITAT) and the Panel’s mandate was expanded to include health issues relating to human settlements in the context of development and to the provision of drinking water supply and sanitation, and urban environmental management for disease vector control. At the time this document went to print, the global PEEM network consisted of 40 experts and twelve collaborating centres representing a range of relevant disciplines.

The promotion of environmental management for disease vector control through agricultural extension programmes is part of the capacity building component of the Panel’s programme of work. The regular counterpart division in FAO for the inter-agency collaboration in PEEM is the Land and Water Division; the organization of these workshops was, in addition, made possible through close collaboration and support from the FAO Division of Human Resources, Institutions and Agrarian Reform.

ACKNOWLEDGEMENTS

The assistance of the FAO Regional Office for Asia and the Pacific in the organization of the workshop is gratefully acknowledged. UNEP made an additional contribution of US$20,000 to PEEM in support of this second workshop. Financial support for the series of three workshops was provided by VBC/USAID and IDRC, thanks to the efforts of Dr Andy Arata and Dr Pandu Wijeyaratne, respectively. Professor Cliff Hoelscher deserves mention for preparing first-draft summaries of the country reports.
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PREFACE

During 1991 and 1992, a series of three inter-regional workshops was held on the subject “Promotion of environmental management for disease vector control through agricultural extension programmes”. The workshops were organized as part of the programme of work of the WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental management for Vector Control (PEEM) and they were co-sponsored by the UN agencies participating in PEEM, the then Vector Biology and Control Project of the US Agency for International Development (Arlington, Virginia, USA) and the International Development Research Centre (Ottawa, Canada).

The concept of promoting environmental management through agricultural extension was first presented at the eighth PEEM meeting (Nairobi, 5-9 September 1988), which had on its agenda a technical discussion on education and training for the planning, design and implementation of environmental management for vector control. A working paper prepared by Dr A.M. El Zoobi, specialist in the Agricultural Education and Extension Service of FAO’s Human Resources, Institutions and Agrarian Reform Division served as the basis for further development of the concept, which, in turn, led to the organization of the three workshops.

The first workshop (see document WHO/EOS/95.12) was held at the WHO Regional Office for the Eastern Mediterranean in Alexandria, Egypt, from 23-26 September 1991 with participants from countries in the WHO African and Eastern Mediterranean Regions. The second workshop, covered in this report, was held at the FAO Regional Office for Asia and the Pacific in Bangkok, Thailand, from 28 to 31 October 1991 with participants from countries in the WHO South East Asia and Western Pacific Regions. The third workshop (see document WHO/EOS/95.14, in Spanish only) was held in Tegucigalpa, Honduras, from 13-17 October 1992 with participants from the Region of the Americas.

Each workshop was attended by country teams from between eight to ten countries, and each country team was composed of one representative of the health sector, working in disease vector control, and one representative of the agriculture sector, working in agricultural extension. Prior to the workshop, each team was asked to prepare a country report. All workshops followed a similar structure: after a formal opening session, brief presentations of technical papers and country reports set the stage for several working group sessions, which, in sequence, identified possible constraints on the proposed integration of disease vector control messages into the information package disseminated by extension workers, developed possible solutions to these constraints and formulated country action plans for follow up.

For a number of reasons publication of the workshop reports met with considerable delays. The PEEM Secretariat was recently strengthened by an Associate Professional Officer, which has allowed for completion of the reports and which will also make possible an adequate follow-up of the workshops. This will include the production of a manual on environmental management for extension workers, the development of a proposal consisting of the most promising recommended country action plans and their subsequent implementation.
INTRODUCTION

The second inter-regional workshop on the promotion of environmental management for disease vector control through agricultural extension programmes was held at the Regional Office for Asia and the Pacific of the Food and Agriculture Organization of the United Nations in Bangkok, Thailand, from 28-31 October 1991.

The workshop was organized by the World Health Organization, the Food and Agriculture Organization of the United Nations, the United Nations Environment Programme and the United Nations Centre for Human Settlements through their joint Panel of Experts on Environmental Management for Vector Control (PEEM), in collaboration with the Vector Biology and Control Project of the United States Agency for International Development and the Canadian International Development Research Centre.

Eight countries from the WHO Regions of South East Asia and the Western Pacific had been invited to be represented by country teams, each team consisting of one professional working in the vector-borne disease control operations of the public health ministry and one professional working in the agricultural extension programme of the agricultural ministry. These countries included the People’s Republic of China, India, Indonesia, Malaysia, Nepal, the Philippines, Sri Lanka and Thailand. The list of participants and resource persons is presented in annex 1.

In preparation for the workshop the country teams had prepared a joint report on the national vector-borne disease problems and how they related to agricultural practices, on existing agricultural extension programmes and how these fitted within the agriculture sector, and on existing arrangements and options for future arrangements between the two sectors. The reports were submitted and presented at the workshop and summaries are contained in the present document. Copies of full country reports can be obtained from the PEEM Secretariat at WHO, Geneva.

On the first day of this workshop, the opening session was followed by an informal introduction of the participants and a clarification of workshop objectives. Two videos were shown and introductory presentations made focusing on human health in relation to water resources development. In order to set the tone for a participatory rather than a formal atmosphere, a debate was organized in the afternoon on the feasibility of intersectoral collaboration. This not only helped creating a more informal atmosphere conducive to more lively discussions, but the participants also identified key issues to be addressed in working group sessions and adjusted the general workshop objectives. On day two the concept of agricultural extension was introduced and the participants subsequently identified constraints on intersectoral approaches in working groups. They presented their findings in the afternoon, which was completed with the review of a number of country reports. On day three the review of country reports was completed and resource persons presented papers on organizational, technical and institutional issues. The information provided served as a basis for the next round of working group sessions, which tried to find solutions for the constraints identified earlier. These solutions were presented in a plenary session at the end of the day. On the last day of the workshop, each country team prepared a plan of action for follow up in their own country. These plans of action are presented below as the outcome of the workshop.
OUTCOME OF THE WORKSHOP

Each country team prepared a plan of action and these make up the substantial output of this workshop.

PLANS OF ACTION

PEOPLE'S REPUBLIC OF CHINA

Action Plan for Follow-up

TITLE:
Improving environmental management for disease vector control through agricultural extension

OBJECTIVES:

Immediate objectives:
• to increase the understanding and knowledge of farmers of the relationship between environmental management for disease vector control and people's health;

• to reduce the vector population and disease incidence in a large rice growing area;

• to stimulate dialogue between the agriculture sector and the health sector and to improve cooperation between both sectors;

• to establish a training center and materials development center on this matter as well as information exchange center.

Long-term objective:
to achieve sustainable agricultural production which takes into account human health and includes environmental management for disease vector control, in order to meet the needs of rural people in terms of improved living and health conditions.

Rationale:
Vector-borne diseases such as malaria are increasing in certain areas of the People's Republic of China while agricultural production is also expanding. At the same time the farming system is changing in some endemic areas where rice is the major crop. The rural population lacks the knowledge about the relation between agricultural production, health and environmental management for disease vector control. There is urgent need for the government to apply new approaches to improve the standards of well-being and health of the rural people.

PROPOSED ACTIVITIES AND TIME SCHEDULE:

Activities
• Training, including the development of necessary materials about agricultural production and environmental management for disease vector control and health improvement.
• Establishment of pilot and demonstration projects.
• The organization of seminars and study tours.
• The feasibility testing and purchase of necessary equipment.
**Time schedule**
Initial duration: 3 years:

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**INPUTS AND OUTPUTS**

**Necessary inputs**
- Human resources, including project staff, international consultants and local resource persons.
- Equipment.

**Expected outputs**
- A reduction in the morbidity due to vector-borne diseases in the intervention areas.
- Increased agricultural production.
- Improved living standard of the people.

**INDIA**

**Proposals for a Research Project**

**TITLE:**
Study of the vector-borne disease situations which would respond to interventions by the farming community and identify constraints at various levels in health and agriculture sectors through KAP studies.

Note: concurrently, the Malaria Research Centre (Delhi, India) would launch studies on environmental interventions and interface with agriculture sector, particularly in relation to irrigation and rice agro-ecosystems. Separate project proposals would be prepared.

**OBJECTIVES:**
- to determine the distribution of mosquito breeding habitats which can be tackled by communities by preventive and corrective measures;
- to impart health education for community awareness, and their active involvement and participation in understanding mosquito biology and disease transmission;
- to study constraints in the promotion of vector control through community participation, agriculture extension workers and health workers.
RATIONALE:
Malaria is a serious vector-borne disease in large parts of India. Anopheles culicifacies is the principal vector of malaria in rural areas and this vector alone is responsible for about 70% of the transmission in the country. Control of malaria through the agricultural extension services involving the farming communities would enable control of vector breeding and thereby reduce transmission. A. culicifacies breeds in clean water and vector populations build up after the onset of the monsoon. The main mosquito breeding sites are borrow pits, pools in the river beds, freshly laid rice fields, wet pastures, cemented tanks, sluggish streams with sandy margins, etc. Some of the breeding sites are amenable to control by the rural communities using measures such as the prevention of the creation of borrow pits, corrective measures of drainage, source reduction and application of larvivorous fish.

Malaria mainly afflicts people who live under conditions of poverty. The disease takes deep roots because of the lack of knowledge about its transmission and methods of its prevention and control.

Transmission is compounded by the socio-cultural behaviour of the people dealing with the problem. Therefore, it is important to achieve a better understanding of these social factors through KAP studies mainly directed towards the rural communities and involving the agriculture extension workers who may be involved in some aspects of interventions. KAP studies are expected to bring out weak points in the implementation of vector control strategies which may be corrected through health education for the control of malaria and other vector-borne diseases prevalent in the study areas.

PROPOSED ACTIVITIES AND TIME SCHEDULE:
The study is envisaged to be taken up in one PHC of Shahjahanpur district in Uttar Pradesh and one PHC near Rourkela in Orissa State. Both places are highly endemic for malaria and filariasis. Japanese encephalitis epidemics also occur in these places. Populations of about 5 to 10 thousand will be selected in each place. The study will be completed in two years.

INPUTS AND OUTPUTS:

* **Necessary inputs:**
The existing manpower available with the Malaria Research Centre and State Health Directorates will be utilized within the existing budget. The required protocols for the research study will be designed by the Malaria Research Centre. A calendar of activities will be prepared in detail before launching the project.

* **Expected outputs:**
  * The studies would indicate specific methods for more effective environmental management of vector control and determine their compatibility with agricultural production.
  * The studies will bring out constraints in the creation of awareness amongst the rural communities, agriculture and health sectors about vector-borne diseases, and suggest remedial measures and possible intervention methods to overcome these.
  * The studies are likely to bring out the possible impact, if any, on the breeding of vectors and also on disease transmission, of the involvement of communities and the possible role of agricultural extension services in launching similar programmes in large parts of the country.
The Indonesian team prepared two proposals:

**Awareness Creation**

**TITLE:**
The improvement of environmental management for vector-borne disease control in Indonesia

**OBJECTIVES:**
- to improve the awareness in the society for the need of environmental management for the reduction of disease vector breeding;
- to obtain community participation in environmental management activities for vector-borne disease control through the collaboration between agricultural extension workers and health workers.

**RATIONALE:**
In essence, development is a process of human activities to change the environment in order to increase human welfare. The greater the increase in development activities, the more changes will occur in the environment.

Agricultural activities utilize natural resources through the process of farming to meet human nutritional needs. Natural resources are limited, but the human population and its needs continue to increase. This has led to the over-exploitation of natural resources.

Some relevant, existing decrees of the Ministry of Agriculture are:
- No 719/1989: concerning technical guidelines for the arrangement of an environmental management plan and an environmental monitoring plan throughout the Department of Agriculture; this has an important bearing on the implementation of the present plan of action.
- Presidential decree No 2/1986: concerning integrated pest management, and the effective and efficient application of pesticides.
- Establishment of Committees of Pesticide Surveillance at the provincial and district level.

The action involved in agricultural environmental management is promoted by agricultural extension workers.

The introduction of new technologies has, in the past, often been accompanied by negative impacts on the environment. Such impacts may be inadvertent, but, at times, they may also be unavoidable. Some examples include:
- pesticide use without concern for the damage of agro-ecosystems;
- fertilizer use, which ends up in the drains where it causes profuse growth of the aquatic weed *Pistia stratiotes*, providing a suitable habitat for *Monsonia* vectors of filariasis;
- the transmigration programme and the deforestation process, which both have an impact on the habitats of filariasis and malaria vectors and also on disease transmission;
- traditional surface irrigation, assumed to be the most important contributor to the malaria problem;
uncontrolled land utilization in traditionally irrigated areas in Central Sulawesi, which has led to the expansion of the habitat of the snail intermediate host of schistosomiasis;

- cultivation of fish ponds, where *Anopheles sundaicus* breeds, causing heavy endemic malaria in coastal settlements.

In view of the above, there is an urgent need to examine and further study environmental determinants of vector-borne diseases in the context of agro-ecosystems, so that their control can be improved.

**PROPOSED ACTIVITIES:**

1. The establishment of coordinating body at the national level with representatives from three state ministries (MOI, MOA, MOH) regarding integrated planning among related sectors to improve the agricultural production through the improvement of the manpower productivity.

2. The formulation of guidelines by the Directors-general of the ministries.

3. The establishment of task forces at either national or provincial level which can assist in implementing the recommendations of the coordinating body.

4. A study focusing on the cost-effectiveness of vector-borne disease control as a contribution to agricultural development.

5. To conduct a national workshop with the objective of developing a comprehensive implementation plan from the national to the community level.

6. Preparation phase on manpower training (methodology, materials, economic, technical, social aspects and a continuous information system by the task force).

**INPUTS AND OUTPUTS:**

**Necessary inputs:**

- establishment of a national coordinating board
- director-general's guidance
- establishment of the task forces
- expertise on epidemiology, entomology, agronomy and sanitation
- funding: national budget, regional (province) budget, international (technical assistance from suitable bilateral donors)

**Expected outputs:**

- increased community awareness of the need to participate in environmental management;
- ability of the community to identify suitable environmental management measures for their own areas;
- ability of the community to participate in their own environmental management to avoid/minimize the transmission of vector-borne diseases;
- an improved health status of the farmers, their enhanced productivity and increased agricultural production.
Pilot Project

TITLE:
Control of malaria in Central Java and schistosomiasis in Central Sulawesi

OBJECTIVES:
* to minimize the rice field breeding places of the malaria vector Anopheles aconitus in Central Java
* to reduce the population of snail intermediate hosts of schistosomiasis in uncontrolled traditional irrigated rice field areas of Central Sulawesi.

RATIONALE AND PROPOSED ACTIVITIES:
On Central Java, especially in the hill and foothill areas, traditional rice irrigation is practised. In these systems, the flow of water is uninterrupted and fields are never drained to dry prior to harvest. The rice fields therefore provide favourable breeding places for *A. aconitus* throughout the year. The annual parasite incidence amounts to more than five per thousand. There are two main malaria control activities: case detection and treatment, and vector control.

In 1987/88 a trial was conducted by the Department of Health which included:
* Mina Pada System (rice-fish cultivation in the rice fields, with dual benefit: the fish feed on the mosquito larvae in the rice fields, and the farmers have a source of additional income from the fish).
* An interrupted/controlled irrigation system to reduce *A. aconitus* breeding in the rice fields.

At the moment, the prevalence of schistosomiasis in Central Sulawesi is 1.4% and the goal of the control programme is to reduce this to < 1%. The schistosomiasis control activities in Central Sulawesi include: surveillance, treatment, vector control, hygiene/sanitation and health education. The snail intermediate host species in Sulawesi is amphibious, and therefore only prolonged periods of drying will help to reduce its population.

Two alternative approaches will be tested in the proposed project:
1. Rehabilitation of existing irrigation and drainage canals.
2. Development of estate crop improvement (with minimum size of 8 000 hectares).

Time frame:
Two years

Expected outputs:
* Central Java: malaria prevalence (API) below one per thousand
* Central Sulawesi: prevalence of schistosomiasis < 1%.
MALAYSIA

Action Plan for Follow-up

TITLE:
Pilot demonstration project for application of environmental management in two agricultural land development schemes for the control of malaria through community participation

OBJECTIVES:

General:
To assess the feasibility of environmental management activities for malaria control in land development schemes

Specific:
- To create awareness of the importance of environmental management for the control of malaria.
- To obtain data on the epidemiological, social and ecological conditions of the land schemes in relation to malaria transmission.
- To obtain community participation in environmental management activities for malaria control.

RATIONALE:
In recent years large tracts of jungle in Malaysia have been opened up for agricultural purposes. This has contributed to the increase in malaria vector breeding sites. The need for labour in this activity has led to the influx of migrant workers from neighbouring malaria endemic countries, resulting in the re-establishment of malaria in previously malaria-free areas. Over 25% of the total number of malaria cases reported in Peninsular Malaysia occurs in these rural land development schemes. This has resulted in relatively high rates of morbidity and mortality due to malaria amongst the workers and settlers in these land schemes.

Indeed, malaria outbreaks occur frequently in these areas affecting the health status, productivity and livelihood of the population. This is directly or indirectly related to the problems and difficulties of implementing malaria control activities in the rural land schemes. With an increasingly mobile and transient population, it has become more difficult for the special malaria teams to locate and detect the positive malaria cases among the target population in these land schemes.

In view of this, there is an urgent need to examine factors affecting the effectiveness and efficiency of malaria control in these rural land schemes so that services may be improved.

The proposed study focuses on the possibility of introducing environmental management in these areas in order to reduce their receptivity to malaria outbreaks. The promotion of environmental management should be incorporated into the existing agricultural extension programmes to obtain the full participation of the community in its application.

ACTIVITIES

Time frame
1. To carry out case studies to assess the feasibility of environmental management measures for malaria control 1st year

2. Organization of a national workshop and seminars to create awareness and sensitize policy makers and agricultural extension and health workers 2nd year
3. To gather data and information on malaria characteristics in the land schemes 2nd year

4. To conduct training courses on environmental management for trainers and community 2nd to 3rd year

5. To develop tools and materials suitable for target groups 2nd to 3rd year

INPUTS AND OUTPUTS:

**Necessary inputs:**
1. Technical expertise - local and external
2. Adequate funding

**Expected outputs:**
1. Increased awareness and sensitivity among policy makers and workers from health and agricultural sectors
2. Two case-studies implemented
3. Training tools and materials developed
4. Data base and information gathered
5. Training courses and workshops conducted

**NEPAL**

**Action Plan for Follow-up**

**TITLE:**
Vector-borne disease reduction through agricultural extension programmes.

**OBJECTIVES.**

- To create awareness among the rural community specifically concerning the role of mosquito vectors with a view to improving the health condition;

- to reduce the breeding places of mosquitoes in order to minimize the incidence of malaria, lymphatic filariasis and Japanese encephalitis without affecting agricultural production

**RATIONALE:**
In Nepal, vector-borne diseases like malaria, filariasis and especially Japanese encephalitis pose a serious public health problem causing hundreds of deaths annually. Irrigation expansion without adequate drainage, defective designs and inadequate repair and maintenance of the irrigation system all contribute to the deteriorating health situation.

Thousands of hectares of land are waterlogged, a condition which favours breeding of mosquitoes in the rural communities in irrigated areas. Double cropping of rice is also practised, mostly in areas where continuous irrigation water is supplied for the entire cropping season. This has led to an intensified and prolonged disease transmission season.
In order to achieve the objectives, the following will have to be undertaken:

- organization of farmer groups
- activation of farmer associations, water user groups and their motivation to create a congenial atmosphere of collaboration to maintain a healthy environment. Women and youth groups should be involved.
- motivation of farmers to discourage them from making burrow pits along the roads, lands and pools where water can stagnate.
- regular programme review: make the modifications required and expand the programme if the impact is satisfactory.
- Considering the present constraints in human resources, budget and technical facilities, the project is proposed in one or two areas as a pilot initiative.

PROPOSED ACTIVITIES:

1. to organize a seminar to create awareness about the importance of environmental management to control vector-borne diseases - participants should be resource persons from agricultural extension and health sector;
2. to select a project area in consultation with the agricultural extension and health staff concerned;
3. to collect entomological base line data for evaluation of the project;
4. to train trainers and field level extension workers
5. to prepare suitable training materials including group and mass media for field level workers.

TIME SCHEDULE:
The project will run for a period of 2-3 years. The exact duration will, however, depend upon the commitment of the staff of the project areas and the departments concerned.

INPUTS AND OUTPUTS:

Internal inputs:
The present research and training centre of malaria of the Ministry of Health and the Central Agricultural Training Centre of the Department of Agriculture will be the training centres for the extension workers. Different health education materials and extension teaching materials like wall charts, flip charts, leaflets, etc., radio programmes, television/video (in combination with different group and mass media) will be prepared for different levels of extension workers and the villagers.

External inputs:
To conduct meetings for awareness creation, to select the pilot project programme area and to prepare educational materials, and to collect baseline entomological survey data, necessary financial support will need to be identified and technical advice sought.

Funds will be needed in particular for the purchase of motorbikes, bicycles, etc. for supervision and monitoring of the programme.

Expected outputs:
- Active participation by the people in water management;
- capacity of the community to maintain a health village environment;
- reduction of the transmission risk of water-related vector-borne diseases.
PHILIPPINES

TITLE:
Training of trainers on environmental management for disease vector control through the agricultural extension programmes.

OBJECTIVES:

General:
to train about 675 trainers from among selected agricultural extension specialists in identified provinces and cities throughout the country.

Specific:
• to select training participants from provinces/cities where vector-borne diseases are endemic and community participation can be mobilized effectively.

• To schedule the training in a sequential manner considering favourable factors such as endemicity of areas, availability of resource persons, venues for hands-on training, climate and weather conditions.

• To secure assurance of local financial support, availability of resource speakers and laboratories for practicum.

RATIONALE:
• Recognizing that health is wealth because it is a basic human right and the foundation for human welfare and for sustainable agricultural and rural development;

• Accepting that agricultural development policies as they relate to irrigation development, chemical inputs, land use and human settlements, agricultural research, post-harvest business and processing have direct and indirect effects on environmental determinants of disease vectors;

• Considering that the complex nature of vector-borne diseases requires multi-disciplinary and multisectoral collaboration of agencies to bring about complementary services, mutual benefits, cost-effectiveness and synergism;

The enrolment for a common cause and the commitment of the health sector and agricultural sector to the goal of controlling vector-borne diseases is imperative to ensure the health protection of the country's population.

Accordingly, a memorandum of agreement is needed to show the workable linkage, definition of sectoral responsibilities, cost-sharing arrangements and alignment of relevant services to achieve the common goal of controlling vector-borne diseases in the affected communities.

Finally, education and training among extension workers to reach affected communities is the initial strategy towards a continued campaign of support to vector-borne disease control in the country.
PROPOSED ACTIVITIES AND TIME FRAME:

- To collect, study, classify and analyse data and information on vector-borne diseases of public health importance in the country which can be integrated into the environmental management components of agricultural extension programmes.
- To assess training needs in the area of vector-borne disease control where these diseases occur.
- To update the existing memorandum of agreement between Department of Health (DOH) and the Department of Agriculture (DA) to include the Department of Interior and Local Government (DILG) in view of the devolution of mandates, functions, budgets and facilities of DOH and DA to Local Government Units (LGU). Definition of specific responsibilities and cost-sharing in the conduct of training courses on environmental management for disease vector control through the agricultural extension programmes are necessary.
- To prepare the training design specific to areas having endemic vector-borne diseases.
- To identify the training participants and prepare their profiles; to determine venues and duration of training; to identify resource persons and facilitators; to determine training methodologies; to prepare budgetary estimates; to plan post-training follow-up, monitoring and evaluation of implementation of action plans of trainees. The time frame is progressive.
- To work out the cost-sharing arrangement among the DOH, DA and DILG to cover the expenditures for venues, facilities, lodging, documentation of proceedings, contingencies, resource persons, materials for practicum, field trips where necessary.

These expenditures will spread over a duration of two years.

Progressive monitoring and evaluation of the effects of training as measured, among others, by a reduction in disease prevalence/incidence, mortality rates, quantitative and qualitative judgements of affected communities, extension agents involved, private sector groups, local government officials and DOH experts.

Impact evaluation of the disease vector control programme by an independent team of experts after one or two years of implementation.

INPUTS AND OUTPUTS:

**Necessary inputs:**

1. **Materials:**
   - training modules/materials on specific vector control measures for resource persons and facilitators. Production of printed materials, audio-visuals, actual or mounted specimens, demonstration areas/case studies
   - audio-visual equipment
   - practicum materials and supplies: laboratories
   - training venues, board and lodging

2. Technical assistance
   - resource persons and facilitators
   - secretariat services
   - consultants

3. Funding requirements
EXPECTED OUTPUTS:
After the training, about 675 participants should be able to:

- identify the vectors transmitting the diseases: malaria, schistosomiasis, filariasis and dengue;
- know the epidemiology and control of specific local diseases;
- know the impact of these diseases on agricultural production;
- know how to resolve the technical, methodological and institutional constraints identified in the process of integrating environmental management into extension messages, specifically in relation to irrigation development, use of chemical inputs, land use and human settlements, agricultural research, post harvest business and product processing;
- organize the community for participatory action in the campaign for environmental management for the control of vector-borne diseases;
- re-echo basic training, in collaboration with others, to empower, motivate, enrol and commit the community to the continuing effort to control vector-borne diseases;
- initiate meaningful contributions towards the reduction of the incidence of the diseases and the mortality rates as a continuing trend.

SRI LANKA

The Sri Lankan team prepared two proposals:

Proposal 1

TITLE:
Pilot project to evaluate the possible beneficial effects of simple environmental methods through agricultural extension service on the incidence of malaria and Japanese encephalitis

OBJECTIVES:
- to reduce reliance on chemical methods for malaria control;
- to find out the efficacy of environmental methods in Japanese encephalitis and malaria control;
- to have the agriculture service play a complementary role to community health services in improving the health of farmer families by control of common vector-borne diseases, e.g. malaria and Japanese encephalitis;
- to motivate the adoption of agricultural technologies that would lead to a reduction in the vector-borne diseases associated with rice and other crops through the agriculture extension service.

RATIONALE:
In Sri Lanka, malaria control depends heavily on insecticides which has the following disadvantages:

- high purchase cost
- environmental pollution
- possible emergence of resistance by vectors
- poor community acceptance
- operational costs and logistical problems involved.
Control of Japanese encephalitis in Sri Lanka is highly dependent on mass immunization of the susceptible population, but not practical due to the high costs of vaccines and other logistical problems involved.

It is observed that both diseases are found in the rural dry zone where rice cultivation is extensively done. It has been established that vector breeding is influenced by various factors associated with the rice cultivation. Sri Lanka has a well established agricultural extension service which may be utilized to motivate the farmer families to engage in practices that will have a positive influence on reducing the incidence of the two diseases. Therefore, there is a need to make a comprehensive study of (1) factors in rice cultivation that contribute to disease vector breeding, (b) the efficacy of possible invention methods that may be propagated through the agricultural extension service.

PROPOSED ACTIVITIES
- to prepare a memorandum to initiate action to declare a policy for Promotion of environmental management for disease vector control through agricultural extension;
- to establish a multidisciplinary study group from Health and Agriculture Department;
- to identify of two areas in the dry zone where malaria and Japanese encephalitis incidence is high, to serve as control area and intervention area;
- to draft the study methodology and obtaining clearance;
- to organize a national level workshop;
- to organize a training workshop for agricultural extension and community health service personnel in pilot areas;
- to organize a workshop for community to be conducted in the community by extension staff;
- to carry out a bench mark study - to be done by the agricultural extension staff and community;
- to initiate a programme to motivate farmers to adopt the recommended practices;
- to prepare media material, for pretesting and production by communication, audio-visual section of Department of Agriculture, in collaboration with health department and field extension staff;
- to collect on a monthly basis data pertaining to malaria and Japanese encephalitis by the local medical institutions and Ministry of Health officers;
- to review activities every six months and monitoring of activities - by all agencies involved
- at the end of a two-year review, to evaluate the activity and prepare a final report, and to produce a manual for agriculture extension service on this subject.

INPUTS AND OUTPUTS
- no external assistance sought
- technical expertise from PEEM and locally from IIMI

OUTPUTS
substantial reduction in the use of insecticides in the malaria control programme in the pilot intervention area and inclusion of sustainable environmental methods through agricultural extension services.
Proposal 2

TITLE:
Study of breeding of vectors of malaria and Japanese encephalitis in rice fields with regard to rice variety, water management practices, physical environment and pesticide use.

OBJECTIVES:
* to explore possibilities of alternative technologies in rice growing that will lead to a reduction of the vectors of malaria and Japanese encephalitis;
* if potential technology is found, application of such technology in rice growing areas affected with malaria and Japanese encephalitis

RATIONALE:
Although it has been established that in Sri Lanka the breeding of Japanese encephalitis vectors occurs mainly in rice fields, no data are available as to the importance of factors such as rice variety, irrigation methods, etc. that influence the degree of vector breeding in rice fields. Therefore, it is felt that research would generate useful data that would support the disease control programme. The network of irrigation canals abundantly found in Sri Lanka has a very high potential for malaria vector breeding. No reliable data are available on the various features of these canals that would influence the degree of breeding. Therefore, it is envisaged that research into this problem would generate useful data.

PROPOSED ACTIVITIES:
* establishment of the research team including experts in rice research and vector-borne diseases;
* drafting of research methodology by the research team;
* selection of experimental sites;
* laying out the experiments;
* collection of data during the season;
* research report at the end of the season and review by the team;
* research to be conducted for two years in order to cover two dry seasons and two wet seasons;
* regular field visits by the investigators.

INPUTS AND OUTPUTS:

Inputs
* personnel: consultants six personmonths
* equipment: laboratory, field, vehicles
* training: group training
* study tours
* conferences

All need external funding. All operating costs to be met by country budget.

Outputs
A research report and recommendations on potential technology to reduce incidence of malaria and Japanese encephalitis in rice growing areas.
THAILAND

TITLE:
Impact of pest control in agriculture of the malaria vector *Anopheles minimus* in the hilly areas of Thailand

RATIONALE:
Malaria control is one of the objectives of the Seventh National Development Plan of Thailand. To control malaria vectors, especially in maize agro-systems, requires feasibility studies. Because environmental conditions change drastically in maize fields throughout the growing season and during the non-growing period, it is possible to study *A. minimus*, its behaviour, life cycle as well as its susceptibility to insecticide in the villages surrounded by maize and/or cotton fields.

To accomplish this programme the study would be carried out in close cooperation with the entomology branch, malaria division, Ministry of Health and plant protection service division, Department of Agricultural Extension, Ministry of Agriculture.

PROPOSED ACTIVITIES:
To carry out a field trial on the above subject matter in some villages of Tak Province.

Location: two villages in Tak Province in the same ecosystem, not more than 10 km apart in the hilly area. Control village: growing maize without applying insecticide; experimental village: growing maize with insecticide (farmers’ practices)

METHODOLOGY:
* Mosquito collection will be carried out by human bait outdoors in the field and in the village compound;
* larval surveys;
* mosquito insecticide susceptibility test;
* larval insecticide susceptibility test;
* mosquitoes collected will be dissected for purity and sporozoite examination;
* rainfall data during the study will be recorded.

INPUTS AND OUTPUTS:
Inputs
* Equipment: adult and larval susceptibility kits
* Personnel: utilize existing personnel of agencies involved
* Operational cost: US$20 000
* Compensation cost: US$20 000 for farmers in unsprayed villages

Expected outcome
The result of these studies will show the integration of health and agriculture of each agro-ecosystem and should be the starting point for a pilot programme on the linkage of health and agriculture.
WORKSHOP PROCEEDINGS

Opening session

In his opening statement on behalf of the Director-General of the World Health Organization, Dr Hiroshi Nakajima, Mr Robert Bos, Executive Secretary of PEEM, recalled the launching, in 1978, of WHO's Strategy of Health for All by the Year 2000, and the unanimous agreement of its Member States that Primary Health Care provided the basis to achieve the strategy's goals. It had become apparent that some health promotional activities, particularly those addressing health problems with significant environmental determinants, fitted less readily in traditional health education programmes. The objective of this series of workshops was to explore the use of existing, alternative community education programmes. The motto of the workshops was: “Health is the message, agricultural extension the vehicle.” It was an innovative avenue of health promotion that should lead to follow-up action in the countries.

Mr. Goh Kiam Seng, Director and Regional Representative, UNEP Regional Office for Asia and the Pacific, addressed the workshop on behalf of the Executive Director of the United Nations Environment Programme, Dr. Mostafa Kamal Tolba. The origin of the series of workshops that were now implemented under PEEM's new, more field-oriented mandate, could be traced to the eighth Panel meeting in Nairobi in 1988, where training and education needs for the design and implementation of environmental management measures had been discussed. Since that meeting there had been an increased focus on sustainable development, a term that had been defined in various ways, but which basically implied that in the drive towards improving human well-being, the resource basis on which human existence ultimately depends should be kept sufficiently in tact to allow future generations to maintain their well-being. The outcome of this workshop would allow the four organizations to pursue their collaboration with national agencies in the promotion of environmental management for disease vector control.

Dr. A.Z.M. Obaidullah Khan, Assistant Director General and FAO Regional Representative for Asia and the Pacific welcomed the participants and pointed out that the countries participating in the workshop had seen a remarkable growth in agricultural production in the past decades, which had outpaced population growth. Food security in terms of availability had been reinforced, but this was not true for access to food.

As the population continued to expand, and limits of arable land brought under cultivation had been reached, there was a need to balance a necessary further increase in production and productivity with the protection of the natural resource base and the promotion of human well-being. A sizable segment of Asian populations were engaged in agriculture, the majority of them small subsistence farmers, tenants and sharecroppers. Their experience needed to be incorporated into strategies aimed to maintain ecological integrity and to ensure increased production. Agricultural extension and education thus became a more complex, two-way conduit for learning from the farmers their objective assessment of the physician and socio-cultural environment, and for transfer of new production technologies to the farmers. Farmers should be put first, before the commodity they produce. A reduction in avoidable morbidity and an improvement of their overall health status would contribute to increased productivity.

Objectives of the workshop

At the inception of the series of inter-regional workshops the secretariat formulated the objectives as follows:

1. to collect information on disease vector control programmes and agricultural extension programmes at the national level;
2. to review the practical implications and assess the potential of incorporating an environmental management component for vector control into agricultural extension programmes;
3. to stimulate an intersectoral dialogue between national participants representing health and agriculture sectors at the workshop, and to identify countries where research and demonstration projects can be initiated;
4. to collect material that, together with information collected at the other two workshops, could form the basis for the preparation of a manual for the incorporation of environmental management into agricultural extension programmes;
5. to formulate a number of proposals for pilot or demonstration projects in countries on the promotion of environmental management through agricultural extension programmes.

Technical presentations

In his presentation on *Human health in the context of sustainable development*, Robert Bos explained the basic principles of sustainability as developed by the UN Commission on Environment and Development and contained in the Commission's report *Our Common Future*. The Commission advocated the effective incorporation of environmental concerns in planning and design instead of after-the-fact repair. Human health represented a special dimension of the cross-cutting concept of environment and development. The interfaces between agricultural development and the human health status were vast and complex, but nutritional status, pesticide poisoning and the vector-borne disease implications of water resources development projects stood out as key issues. Globally malaria and schistosomiasis were the main problems, and at a more regional level lymphatic filariasis and Japanese encephalitis should be included. A number of case studies were quoted. At the roots of this issue were:

- the lack of intersectoral institutional arrangements that would ensure the effective consideration of human health at the planning and design stages of projects (particularly the proper incorporation of health into feasibility and environmental impact assessment studies),
- biased economic valuation methods which favoured unsustainable, recurrent chemical control methods over environmental management measures initially requiring substantial capital investment which reduced the viability of a project as expressed in strictly economic terms.
- a lack of research and development in the field of environmental engineering and management for vector control, because of the almost exclusive reliance on pesticides during the last three decades,
- insufficient involvement of communities in the assessment of their specific health problems and in the application of measures that are compatible with their agricultural activities.

While the first two items needed to be overcome by policy change, the latter two should be addressed by a renewed emphasis on community based environmental management measures, the promotion of which could best be undertaken by agricultural extension workers.

In the next presentation, *Rice ecosystems and disease vectors*, Hans Verhoef went into more detail on the links between rice agroecosystems and vector-borne diseases. The importance of rice as a staple food in Asia was well known, and the Green Revolution, led by the scientists at the International Rice Research Institute in Los Baños, had made it possible for production to overcome predicted shortages and keep up with the demand of growing populations. There was a range of links between vector-borne diseases and irrigated rice production systems in Asia, of which Japanese encephalitis was the most apparent. A number of malaria vector species were associated with the rice ecosystem as well and in the Philippines, China and Indonesia there were foci of schistosomiasis associated with the irrigated rice ecosystem. In 1987, PEEM and IRRI had jointly organized a workshop that set a research agenda in this field. Research should focus on the links between rice cultivation practices, in particular irrigation water management, new trends in rice
production (such as intensified cropping systems, or increased chemical inputs) and vector-borne disease transmission, and commonalities between integrated pest management and vector control. National agricultural extension networks would be crucial in the dissemination of research results to farmers.

Professor Cliff Hoelscher introduced *The origin and basic concepts of agricultural extension*. The first modern agricultural advisory service was established in Ireland in 1849 at the time of the great potato famine. The actual use of the term “extension” appeared first in England when the universities of Cambridge and Oxford started an education system extending to farmers in the 1860s. In the United States city libraries were in the forefront of extension, followed, in 1892, by the universities of Chicago and Wisconsin. The establishment of Land Grant Colleges originated from the extension concept. The main objective of extension continues to be to change farmers’ attitudes towards their problems and assist them in solving these through the application of scientific knowledge and modern technology. However, with time the farmers’ role as the recipient has shifted to a more balanced situation where researchers in their work are guided by needs expressed by farmers.

Extension services over time developed different organizational structures to deliver their messages to farmers. In the United States legislation actively helped promote the concept. In 1987, the US Cooperative Extension System adopted a “New Direction”, aimed at creating a more relevant, flexible and dynamic organization. To meet the challenges of change, the concept of “Issues Programming” was introduced. Partnership leadership directs this new movement; it entails system-wide ownership, system-wide acceptance of roles and responsibilities, system-wide agreement on leadership expectations, strategic and structural mechanisms for shared programme decision making making a system-wide commitment to open communication and a system-wide accepted definition of excellence and quality achievement.

Issues programming consists of four phases: issues identification; initiative development; initiative implementation; and, management. In the partnership of federal, national, county governments and individual farmers, each level contributes to these phases and programme objectives become more specific as they move to lower levels in the system.

Dr El-Zoobi presented FAO’s strategy for promoting agricultural extension in the 1990s. Three premises for this strategy were: (1) the promotion of extension as part of integrated rural development must be a key component of FAO’s efforts at national capacity building; (2) agricultural extension must accommodate the changing conditions and needs in rural areas; and (3) human resources in the area of extension need to be strengthened to meet the needs imposed by the accelerated expansion of the agricultural knowledge base. In its implementation, technical cooperation projects in some 90 countries promote extension services particularly to rural women, youth and young farmers. Cooperation covers:

- strengthening of extension systems (through institution building, consolidation of scattered extension services, improvement of effective links between extension, research and training systems and the promotion of a target group approach);
- development of agricultural education (through curriculum development, creating opportunities for field training, promoting instructors’ performance and establishing pilot extension outreaches close to agricultural schools);
- promotion of in-service training (through information collection and dissemination, ensuring that in-service training is included in new extension programmes and fostering cooperation between countries in in-service training).

In complementary papers, Dr V.P. Sharma reviewed the Indian experience in Community participation in disease vector control and Dr Norman Gratz presented Options for integration of agricultural pest management and vector control at the community level.
In her paper, *The potential for increased collaboration between health education, agricultural extension and general education systems at the community and district levels*, Dr Mayling Simpson-Hebert outlined the role of the education sectors in strengthening efforts to carry health messages through the agricultural extension system. In many countries schools could serve as community education centres for adult learning in such areas as disease vector control. Parallel to extension, ministries of education could develop primary school curricula on the same subject aimed at farmers' children. The successful example of the Mazingira Institute in Kenya (the use of comic magazines as a vehicle for educational materials) could be applied in this area. Participatory learning methods and their tools, such as those developed in the water supply sub-sector, could similarly be used in the promotion of environmental management through agricultural extension. The PROWESS (Promotion of women in water and environmental sanitation services) project had developed prototype methods and tools that had found application in many other fields. The training of trainers at the country level is crucial to the successful introduction of participatory learning methods.

**Debate**

Following introductory presentations, a debate was organized on the afternoon of the first day of the workshop. The participants were divided over two groups, and one group was given the assignment to defend the thesis "the promotion of environmental management for disease vector control through agricultural extension is a feasible option with a great deal of potential," while the other group was asked to defend the opposite: "the promotion of environmental management for disease vector control is an activity strictly confined to the health sector, and impossible to achieve through agricultural extension." As a result of this debate a number of constraints were identified to the objective of promoting environmental management through agricultural extension.

The secretariat grouped these constraints into three categories: technical, methodological and institutional, and they are listed below.

**Technical Constraints**

1. *The lack of a general knowledge base on linkages*

The concept of promoting environmental management for the control of disease vectors and the reduction of vector-borne disease transmission through agricultural extension programmes has, in principle, a good potential. An essential preliminary requirement is a sound knowledge of the association between agricultural practices and vector-borne diseases.

The lack of a sufficiently developed knowledge base on agriculture-health linkages is the first technical constraint in this area.

2. *The need for specification of environmental management measures*

Environmental management measures for vector control do not constitute a methodology that is universally applicable, such as the spraying of residual insecticides. Their selection requires the careful consideration of local epidemiological and ecological conditions. Where agricultural practices come into play, these conditions are, moreover, subject to continuous change.

Another important consideration in this connection is that a premature decision to promote methods which have not been properly tested under local conditions carries the risk of undermining the credibility of agricultural extension workers.
There is at present insufficient knowledge of the effectiveness of environmental management under specific conditions to successfully promote it through agricultural extension programmes.

3. **Compatibility of environmental management and agricultural production**

Farmer acceptance of environmental management measures will depend on their effect on agricultural production. A decreased yield or the need for additional inputs will diminish the acceptability of such measures. On the other hand, measures that have a dual benefit, i.e. favoring both vector control and agricultural production will be easy to promote.

There is insufficient knowledge of the compatibility of environmental management measures and agricultural production.

4. **The relative role of environmental management in integrated disease vector control**

Environmental management for vector control must be part of an integrated approach to disease prevention and control. The possibilities and limitations of environmental management must be weighted against those of other interventions to ensure an optimal level of cost-effectiveness. Malaria control is faced with serious problems of insecticide and drug resistance; chemotherapy of schistosomiasis is costly; and, the delivery of the Japanese encephalitis vaccine often meets with financial and operational limitations.

The relative role of environmental management in an integrated disease control approach cannot be generalized; there is a need for a better understanding of the limitations of environmental management in different epidemiological and ecological situations.

**Methodological Constraints**

1. **Absorption of additional tasks by agricultural extension workers**

There is a danger of overburdening agricultural extension workers. They may also be less willing to perform tasks outside their primary scope of work.

2. **Resource constraints**

Many agricultural extension programmes are already faced with considerable financial and human resource limitations. The resources needed in terms of funds, time and manpower to train agricultural extension workers and deliver a programme of this magnitude at the village level will add to existing constraints. There is a lack of funds and material resources to implement the research findings in field programmes.

3. **Farmer acceptance and participation**

Communities at present often lack the basic knowledge about vector-borne diseases and their transmission in order to effectively participate in their control. An awareness of the linkages between agriculture and vector-borne diseases is also lacking. Under these circumstances agricultural extension workers will have major problems in conveying their environmental management messages to the community.

4. **Transfer of research findings to programmes**

The essence of agricultural extension is to channel the output of research activities to the community level where they can be applied by the farmer. In the case of health messages the mechanism for transfer of research findings from health research institutes to the extension system may be inadequate or non-existent.
Institutional Constraints

1. Absence of a policy basis

Health and agricultural policies are not ready for this approach. Neither the health sector nor the agriculture sector leave room in their current policies for an intersectoral approach for delivery of health messages.

2. Allocation of responsibilities and sources of funds

Intersectoral collaboration carries the risk of overlap between the health education programmes and the agricultural extension programmes. Sharing responsibilities in the promotion of vector-borne disease control through agricultural extension programmes raises the question how the health and the agricultural department should divide between them the expenses incurred.

3. Management constraints

Lack of coordination and existing bureaucratic procedures make integration of health and agricultural programmes difficult. The gap between the health and agricultural sectors is felt mostly at the national level, but this will have repercussions for collaboration at lower levels.

Solutions

Workshop participants divided themselves over three groups and in each group one category of constraints were discussed and possible solutions listed. The solutions were subsequently presented in a plenary session, and where necessary, further discussed.

The reports of the three groups are presented below.

GROUP 1 - TECHNICAL CONSTRAINTS

1. The lack of a general knowledge base on linkages. The lack of a sufficiently developed knowledge base on agriculture-health linkages is the first technical constraint.

Solutions and recommendations

- Review the existing knowledge, understanding and experiences for the region in general, and specifically by country.
- Identify gaps in existing knowledge, understanding and experiences for the region in general and specifically by country.
- Identify relevance and applicability of existing knowledge, understanding and experiences for each relevant country.
- Identify available resources for expanding knowledge, such as those available in learning institutions, in the technical cooperation agencies participating in PEEM and in funding agencies.
- Prioritize knowledge that is relevant on a country basis.
- Identify appropriate educational materials, such as mosquito identification keys by country.
- Identify appropriate operational research projects or base-line surveys for vector-borne diseases and environmental management.
- Identify inter-regional procedures for sharing knowledge, experience and information.
- Establish regional demonstration projects to prove the effectiveness of applying existing knowledge, experience and information.
- Identify target groups for transfer or adaptation of knowledge at all levels.
2. *The need for specification of environmental management measures*. There is at present insufficient knowledge of the effectiveness of environmental management under specific conditions to successfully promote it through agricultural extension programmes.

**Solutions and recommendations**

- Define environmental management in terms of disease vector control by agro-ecosystem management.
- Review existing methods of environmental management.
- Consider what methods may be applicable to the local epidemiological, social and ecological situations.
- Identify gaps in applicable methodology.
- Identify resources from health and agricultural sectors for carrying out field trials.
- Organize field trials of the methods most likely to succeed in each interested country.

3. *Compatibility of environmental management and agricultural production*. There is insufficient knowledge of the compatibility of environmental management measures and agricultural production.

**Solutions and recommendations**

- Conduct action-oriented studies on the effect of appropriate environmental management measures for vector-borne disease control on agricultural production and their farmer acceptance.
- Determine feasibility, sustainability and capacity of the proposed methods in the light of existing farming practices.
- Carry out a sociological study to determine the implications of the proposed methods and whether they are acceptable to the farming community.
- Determine the cost implications of adding environmental management measures for the control of disease vectors and nuisance mosquitoes to existing chemical, biological and personal protection measures.
- Determine the agronomic practices which could be of help in overcoming health problems inherent to incorrect environmental management methods.

4. *The relative role of environmental management in integrated disease vector control*. The relative role of environmental management in an integrated disease control approach cannot be generalized; there is a need for a better understanding of the limitations of environmental management in different epidemiological and ecological situations.

**Solutions and recommendations**

- Analyze the cost-effectiveness of alternative control measures as compared to environmental management.
- Determine what other measures, such as spraying of (residual) insecticides and chemotherapy, are being used in the agricultural and public health sectors and what this implies for agricultural extension and health programmes.
- Determine the vector-borne disease dynamics in relation to timing of integrated disease control and environmental management measures.
GROUP 2 - METHODOLOGICAL CONSTRAINTS

1. Absorption of additional tasks by agricultural extension workers. There is a danger of overburdening agricultural extension workers. They may also be less willing to perform tasks outside their primary scope of work.

2. Resource constraints. Many agricultural extension programmes are already faced with considerable financial and human resource limitations. The resources needed in terms of funds, time and manpower to train agricultural extension workers and deliver a programme of this magnitude at the village level will add to existing constraints. There is a lack of funds and material resources to implement the research findings in field programmes.

Solutions

- The establishment of a coordinating body and task force committee comprising extension workers, health workers and community representatives. The task force would be led by the community development officer. Each agency concerned would be designated with clearly defined and relevant tasks and responsibilities. Agricultural extension workers, responsible for providing the channels to reach the clientele, and health workers would be responsible to provide the technical information and services.

- A coordinating committee at the rational level should have as its task to seek funds from national and international bodies and manage these funds accordingly. The activities it coordinates should include operations and research.

- Training in environmental management for disease vector control needs to be incorporated into existing curricula. Subject matter on environmental management needs to be incorporated into the syllabus of extension training and likewise extension subject matter should, where appropriate, be incorporated into the health training curricula, especially in the training of health workers.

- At the community level, environmental management could be planned and channelled through the Training & Visit system, whereby environmental management would be one of the impact points. Research findings must be tested at the community level as a feedback to the research institutions.

3. Farmer acceptance and participation. Communities at present often lack the basic knowledge about vector-borne diseases and their transmission in order to effectively participate in their control. An awareness of the linkages between agriculture and vector-borne diseases is also lacking. Under these circumstances agricultural extension workers will have major problems in conveying their environmental management messages to the community.

Solutions

- Qualitative and quantitative improvement should be made in community educational activities using mass media techniques aimed at target groups such as community and opinion leaders, local practitioners of medicine, religious and cultural leaders, women, teachers, school children, etc. Health and extension education modules should be developed for easy communication techniques and quick public acceptance of the programmes through television, radio, video films, posters, hand bills, group gatherings, class rooms, etc. The environmental aspects of vector control should also be included in school curricula.

- The health and agricultural extension workers should be adequately trained in a common class room set-up to participate in the lecture discussions which should facilitate exchange of views from the two sectors. The teaching staff should be drawn from both sectors.
• The training of trainers should be taken up before embarking on ambitious field level programmes.

• Pedagogical facilities in the institutions at the national level for the training of trainers should be identified and strengthened through bilateral and multilateral agencies for development of up-to-date and adequate techniques.

• Short term refresher training courses should be conducted for both health and agricultural extension workers jointly.

• Adequate resources should be available to ensure the assigned tasks are carried out.

• Public awareness about vector control should be promoted through village committees that set their own policies and goals. This could be achieved by small group discussions among the villagers, allowing them to analyze their own problems and how to overcome them.

4. **Transfer of research findings to extension programmes.** The essence of agricultural extension is to channel the output of research activities to the community level where they can be applied by the farmer. In the case of health messages the mechanism for transfer of research findings from health research institutes to the extension system may be inadequate or non-existent. For the adoption of environmental management measures mere reliance on small demonstration projects is not sufficient.

**Solutions**

• Operational research should be adequate in “space and time” with proportionate manpower deployment and management methods should include supervision that takes into consideration its technical, administrative, operational and financial feasibility.

• Research design should ensure the involvement of project officials from the health and agricultural extension in the planning, implementation, monitoring and evaluation of the research project.

• Research projects should be carried out in different ecological settings as environmental management methods are likely to differ from one ecosystem to the other. The socio-cultural determinants of human behavioral aspects should be looked into and the programme should be properly adapted to the local situation since the success of operational research in one area does not guarantee its success in another.

In its deliberations, group 2 identified three more methodological constraints.

5. **Programme benefits.** The individual farmer and extension workers may not receive direct and immediate benefits from environmental management programmes.

**Solutions**

• A policy which formulates long term goals and objectives could be made available to health and agricultural workers. Job descriptions should be modified and evaluation of environmental management activities could be included in the annual appraisal report of agricultural extension officers. Agricultural workers at the national and regional level could be involved in the planning and implementation of research to motivate them and to convince them of the benefits of environmental management measures. Their participation in a national workshop for research planning would be appropriate. Workshops could be held at the appropriate levels for health and agricultural workers to inform them of changes in policy and to disseminate the research results. Educational material will have to be prepared beforehand.
6. **Legislation concerned with environmental management.** In the absence of the enactment and enforcement of legislation which targets environmental management it will be difficult to achieve vector control.

**Solutions**

- Many national health programmes in the past faced numerous legal hurdles in the implementation of control activities. The laws were promulgated subsequently to overcome these constraints. WHO/FAO may bring out a comprehensive review document about current legislation in different countries related to the promotion of public health programmes, environmental protection, pesticide management and agricultural work rules and regulations governing the service conditions as they pertain to governments and non-governmental organizations. Such a review should also contain guiding principles for modification to assist the participating countries in the proper codification, enactment and implementation of relevant laws.

7. **Environmental impact.** Environmental impact statements are inadequate or non-existent to provide sufficient background data to evaluate programme progress. Programme directors must be able to define the present ecological system to determine the proper changes to be implemented.

**Solutions**

- Methods to properly conduct environmental impact assessments are beginning to emerge in the scientific literature. These studies are expensive to conduct because of the high level of scientific expertise demanded and the extensive time required. The US Environmental Protection Agency and the European Community have may have the documents required to develop environmental impact studies.

- Some impact studies have been completed UN Thailand, Nepal and Myanmar to define water management projects for malaria control. These will need to be an effort to scale down the scope of major environmental studies to target specific aquatic, terrestrial and human parameters that are likely to be impacted. Training of pilot project personnel will need to be continued in the early phases of the programme to develop background data. The background data will become the focal point for future evaluation of schemes and all major project activities.

**GROUP 3 - INSTITUTIONAL CONSTRAINTS**

The group reviewed the constraints that had been listed by the secretariat under the heading institutional. It agreed on their validity and formulation. It added a fourth constraint to the list, which had to do with the lack of capacity of existing institutions and the need for their strengthening in order to successfully incorporate an environmental management component into agricultural extension. It also decided to include two additional constraints (transfer of research findings to extension programmes and lack of institutional capacity), as these have a clear institutional dimension.

In the general discussion the group remarked that from some documents outsiders might conclude that it was proposed by the workshop for agricultural extension programmes to take over the promotion of vector control as a whole. It should be made explicit in the final document, that the scope of vector control promotional activities through agricultural extension was limited to those vectors whose habitat is directly associated with the agro-ecosystem and could be modified by a change in farming practices.
On the other hand, inclusion of health measures through agricultural extension could be given a broader basis by bringing in other issues of the agriculture/health interface: nutrition, safe use of pesticides, sanitation and rodent control. Nutrition and sanitation were already part of the agricultural extension programmes in many countries.

1. **Absence of policy basis**

**Solutions**

- While there would seem to be no policies in either the health or agriculture sectors that actually obstruct the promotion of environmental management through agricultural extension, policy review and, if necessary, modification may be needed to make policy frameworks more complementary.

- Most important, however, is the need to formulate new policies that will explicitly direct the process of introducing a component of environmental management for disease vector control into agricultural extension. Such policies should facilitate cooperation between the health and agriculture sectors at all levels, including at the community level where extension workers and health workers operate.

- Such policies should also aim at promoting collaboration with other entities outside of the ministries: at the central level the relevant national research councils, at the local level farmer associations and other NGOs.

*To achieve policy formulation and modification two types of action are proposed:*

- Preparation of national position papers which would be submitted to high level policy makers and form a basis for policy development. The participants of the workshop would play an active role in this respect as a first follow-up.

- Promotion of the issue by international agencies (WHO, FAO and UNEP). At the time of distribution of the report of the workshop, the attention of national authorities should be drawn to the need for a solid policy basis.

2. **Allocation of responsibilities, financial limitations**

**Solutions**

- Provided the rationale for promoting environmental management through agricultural extension is clearly visible, the group did not foresee competition between the health sector and the agriculture sector over this issue.

- In most countries in the Region of Agia and the Pacific the planning/budgeting process includes consultation between sectoral ministries. It was considered imperative that coordination at the central level occurs first. This will automatically lead to the adoption of the concept at lower administrative levels. Local initiatives stand little chance if there has been no agreement at the central level.

- In addition to the technical rationale, the cost-effectiveness of sharing resources is important and should be pointed out.
The group agreed that a memorandum of understanding, which assigns responsibilities and defines where inputs come from, is the best mechanism to overcome this potential constraint.

The additional training required to introduce environmental management into agricultural extension probably requires some funding. Again, this is an area of mutual benefit between the two sectors: agricultural extension staff will learn from the health professionals, but health staff should also learn from the agricultural professionals.

The group felt that the financial implications in this connection would not be prohibitive.

The question was raised whether an additional subject matter specialist on human health should be added to the agricultural extension staff. It was unanimously agreed that the creation of a new post was not feasible in the present economic circumstances. A solution to this constraint would be to give the task of looking after human health to a subject matter specialist in a relevant area, such as veterinary public health. Such a person would also fulfill a bridge function to professionals in the health sector.

3. **Management constraints**

**Solutions**

- Many issues discussed under constraint 2 already cover the problem of how to bridge the gap between the two sectors.

- At the peripheral level the overburdening of extension staff by adding new tasks may create a management problem but no obvious solution other than expanding the extension staff was found.

- For management problems to be minimized, staff from different disciplinary backgrounds need to be shown the mutual benefits of collaboration and taught to respect each other.

4. **Transfer of research findings**

**Solutions**

- The group first of all recognized that a lot of simple environmental management measures were already available, that could be readily introduced into the extension package. It discussed at some length the use of Azolla and intermittent irrigation but decided it could not make general recommendations on the suitability of measures, as this was determined by many local conditions.

- Health and environmental engineering research would continue to yield new measures that would need to be channelled through to the extension system. At the central level, contacts between national research councils should be promoted.

- Agricultural extension services have their own technology transfer mechanisms, starting with technology testing (verification) followed by the actual transfer by extension services, sometimes in collaboration with NGOs.
For new environmental management measures, a first step should be testing their applicability and effectiveness for disease vector control. This step should occur before agricultural verification on their effect on production takes place.

At the same time, it would be useful if new agricultural methods which are suspected of carrying a health risk, are tested by health researchers. This is, therefore, a matter of exchange, as well, between health and agricultural research institutions, to their mutual benefit. It may be formalized by a memorandum of understanding.

5. **Lack of institutional capacity**

Capacity building consists of two elements: institutional strengthening and human resources development. The group focused on the latter.

**Solutions**

- In this field, three levels of training can be distinguished: (1) Training of trainers, (2) Training of extension workers and (3) Training of farmers.

- The training of trainers is the crucial first step to come to the collaboration that is required. This training can be done by the health department. A wide range of media is available for training (print, radio, television, etc.); their suitability will depend on the level of staff addressed. For the training of trainers it was considered important to include on-site training in demonstration project areas.

- The group noted the emphasis given by the United Nations development Programme on capacity building. Possibilities for assistance in the area of environmental management training for extension personnel should be explored.
FACT FILE CHINA  
*(data 1991)*

General characteristics:

- **Land area:** 9 596 960 km²
- **Population:** 1 151 487 000
  - number:
  - annual growth rate: 1.6%
  - population doubling time: 44 years
  - urban population: 26%
- **Main towns - number of inhabitants:**
  - Shanghai - 7 112 000
  - Beijing - 5 469 000
  - Tianjui - 4 314 000

Economic performance:

- **Gross National Product:** US$ 479 870 million
- **Sectoral breakdown:**
  - agriculture: 34%
  - industry: 53%
  - services: 13%
- **Annual GNP growth:** 10.5%
- **GNP per caput:** US$ 417.00
- **Main exports:** Textiles, metal products, livestock, rubber products
- **Main imports:** Machinery, vehicles, textiles, rubber products

Health:

- **Life expectancy at birth:**
  - male: 68 years,
  - female: 72 years
- **Crude birth rate:** 22/1000
- **Crude death rate:** 7/1000
- **Infant mortality:** 33/1000

**Adult literacy rate:** 73 %
PEOPLE’S REPUBLIC OF CHINA

by

Xu Bozhao and Jun Wu

Introduction

China’s topography varies from mountainous to flat regions and featureless plains. The western part bordering the Himalayas is a mountainous area, whereas the central and eastern parts are plains and areas with low hills. Most of China’s rivers flow east as the land surface descends from West to East. Climatic conditions vary considerably from North to South; the North has a temperate climate and the South is sub-tropical.

Human Health

Since the founding of the People’s Republic of China in 1949, the general level of the health of its people has improved significantly.

Health problems in the rural environment

The major problems attributed to health in the rural areas are poor housing conditions, generally low hygiene, solid waste and chemical pollution, including pesticide pollution, and inadequate water supply and sanitation facilities. In addition to these problems, agricultural development i.e. increased numbers of dams, reservoirs and expansion of areas under cultivation, in particular irrigated rice production, may contribute to an increase in the prevalence of malaria, filariasis and schistosomiasis in some rural areas.

Vector-borne diseases

Vector-borne diseases of secondary importance such as plague, kala-azar, relapsing fever, typhus and dengue fever are still present in China even though they are minor public health problems.

Malaria

A control campaign using environmental management and case detection and treatment has led to the elimination of epidemic foci. There has therefore been a significant decrease in malaria cases in the whole country; from 30 million to 117,359 in 1990. The target of the present malaria campaign for 1991-1995 is to further reduce the malaria incidence to less than one hundred thousand cases, to reduce the extent of endemic areas and to prevent focal outbreaks from occurring.

Filariasis

Prior to the disease control programme, filariasis occurred in 864 counties and cities in 14 provinces, municipalities and autonomous regions; 467 counties and cities were endemic in bancroftian filariasis and approximately 225 counties and cities were endemic in brugian filariasis, accounting for 54.1 percent and 26 percent of the total filariasis cases, respectively.

The disease control programme led to a drastic reduction in infection rates in endemic areas, resulting in a dramatic reduction in the number of filariasis cases which was in excess of 30.99 million. Between 1986 and 1990, 22,350,772 persons underwent blood examination and among these 268,034 were found to be microfilaria positive. A total of 78,550,945 man/times of treatment with DEC were given, including administration of DEC-medicated salt. By the end of 1990, filariasis had been basically eliminated in 823 counties/cities out of the 864 endemic counties/cities.
Dengue and dengue haemorrhagic fever

Dengue haemorrhagic fever outbreaks first occurred in Heilongjiang province in the 1930s. Recently the disease has become more common.

Schistosomiasis

Schistosoma japonicum is prevalent in some areas, including the Dongting Lake area in Hunan province and the Poyang Lake area in Jiangxi province. Acute infections have been recorded in the Hubei and Hunan provinces. The infection mostly affects the inhabitants of fishermen villages on the banks of the lakes. Schistosomiasis caused by S. japonicum is the most severe and gives rise to high morbidity and mortality. S. japonicum is a zoonotic parasite with a wide range of reservoir hosts, including cattle and pigs. The amphibious snail Oncomelania sp. is the intermediate host species.

Health Sector

Each province, municipality and autonomous region in China has a Bureau of Health which leads and organizes medical and preventive work. Under the Department of Epidemic Prevention, Ministry of Health, are the anti-epidemic stations and the Institute of Parasitic Diseases. Their responsibility covers field work and technical guidance for acute infectious diseases and parasitic diseases.

By the end of 1990, there were 208,734 health units in China with a total staff of 3,897,921. Some areas have set up organizations for controlling parasitic diseases, endemic diseases, and tuberculosis. These total 1566 and are staffed by 47,065 professional personnel. Sanitarian and anti-epidemic stations, and maternal and child care stations are present in most counties.

Agricultural Sector

China’s major grain crops are rice, wheat, corn, sorghum and millet. The total sown area for grain crops was 112.204 million hectares in 1989 of which the greatest part is for rice and wheat. In addition, potatoes and soy beans cover an extensive hectarage.

The industrial crops include cotton, oil-bearing crops, bast-fibre plants, sugar crops, tobacco and medicinal crops as the major industrial crops in China. In 1989, the total sown area for industrial crops was 20,989 thousand hectares, of which 5203 thousand hectares were for cotton, 10,504 thousand hectares for oil-bearing crops (i.e. peanuts, rapeseed, sesame and sunflower), 563 thousand hectares for bast-fibre plants (i.e. jute and kenaf), 1529 thousand hectares for sugar crops (i.e. sugar cane and sugar beet); 1798 thousand hectares for tobacco, 182 thousand hectares for medicinal crops and the remaining 1209 thousand hectares for other industrial crops.

The development of agriculture has resulted in the increase of agricultural commodities and a prosperous rural economy. Farmers’ income has generally increased and living standards improved.

Role of women in agriculture

In China, rural women play an active role in agricultural production and contribute half of the labour force. Horticulture and animal husbandry are generally carried out by women and they also participate in general field tasks such as sowing and harvesting. Furthermore, as an increasing number of the population, especially men, are working as part-time farmers due to the more attractive job opportunities offered by the various rural enterprises, more responsibilities and tasks related to farm work are carried out by rural women.
Plant pests

Plant diseases and pests cause tremendous economic losses. Surveys made in the 1970s show that more than 1320 plant diseases and insect pests are present in China. Other factors that may contribute to agricultural losses yearly are extreme climatic conditions such as hailstorms and flooding, which in 1989 alone, affected 4.33 million hectares of farmlands.

Agriculture/Health Linkages

The nutritional status of the farmers is generally improving due to increased income from higher agricultural production which has led to an improvement in living conditions.

Agro-ecosystems and vector-borne diseases

Agricultural development may lead to an increase in the prevalence of malaria, filariasis and schistosomiasis. Especially, rice production with surface flooding and soil saturation provides an ideal environment for many vector mosquito larvae or for the snail intermediate host of schistosomiasis. The following mosquitoes are rice breeding species: Anopheles sinensis, A. anthropophagus, Culex tritaeniorhynchus, C. gelidus and C. vishnui. Malaria, filariasis and Japanese encephalitis are transmitted by these mosquitoes. As rice cultivation is of major importance in China, A. sinensis and C. tritaeniorhynchus are more than common and special attention is given to these mosquito vectors in China.

Coordination between the agricultural and the health sector

There has been some collaboration between the agricultural and health sectors in controlling vector-borne diseases in recent years. Examples are the joint effort in controlling schistosomiasis snail vector in the Dongting Lake area in Hunan province and Poyang Lake area in Jiangxi province. The legislation for the intersectoral coordination is provided by the State Council of China.

Agricultural extension

As early as four thousand years ago, during the dynasty of Yao and Xun, “agricultural teachers” appeared who were engaged in agricultural extension. In 1989 there were 44,866 agricultural extension stations established by the local governments dispersed in 80% of the total number of townships in China. The managing agency for agro-extension, under the Ministry of Agriculture, are the National Agro-Technology Extension Centre (NATEC) and specialized stations such as National Plant Protection Station, National Soil & Fertilizer Station and National Seeds Station. Corresponding centres have been set up at the provincial level. The agricultural extension programme encompasses not only agricultural issues but also the rural economic development and farmers’ living conditions and work. It is therefore adapted to the needs, demands and possibilities of the different areas of the country taking into account the wide variations in the production level among the farmers as well as their acceptance of innovations.

Extension linkages

Agricultural extension, research and education are regarded as the three mainstays for agricultural science and technology. Agricultural education is designed to pass on knowledge obtained from research.
Environmental issues dealt with by agricultural extension

The major environmental issues dealt with by agricultural extension are:

* Land and water development for food production, which leads to increased number of vector habitats.
* Contamination of drinking water by pesticide, excreta, industrial solid waste material and water.

Incorporation of Environmental Management of Vector Control in Agricultural Extension

Possibilities for immediate action

Since the current scope of China's agro-technology extension system is limited to agricultural production, particularly within crops farming, not many of the agricultural extension activities relate to environmental management for vector control. Thus, the possibilities for immediate action on the incorporation of environmental management for vector control in agricultural extension should be as follows:

* research on the feasibility of the incorporation of environmental management;
* training of agricultural extension staff on environmental management for vector control;
* development of training materials;
* programming and implementing some agricultural extension projects on environmental management for vector control.
INDIA
(data 1991)

General characteristics:

- Land area: 3 287 590 km²

- Population:
  number: 866 352 000
  annual growth rate: 1.9 %
  population doubling time: 37 years
  urban population: 27 %

- Main towns - number of inhabitants:
  Bombay - 8 243 000;
  New Delhi - 5 714 000;
  Calcutta - 3 305 000.

Economic performance:

- Gross National Product: US$ 319 864 million

- Sectoral breakdown:
  agriculture 32 %
  industry 28 %
  services 40 %

- Annual GNP growth: 5.5 %

- GNP per caput: US$ 369.00

- Main exports: Pearls, jewellery, clothing, machinery

- Main imports: Petroleum products, machinery, pearls, semi-precious stones

Health:

- Life expectancy at birth: male: 57 years,
  female: 59 years

- Crude birth rate: 29/1000

- Crude death rate: 10/1000

- Infant mortality: 87/1000

Adult literacy rate: 48 %
INDIA
by
C. Krishna Rao and K. Rajan

Introduction

India is comprised of four regions, namely the great mountain zone, the plains of the Ganga and the Indus, the desert region and lastly the southern Peninsula. It is a Union of 25 States and 7 Union Territories (UTs). The country's climate varies from the snow-covered Himalayas to tropical rain forest in the south. The Indian economy is predominantly based on agriculture. About 1/3 of the national income derives from agriculture which employs about 2/3 of the national work force. It is self-sufficient in food production and the tenth most industrialized country in the world.

Human Health

Vector-borne diseases

The major vector-borne diseases in the rural areas of India are malaria, filariasis, kala-azar (visceral leishmaniasis), Japanese encephalitis, Guinea worm disease, Kyasanur Forest Disease (KFD), plague, dengue and dengue haemorrhagic fever (DHF). Arthropod-borne infections include endemic typhus, scrub typhus and Q fever.

Malaria

Malaria is prevalent throughout India except in high altitude areas (above 5000 ft.) and a narrow plain strip along the west coast of Kerala State. The disease has been known to be prevalent in India for centuries and it has been the most important health problem. After the launching of the National Malaria Eradication Programme (NMEP), the incidence declined to 0.1 million with no deaths in 1965. Thereafter, however, the incidence gradually increased, recording 6.4 million cases in 1976. Strategies under a Modified Plan of Operation has stabilized disease incidence at around 2 million cases per annum during the last 6 years.

Malaria in India is primarily caused by Plasmodium vivax followed by P. falciparum. P. malariae is confined to a few areas in the country. The total number of recorded cases of malaria, in 1990, was 1.9 million of which 35% were Plasmodium falciparum infections. There were 290 deaths due to the disease.

Anopheles culicifacies is the predominant vector species for malaria transmission in India. It is associated with perennial transmission and also with spring transmission in the northern states.

A. stephensi is a very important vector in the arid zones (Rajasthan), urban centres and in rural areas particularly in Tamil Nadu. It breeds in cisterns, fountains, ornamental tanks and artificial containers, in construction sites and water held in air coolers/air conditioners.

A. dirus is an important vector in the forest areas of the north-eastern states of India. It breeds in forest pools, burrow pits along forest roads, trenches and streams often with decaying leaves.

A. minimus is an important vector in sub-Himalayan areas and all the eastern states of India from Assam, Meghalaya to Tripura. This species is also found in Bihar and West Bengal. It has been greatly suppressed by DDT spraying. It breeds in clear, slow moving water (streams) with grassy margins, swampy vegetation and little shade.
A. *philippinensis* was recognized as a vector in the delta area of West Bengal where it nearly disappeared following the launching of the NMEP. In recent years, however, the species which occurs in large numbers outside Bengal has become an important vector of malaria in Assam, Meghalaya and also in other eastern states including Tripura.

*A. annularis* is a widely distributed species in India. However, its importance as a malaria vector is only recognized in Garo Hills of Meghalaya, coastal Orissa, Uttar Pradesh and the Madhya Pradesh border area.

*A. sundaeicus* breeds in brackish waters. Its importance as a malaria vector is limited to the Sunderbans area/coastal Calcutta, as well as coastal Orissa particularly in the Chilka Lake area, Andaman and the Nicobar Islands.

*A. fluviattilis* and *A. culicifacies* are vectors in the foothill areas and they are often found in irrigated tracts of Deccan Plateau, Central and Peninsular India, the Wynad area of Kerala and the Western Uttar Pradesh Terai area.

*A. varuna* breeds in running water in hilly tracts and in stagnant water in the plains. This vector is no longer significant in malaria transmission.

**Filariasis**

Filariasis is one of the major public health problems in India and the number of cases is presently increasing. There are two types of filarial infections prevalent on mainland India, namely *Wuchereria bancrofti* and *Brugia malayi*.

*W. bancrofti* infection is prevalent in 13 states and 5 union territories. It is prevalent in the Andaman and Nicobar group of Islands and is responsible for 99.3% of cases. The number of *W. bancrofti* cases is increasing while *B. malayi* cases are decreasing. About 2.5 million people are living in *B. malayi* areas of whom about 0.2 million are microfilaria positive and 0.13 million have disease manifestations.

*Culex quinquefasciatus* is the principal vector for Bancroftian filariasis while *Mansonia annulifera*, *M. uniformis* and *M. indiana* are vectors for *B. malayi* infection.

**Leishmaniasis**

Visceral leishmaniasis, also known as kala-azar, is caused by the parasite *Leishmania donovani*. During the National Malaria Eradication Programme (NMEP), the regular residual insecticidal spraying led to a near eradication of the disease. With the withdrawal of residual DDT spraying, however, kala-azar has again become endemic in Bihar. *Phlebotomus argentipes* is the vector of Kala-azar in India.

Cutaneous leishmaniasis caused by *L. tropica* was occurring in the north-western parts of the country but has become rare. A zoonotic focus has been discovered in Rajasthan in recent years.

**Japanese encephalitis**

Japanese encephalitis (JE) is an acute viral and zoonotic infection transmitted by mosquitoes. JE is endemic in India and has been responsible for many deaths in a large number of states and union territories of India during the past two decades. The disease has been spreading slowly and steadily to newer areas. JE cases were detected in 24 states & UTs during the last 13 years, while in the remaining eight, namely Gujarat, Himachal Pradesh, Punjab, Jammu & Kashmir, Sikkim, Dadra & Nagar Haveli, Daman & Diu and Lakshadweep, none were detected.
The main vectors of JE in India belong to the *Culex vishnui* group of mosquitoes. *Culex tritaeniorhynchus* is widely distributed in the whole sub-continent especially in rural surroundings. Besides the *C. vishnui* group, the suspected JE vectors are *C. gelidus*, *C. whitemori*, *C. tritaeniorhynchus*, *C. fiscocephala*, *C. epidesmus*, *Anopheles subpictus*, *A. hyrcanus* group, *A. barbirostris* and *Mansonia annulifera*. Japanese encephalitis outbreaks generally coincide with very high densities of the vector population.

**Guinea worm infection**

Guinea worm infection, or dracunculiasis, which is caused by the nematode *Dracunculus medinensis* is a problem in India although the number of cases is decreasing (4798 cases were found in 2592 villages in 1990).

The vectors of Guinea worm disease in India are *Mesocyclops leuckarti* and *M. hyalinus*.

**Kyasanur Forest Disease**

Kyasanur Forest Disease (KFD) is a viral infection transmitted by ticks. It is immunologically related to the Russian spring-summer encephalitis complex. KFD was recognized for the first time as a new disease in the forest of Sagar Taluk, Shimoga district in Karnataka State during a study held in 1957 when abnormal deaths were recorded among monkeys.

Presently, three districts in Karnataka are endemic for KFD; 76.4% of all cases in the State have been found in the Shimoga district, followed by Uttar Kannada District with 15.2 percent.

At least 15 species of ticks of the genus *Haemaphysalis* account for more than half the number of isolations followed by *H. turturis* with nearly one third. Five other species, namely *H. mimuta*, *H. wellington*, *H. panuana kinneari*, *H. kyasanurensis* and *H. bispinosa* account for the rest of the isolations.

**Plague**

Plague still remains a "natural focus" in a small area in South India. It is caused by *Yersinia pseudotuberculosis pestis*. In India, the wild rodent *Tatera indica* is known to be the main zoonotic reservoir.

The vectors of plague in India are the rat fleas *Xenopsylla cheopis*, *X. astia* and *X. brasiensis*, with the first being the most efficient transmitter.

**Dengue and dengue haemorrhagic fever (DHF)**

Dengue fever is a viral disease transmitted by mosquitoes. DHF is a severe form of dengue caused by more than one type of dengue virus. The viruses belong to a group of four flaviviruses. Most outbreaks of these diseases are found in urban areas.

*Aedes aegypti* is the principal vector. It is the most common mosquito in India and breeds in small containers. The flight range of this mosquito is generally restricted to 50 meters.

**Health Sector**

Under the Constitution of India, the States are largely independent in matters relating to the delivery of health care. The central responsibility consists mainly of policy making, planning, guiding, assisting, evaluating and coordinating the work of the State Health Ministries.
The Union Ministry of Health and Family Welfare is headed by a Cabinet Minister, a State Minister and also sometimes by a Deputy Health Minister. The Union Ministry is comprised of the Departments of Health and Family Welfare which are both headed by a Secretary. The responsibilities of these departments cover international health, administration of central institutes, promotion of research, regulation and development of the medical/pharmaceutical/dental/nursing professions, establishment and maintenance of drug standards, census and statistical data, immigration and emigration, regulation of labour/working of mines/oil fields, and coordination with states & other ministries for the promotion of health.

The Central Council of Health, with the Union Health Minister and the State Health Ministries as chairman and members respectively, promotes coordinated and concerted action between the Centre and States in the implementation of all health programmes. The council’s functions include:

- Policy matters on provision and remedial and preventive care,
- Proposals for legislation on medical and public health matters,
- Recommendations for distribution of grants-in-aid for health purposes to the states,
- The establishment of organization(s) to promote cooperation between the Central and State health administrations.

One of the basic tenets of primary health care is universal coverage and equitable distribution of health services. This health policy is implemented through Village Health Guides (VHW), trained local Dais and Integrated Child Welfare Services, (ICDS). The Village Health Guide is not a government functionary but is paid an honorarium of Rs. 50.00 (about $2 per month). The VHWs are mostly women who are chosen from the community. After training, they receive a training manual and a kit of simple medicines belonging to the Western and the traditional system and attend to treatment of simple medical ailments, first aid, mother and child health, family welfare, health education and sanitation. After the initiation of the treatment, they refer the patient immediately to the nearest health care centre whenever warranted. Presently, there are about 400 000 health guides in the country.

**Control of vector-borne diseases: Integrated approach method for the control of vector-borne diseases**

**Environmental sanitation**

This offers the best approach for source reduction through minor engineering methods: filling, levelling, etc. It requires an intensive health education of the community, political commitment and a considerable financial outlay. Some of these methods are used in 128 towns under the Urban Malaria Scheme (UMS) and 204 towns under the National Filariasis Control Programme (NFCP).

**Biological control**

*Gambusia affinis*, a larvivorous fish, is used for the control of *Anopheles* breeding and *Poecilia reticulata* (Guppy) for the control of *Culex* mosquito breeding in the towns under UMS and NFCP. Many small scale field studies were conducted with other biological agents but they have not found a place in the programme yet.
Chemical control

Chemical control in urban and rural areas varies. In the urban areas, anti-larval measures constitute the main method of control while in the rural areas, residual indoor spraying is most common. The larvicides used in urban areas are mosquito larvicidal oil (MLO), temephos and fenthion. The latter two compounds belong to the organophosphorous group. In addition, Paris green is used for control of anopheline mosquitoes in towns under UMS where pyrethrum space spray also is given in 50 houses around every malaria positive case. Anti-larval measures are applied at weekly intervals.

Drug resistance problems are mainly confined to malaria in India. The focus of *P. falciparum* resistant to chloroquine was first discovered in India during 1973 in the Karbi-aningling district of Assam. Until the end of 1990, 182 resistance cases have been reported. The resistant strains are still susceptible to a sulfadoxine and pyrimethamine combination of drugs.

DDT resistance in India was first recorded near Delhi in 1952 with *C. quinquefasciatus* and in Gujarat in 1959 with *A. culicifacies*. Dieldrin resistance was recorded in the latter species in 1958 in Maharashtra. In NFCP, indoor residual spray of dieldrin was withdrawn within five years due to insecticidal resistance problem. The control of *C. quinquefasciatus* is presently done through anti-larval measures.

Women and Health

The health care of women has low priority in many rural families due to cultural traditions. Nevertheless, health education programmes are being implemented to reduce the discrimination against women.

Agricultural Sector

Agriculture plays an important role in the economy of India as approximately a third of the GNP comes from this sector. Just under half of India is cultivated land, and almost 30% of this area is irrigated. The net and gross irrigated areas are about 42.49 million ha. and 55.69 million ha., respectively.

The intensified research on crop improvement in India has led to a rapid increase in the yields of cereal crops. The cultivation of hybrids of cotton has also resulted in increased production. The extension of irrigation facilities and the setting up of sugar factories, particularly Cooperative Sugar Factories, has increased the production of sugar cane.

A lot of emphasis has been placed on livestock and dairy development, fisheries and horticulture lately.

The role of women

The Government of India has reviewed its policies on agriculture, reorienting the programmes in order to put more emphasis on the role played by women in the agriculture development.

Irrigation

Given the high dependency on irrigation (almost 30% of the gross cultivated area), the Government has launched a major programme for the treatment of non-irrigated lands thereby enhancing the productive potential of dry lands to generate higher income levels to those dependent on them.
An area of major concern is the adverse environmental impact arising from surface irrigation from large and medium scale irrigation projects. Unless the drainage system is maintained at a high level of efficiency, concurrently with the canal network, any excess irrigation results in waterlogging or stagnation and the creation of vector breeding sites.

Agriculture-health linkages

A health education/nutrition improvement programme has been launched with the objective of improving nutritional standards and to teach people about the importance of a varied diet. Livestock products like milk and eggs also constitute important components of the nutrition improvement programmes.

Agro-ecosystems and vector-borne diseases

There has been a 27-fold increase in the acreage where high yielding varieties of food grains are grown over the last 25 years. The high yielding varieties of rice, wheat and cash-crops like cotton, sugar cane, etc. require intensive periodic irrigation resulting in more frequent pooling of water in and around the cultivated land and in the peripheral irrigation channels.

Malaria prevalence is found to correlate with irrigation development. Increased irrigation has resulted in high water tables, slow movement of water and swampy conditions in many districts of the north-western parts of the country. A large number of perennial mosquito breeding grounds have been created in this connection. *A. fluvialitis* is common along the forest fringes whereas *A. culicifacies* has spread into new agro-ecosystem and malaria transmission has increased over wide areas with varying intensity.

The *filaria* vectors generally breed in water with high organic matter content. *C. quinquefasciatus* breeds in land irrigated with sewage water in or adjacent to some urban areas. The use of sewage water for growing vegetables and fodder for cattle is the cause of high vector density. *Mansonia* mosquitoes, the vectors of *B. malayi*, breed only in association with floating aquatic plants mostly found in rural areas.

*Guinea worm infections* are confined to arid and semi-arid agro-ecosystems. The disease is mainly transmitted through step-wells and ponds and many farmers get infected by drinking unfiltered water from ponds and ditches dug for watering the dry crops. Transmission may also take place during the summer months when water collection in the fields takes place and is used as drinking water. Guinea worm infections are closely related to the supply of potable water. This is clearly illustrated by the changed agro-ecosystem in Haryana where the availability of safe drinking water via tube wells has led to a total elimination of guineaworm infections from this state.

Agricultural Extension

The Directorate of Extension (under the Department of Agriculture at the national level) is responsible for the agricultural extension programme. It has been strengthened under the World Bank assisted National Agricultural Extension Project.

Various extension tools such as demonstrations, group discussions, audio-visual presentations, information on technologies and broadcast on the electronic and print media are used in the programme.
Women and the agricultural extension programme

Women play a major role in the agricultural sector and special projects have been developed to train them. The broad objectives of these projects are to improve the technical skills of the farm women with small or marginal holdings or as casual labour and to accelerate the growth in agriculture and strengthen the status of farm women in the society through an improvement in their economic condition.

Incorporation of environmental management for vector control in agricultural extension

Three basic approaches can be considered as environmental manipulative methods for immediate implementation:

- physical methods,
- intra and inter-sectoral coordination and
- community based activities

The physical methods include changing/eliminating water bodies that may serve as mosquito breeding ground, including changing the composition of the water, i.e. salt content or organic matter.

Community participation in environmental management for vector control is recommended through activities such as filling of ditches, burrow-pits, prevention of water collection in domestic and peri-domestic surroundings. The community must develop an awareness of the vector breeding sites and the risks of disease transmission.

Standing water in rice fields, for instance, provides the breeding grounds for species of *Anopheles* and *Culex* which are vectors of malaria and Japanese encephalitis. The problem has increased with the introduction of multiple cropping of rice in several areas which results in a larger stagnation of water and has led to increased vector populations.

Vector-borne diseases in many urban areas are closely connected to human behaviour. Civic by-laws should be formulated and implemented to minimize/eliminate mosquito breeding places. An appropriate legislation ought to be enacted to make the project authorities accountable for creating conditions for the use of environmental management methods for vector control.

Conclusions

Health standards have generally improved in India with the growing economy. Nevertheless, vector-borne diseases continue to cause high morbidity and mortality in different parts of the country. The country has been able to reduce the incidence of some of the major public health problems like malaria. However, vector resistance and other factors have contributed to the resurgence in vector-borne diseases.

Operational research studies need to be intensified in different geographic regions to increase the impact of the national control programmes. Training facilities to address capacity building requirements need to be improved.
INDONESIA
(data 1991)

General characteristics

• Land area: 1,919,440 km²

• Population:
  number: 193,560,600
  annual growth rate: 1.8%
  population doubling time: 39 years
  urban population: 31%

• Main towns - number of inhabitants:
  Jakarta - 6,503,000
  Surabaya - 2,028,000
  Bandung - 1,463,000

Economic performance

• Gross National Product: US$ 94,746 million

• Sectoral breakdown:
  agriculture: 26%
  industry: 33%
  services: 41%

• Annual GNP growth: 3.8%

• GNP per caput: US$ 489.00

• Main exports: Petroleum products, rubber, natural gas, plywood

• Main imports: Machinery, vehicles, chemicals, fuels

Health

• Life expectancy at birth:
  male: 59 years,
  female: 63 years

• Crude birth rate: 26/1000

• Crude death rate: 8/1000

• Infant mortality: 77/1000

Adult literacy rate: 77%
INDONESIA

by

S. Soerjosembodo and S. Soebroto

Introduction

About 7% of the groups of islands identified as Indonesia is inhabited while about 56% of the rest are nameless. Indonesia has a tropical climate with two seasons, the dry season (June-September) and wet season (October-May), 34 active volcanos and a mainly volcanic soil. The inner islands of Java, Bali and Lombok have very fertile soils whereas the islands of Sumatra and Kalimantan have soils comparatively less suitable for agricultural purposes.

The country consists of 27 provinces, 247 Kabupaten (districts) and 54 Kotamadya municipalities, 3370 Kecamatan (subdistricts) and 61 166 desa (villages). The province and district are autonomous local administrative authority areas.

Human Health

Vector Borne Diseases

Four vector borne diseases are considered endemic; malaria, filariasis, rabies and dengue hemorrhagic fever (DHF). The first three diseases are endemic mainly in the rural areas whereas DHF is mostly found in urban areas.

Malaria

On Java and Bali, malaria is not a major public health problem, except for some foci in Central Java. Malaria is mainly concentrated in the eastern part of the country and is a major problem in the rural areas although the number of cases has declined between 1986 and 1990. Intensive anti-malaria measures have been carried out in priority areas on the outer islands, i.e. resettlement projects, socio-economic development areas and areas bordering with neighboring countries. Approximately 10% of the total population lives in these areas.

On Java and Bali, seasonal workers arriving from the outer islands have been a source of an increasing numbers of imported malaria cases. Thus, the malaria foci will continue to occur in receptive areas such as in the rice fields, on hilly slopes with perennial water flow (vector Anopheles aconitus), and lagoons along the southern coastal belt (vector A. sundaicus). Adequate surveillance activities will be the key to prevent the resurgence of malaria on Java and Bali.

On the outer islands, malaria foci will remain in the eastern parts of the country, and new foci will most likely be found in remote areas following the expansion of health services. Forest related malaria will become a major problem on outer islands in the near future and therefore population migration to these areas should be under surveillance and people be given adequate treatment if malaria resurgence is to be prevented.

Malaria Control

Objectives for the Fifth Five-Year Development Plan (1989/1990-1993/1994) (Pelita V) for malaria control have been the reduction of the number of high case incidence subdistricts to 20 in high case incidence areas and to less than 1 per thousand population on Java and Bali.
On the outer islands, the objectives were to reduce malaria prevalence to less than 4% in the priority area. In non-priority areas, the objectives were a reduction in slide positivity rates to less than 20%. In hyper-endemic and meso-endemic areas, pregnant women should be given prophylactic treatment and clinical cases should be treated.

Indoor house spraying is the key approach in the malaria control programme, but this approach will be modified to reduce the use of insecticide. In the latest planning of malaria control, other approaches such as active case treatment, bio-environmental control measures through community participation, use of larvivorous fish, and use of impregnated bed nets have been included.

Indonesia faces problems with indoor spraying as the vectors on Bali and Java have become resistant to DDT. The use of DDT has therefore been limited to the outer islands. Presently, fenitrothion is used on Java and Bali. The MOH has decided to replace DDT with bendiocarb for its malaria control programme on the outer islands in 1992.

**Human resources in the health Sector**

Training on malaria control strategies has been conducted for health staff including those at the decision making level in the province, as well as for the technical staff.

**Agricultural Sector**

Agricultural production is increasing. In 1990, 62% (45 179 million tons) of the rice produced was on Java island alone. The increase in the agricultural production is due to the use of high yielding varieties and the increase of farmers’ capacity in applying new technology.

During 1989-1990, the production of secondary food crops including soybean, maize, peanut and mungbean also increased by approximately 10% except for sweet potato and cassava. Likewise, livestock production and marine fishery production increased. The production of the estate sub-sector producing palm kernels, palm oil, coconut, tea, coffee, rubber, pepper, cocoa and sugar cane also increased.

At present, the agricultural development policy is mainly geared to maintaining rice self-sufficiency and to obtain self-sufficiency in soybean and corn supplies.

**Role of women in agriculture**

Women attribute as much as men to the every day work in the household. During recent years, the welfare of a standard family has increased.

**Insecticides**

The insecticide usage for rice increased sharply during the last 5-year plan. The use of insecticide per hectare is increasing, especially for dry land rice. In 1989, the integrated pest management programme (IPM) sponsored by FAO was launched in order to decrease the use of pesticides.

**Irrigation**

The success of many small-scale irrigation development projects in Indonesia is a possible example for encouraging farmers’ participation in large-scale irrigation projects.
Agriculture/Health Linkages

The increased production has led to increased calorie intake per capita thus increasing the overall nutritious status of the population.

Marine fishponds

Cultivation of fish in artificial ponds in the coastal zone of northern Java has been practiced for centuries. *A. sundaicus*, a malaria vector, breeds in these fish ponds and is the cause of heavy endemic malaria in the coastal settlements.

Resettlement (transmigration)

Major transmigration programmes are continuously carried out in an attempt to reduce the population pressure on the heavily populated, well-developed agricultural area of Java, Bali and West Nusa Tenggara to 21 receiving provinces on the outer islands. Resettlement was intended to utilize the potential resources and to promote economic development in the respective areas. Between 1981 and June 1988, a total of 644,675 families moved from Java, Bali and West Nusa Tenggara under the transmigration programme. The Ministry of Public Works is responsible for the “opening” of the land, i.e. cutting down trees for housing materials, building of houses, land-levelling, road building, burning of excess woods and all shrubs. The Ministry of Transmigration (MOT) has the responsibility for the coordination of the transmigration programme, but the Ministry of Health (MOH) is technically in charge of health care delivery to the resettlers. A special unit has therefore been created under the Directorate General of Environmental Health, which is in charge of the environmental health of the resettlers. The main objectives of the transmigration health services are to select healthy individuals for resettlement and to protect the transmigrants from potential health hazards in the new areas.

In the newly opened areas, house spraying with insecticide has been conducted to control malaria mosquito vectors and malaria cases are being treated in polyclinics established in the settlement areas to prevent outbreaks.

Agricultural extension

Since Pelita I (1969/70), agricultural extension activities have been carried out to motivate farmers to adopt new agricultural technologies.

In 1970, the Indonesian Government started recruiting field extension workers (PPLs) who presently carry out the agricultural extension activities which were previously done by the Mantri Pertanian (agricultural officer in the Sub-district). Following this, the Government, in 1972, recruited Subject Matter Specialists (PPS) who act as trainers and consultants of PPLs in technical recommendations and problem solving matters.

Agricultural and water management extension through the Training and Visit System can be used to motivate the farmers to participate in the operation of the programme. One way to encourage farmers to develop their organizations and their management skills has been by the establishment of competition among farmer groups for water management.

Current programmes

The principal task of extension activities is transfer of technology. Agricultural extension aims at creating an awareness among the farmers concerning the importance of conservation and rehabilitation of the poor soils to improve and maintain the balanced natural resources and the ecology of the land. The Ministry of Forestry is involved in this area.
Training for agricultural extension officers takes place at the Agricultural High School, the Fishery Business Academy and the Agricultural Extension Academy. The agricultural extension programme is within the Department of Agriculture, liaising under four Directorates General, namely the Directorate General of Food Crops Agriculture, Estates, Fishery and Animal Husbandry. The increase in farm productivity highly depends on the level of available technology and the readiness of the farmers to apply it.

**Women development in extension programs**

Women's educational level is still low in rural areas which makes transfer of new technology to this group more difficult.

**Health issues dealt with by agricultural extension**

There is the need for education on pesticide management. This could be carried out by the agricultural extension workers. Pesticide surveillance has been established at the provincial and district levels.

**Conclusions**

Presently, the vector-borne control programmes are focused on the application of insecticides and chemotherapy. There is a need to include environmental management.

Through the training and visitation system and other extension methods, the agricultural extension programme has been successful in contributing to the efforts at increasing food production. A great achievement is Indonesia's self-sufficiency in rice production which was reached in 1984.
MALAYSIA
(data 1991)

General characteristics:

- Land area: 329 750 km²
- Population:
  
<table>
<thead>
<tr>
<th>number</th>
<th>17 982 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>annual growth rate</td>
<td>2.4 %</td>
</tr>
<tr>
<td>population doubling time</td>
<td>29 years</td>
</tr>
<tr>
<td>urban population</td>
<td>35 %</td>
</tr>
</tbody>
</table>
- Main towns - number of inhabitants:
  
  | Kuala Lumpur | 938 000 |
  | Ipoh | 301 000 |
  | Johore Bahru | 270 000 |

Economic performance:

- Gross National Product: US$ 40 025 million
- Sectoral breakdown:
  
  | agriculture | 21 % |
  | industry | 39 % |
  | services | 40 % |
- Annual GNP growth: 4.0 %
- GNP per caput: US$ 2 226.00
- Main exports: Thermionic valves & tubes, petroleum, lumber, rubber
- Main imports: Consumer goods, petroleum products, steel, cereals

Health:

- Life expectancy at birth:
  
  | male | 65 years |
  | female | 71 years |
- Crude birth rate: 30/1000
- Crude death rate: 6/1000
- Infant mortality: 29/1000

Adult literacy rate: 78 %
MALAYSIA

by

T. Ah Seng and A. bte Md. Jan

Introduction

Malaysia covers the Malay Peninsula, Sabah and Sarawak on the island of Kalimantan (Borneo). The country is situated in the tropics and has a climate which is dominated by two monsoons in between of which heavy rainfall occurs.

Presently, Malaysia has a high economic growth rate catalyzed by the structural transformation of the economy and a gradual shift from low productive subsistence activities to high productive modern activities. The current trend in the economy is that the agricultural sector is declining and that the secondary and tertiary sectors such as manufacturing, construction, banking, financing and other services are increasing.

Human Health

Health services and programmes in Malaysia have been expanded and emphasis has been put on an integrated approach to preventive, curative, and rehabilitative efforts. Additional facilities have been provided and existing facilities upgraded to increase coverage, especially to rural areas. The result of the efforts can be observed in the improvement in the general health status of the people. Mortality rates of infants and toddlers have progressively fallen over the years. The health of mothers has also improved and life expectancy has gone up.

Some segments of the population were identified to have low coverage of immunization, namely, the Orang Asli (aboriginals), estate population, remote rural villages, urban poor, and a few other isolated groups.

Vector-borne Diseases

Transmission of vector-borne diseases like malaria, filariasis, Japanese encephalitis and typhus is considered a major public health problem in the rural environment.

Malaria

Malaria is a major problem in a few endemic areas in the country. In terms of incidence and mortality, it is considered to be the major public health problem, especially in the rural environment where more than 90% of the malaria cases are detected.

Since the Malaria Eradication Programme started in the 1960s, there has been a remarkable decrease in the annual incidence of malaria from 168 409 recorded cases to around 8631 in 1982 in peninsular Malaysia. Since then, the average number of cases in peninsular Malaysia has been about 12 541 cases, and about 45 000 for the whole of Malaysia for the past ten years. Approximately 65 persons are reported to die from malaria annually.

Malaria is often associated with land development for agricultural purposes. The main vector on the peninsula is Anopheles maculatus which breeds in unshadowed streams. The presence of special high risk ethnic groups like the Orang Asli also contributes to the malaria problem. The opening up of land for agricultural purposes and urban construction attracts many migrant workers from neighboring malaria endemic countries. These workers serve as the source of infection resulting in the spread of malaria among local workers and populations in the traditional villages situated near the land schemes. As these migrant workers are often illegal aliens, their interaction with the health services is virtually non-existent.


**Dengue**

The number of notified dengue fever and dengue hemorrhagic fever cases peaked in 1974, 1982, 1987, and 1990. The highest number of notified cases of dengue was 4880 in 1990.

Dengue continues to be an important public health problem in the country, especially in densely populated urban areas. However, in recent years, sporadic cases of outbreaks of dengue have been reported in the rural areas too, especially in Sarawak.

**Filariasis**

Filariasis is endemic in Malaysia, especially in rural areas. A filariasis control programme was established more than 30 years ago but the disease continues to be a public health problem in some areas.

**Japanese encephalitis**

Japanese encephalitis is endemic in Malaysia, predominantly in rural areas. The total annual number of reported cases had ranged from ten to 30 in the last decade, although the total number of viral encephalitides had been higher.

**Vector-borne disease control**

For the control of vector-borne diseases in the country, the Vector-borne Disease Control Programme was formulated during the Fourth Malaysian Plan (1981-1985). The programme continued into the Fifth Malaysian Plan (1986-1990) and the Sixth Malaysian Plan (1991-1995).

The Vector-borne Disease Control Programme is a special programme under the Ministry of Health with an allocation of 45 million ringgit in 1991 to carry out control activities. About 60% of the budget is spent on malaria control, 30% on dengue control and the rest on the other vector-borne diseases. In 1990, a total of 5113 field stations were approved to carry out the various activities aimed at disease prevention and control.

At the national level, the programme is headed by a Director and has five divisions, namely Epidemiology and Laboratory Services, Vector Control, Health Education and Training, Record and Administration.

At the state level, the programme is headed by a Senior Medical Officer of Health (VBDCP) and assisted by an entomologist.

At the district level, the District Medical Officer of Health is in charge of the programme and the implementation of the various vector-borne disease control activities at the operational level. Operational teams such as the filariasis control team, malaria control team, dengue control team, and the multi-purpose team, carry out prevention and control of vector-borne diseases. At the local level, a field canvasser team, a spraying team and a special team carry out anti-malaria work.

**The Main Strategies emphasized are**

- **Geographical reconnaissance (GR):** a complete geographical reconnaissance inclusive of house/population census, and location of sprayable structure is done for every locality. Updating is carried out at regular intervals and when considered necessary. The GR is used to divide the country into localities of malarious, malaria-prone and non-malarious areas which in turn will determine the specific control activities to be implemented in each area.
"Surveillance against malaria: this is maintained through active case detection (ACD) and passive case detection (PCD). Prompt investigation, early treatment and follow-up of cases are also emphasized. In the malarious areas, active case detection is carried out by field canvassers who visit houses on a monthly basis to detect fever cases.

Indoor residual house spraying: in malarious areas, the main strategy is still regular six-month spraying with DDT to interrupt transmission. Focal spraying is done whenever a case occurs or in a malaria focus.

Application of environmental management measures: the manipulation and modification of the environment are carried out in areas which are receptive and vulnerable for malaria transmission. These measures are aimed at providing conditions unfavourable to vector breeding. Permanent anti-larval control measures include various forms of drainage such as open sub-soil, fascine and stone-packing, and the construction of automatic siphon sluices and tidal gates.

Measures to avoid man-vector contact: various measures to avoid man-vector contacts such as screening of the house, use of mosquito nets (treated or untreated with insecticides), use of insect repellent, etc. are being promoted and the outcome monitored.

Problems in control

Endemic areas: Malaysia still has many pockets of endemic areas due to various intrinsic factors which favour the continuous transmission of malaria. These include logistical difficulties and vector/parasite behaviour.

Opening of land for agriculture: in recent years, vast parts of the rainforest have been opened up for agriculture. This has led to changes in the natural habitat of vectors resulting in an increase in their population. The need for labour in deforestation has led to an influx of migrant workers from Indonesia, Thailand and Philippines. Difficulty is encountered in screening and treating those who are not registered with the proper authorities. Efforts are being made to get the cooperation of the managers of the land and schemes to supply lists of workers to be screened.

Highly mobile Orang Asli: the Orang Asli people who are living in the rainforest make up a high risk group as they are constantly exposed to malaria. As a result of improved infrastructure, contact had been made with the people in the fringe traditional kampongs, thereby increasing the chances of malaria transmission. There is a need to intensify the surveillance of malaria among the Orang Asli group. In certain areas, Orang Asli volunteers help in the screening and treatment of cases.

Agriculture Sector

The agriculture sector includes crop production, fisheries, livestock management and forestry. Over the years, the contribution of the agriculture sector to the overall growth has declined in comparison to other sectors. However, its contribution in absolute terms has increased. The growth rate of the agriculture sector was 4.6% per annum during the period of 1985-1990.

The agriculture sector in Malaysia is characterized by the existence of an efficient well-organized estate sub-sector engaged in export-oriented production of tree crops and the traditional less efficient non-organized smallholder sub-sector. However, the smallholders occupy about 60% of the agricultural land. Most of the smallholders are engaged in rubber, coconut and rice production.
Role of women in agriculture

The rate of participation of women in the national labour force increased from 37.2% in 1970 to 46.7% in 1990. Malaysian women participate in three major sectors namely agriculture (34.4%), industry (28.1%) and services (38.6%).

There has been a significant decrease in the number of women employed in the agriculture sector as a result of the urban drift and increasing opportunities in the industrial and service sectors. The concentration in the agricultural sector decreased slightly from 39% in 1980 to 34.4% in 1990.

In rural areas, women comprise the majority of the agricultural work force (65.5%). Rural women contribute both in the plantation and smallholder sectors. The plantation sector is an opportunity for women to earn a wage. In the estate sector, women contribute more than half of the labour force except in the oil palm estate. At the smallholder farm level, women are involved in various aspects of agricultural production, animal husbandry, fisheries, rice, and field crop cultivation. In addition to their role in the various agricultural activities, rural women have the responsibility of child care, cooking, looking after the elders, and other household tasks. The current trend is that men seek work in urban areas and as a result females make up 67% of the population in the rural areas.

Plant diseases and pests

Pesticides used under good agricultural practice do not usually give rise to problems such as resistance, residues and contamination to the environment. However, many farmers are often ignorant of the hazards of pesticides. They are known to mix pesticides indiscriminately hoping to increase effectiveness and save time and labour, to use excessive dosages for immediate results and not to observe the pre-harvest interval. These practices have implications on the health of farmers, pest resistance, the environment and residue levels in food, particularly short term crops such as vegetables.

Agriculture/Health Linkages

Malnutrition is not exclusively considered to be a health problem and is therefore not the sole responsibility of the Ministry of Health.

Agro-ecosystems and vector-borne diseases

The opening up of the land, especially forest areas, for agricultural purposes exposes new breeding sites and increases the risk of malaria. Health facilities are sometimes only completed after settlers are installed and the vulnerability of the non-immune settlers to vector-borne diseases is, therefore, high.

Agricultural extension

Agricultural extension is seen as the vehicle in the development of rural farm families into productive units. This is in line with the objective of the National Agriculture Policy which is “to maximize income from agriculture through the efficient utilization of the country’s resources and the revitalization of the sector’s contribution to the overall economic development of the country”.

Farm family development

The Department of Agriculture has implemented a range of programmes for rural women. Over the years, extensive programmes for rural women have been implemented, ranging from home economics training, income generating activities in food production and food processing, cash cropping and handicrafts.
A special programme has been set up by Department of Agriculture. The programme aims at helping poor farmers with monthly income below $350 by providing quality planting materials suitable for their specific locality along with basic inputs and extension leaflets on cultivation. Assistance at securing production credit and assistance for the marketing of farm produce have also been provided.

**Environment and health issues dealt with by agricultural extension.**

Health related issues being dealt with by agricultural extension are related to nutrition and pesticides. The greatest concerns are the safety of those using pesticides, possible residues in food and possible effects on fish, water and marine life. The indiscriminate use of pesticides may cause the disruption of the ecosystem because of the death of non-target species, the accumulation of pesticide residues in the environment and food, and the induction of pesticide resistance in the target species.

**Problems and constraints in agricultural extension.**

A socio-cultural resistance among the farmers to accepting and implementing the extension messages still exists as a major constraint. Often the extension agencies cannot get the appropriate technology needed by the farmers, indicating a lack of communication between research and field requirements. Thus, the problems and constraints of extension relates to all aspects of extension, i.e. target group, organizational structure, technical support and research linkage. Even though there are existing linkages between respective agencies/institutions responsible for technology production (research) and transfer (extension) and the respective target groups (users of technology), this needs to be improved.

**Incorporation of environmental management for vector control in agricultural extension**

Simple environmental management measures for malaria vector control should be undertaken through community participation in the rural areas.

**Vectors and diseases - baseline studies**

There is a need for the collection and analyses of existing data and reports on vectors, diseases and their control.

**Environmental management studies**

The types of possible environmental management measures which are suitable for the area should be considered with regard to the problems present and the resources available (as for example, drainage, filling, flushing or other manipulations or modification measures which could be implemented in the area).

The availability of labour in the area, the acceptance of the environmental management works by the local population and the prospects of participation by the local communities (e.g. agricultural extension workers) in the envisaged work for environmental modification should be assessed.

**Longer term possibilities**

- The vector control personnel could be responsible for implementing small simple environmental management measures as part of a malaria control programme. They should be capable of planning, designing and carrying out such measures, aimed principally at eliminating vector-breeding sites. They should maintain close collaboration with the departments responsible for land and water resources development and request technical support when required.
Major environmental management works, such as the construction of dikes, drainage of swamps and marshes, and construction of flood control and diversion structures, must be the responsibility of specialized departments or companies with appropriate financial and organizational resources. Agencies responsible for development projects, particularly those dealing with land and water resources, are becoming increasingly aware of the need to prevent the occurrence and intensification of vector-borne diseases like malaria.

There is a need for cooperation with the technical personnel of governmental agencies responsible for water resource and agricultural development projects to secure collaboration in the prevention of "project-induced" malaria.

Development of a public information programme to keep the local population duly informed of methods and objectives of source reduction or other mosquito control activities should occur in order to obtain the maximum cooperation and assistance of citizens and local governmental authorities.

It is recognized that, in the implementation and maintenance of environmental management measures for vector control, much can be achieved through community participation. Efforts to get the cooperation and participation of the people are likely to succeed if the proposed actions are closely related to their real needs and concerns. Generally the population is appreciative of the integrated approach of primary health care of which malaria control is an essential element, in combination with other health and social services.

Concluding Remarks

Agricultural development may often contribute to the increased receptivity of the environment to disease vectors. The farming communities are increasingly vulnerable to vector-borne diseases, particularly malaria. In Malaysia, the incidence of malaria among agricultural workers is increasing. The agricultural extension workers who are the front line workers have established close working relationships with the farm population, they are in a position to induce change in practices and to promote general environmental management activities at the farm level.

The opening of land for agricultural purposes has exposed new breeding sites of the malaria vector *A. maculatus* and has thereby increased the risk of transmission of malaria. Another potential contributing factor is the arrival of migrant workers from neighboring endemic countries who may introduce malaria into the malaria-free areas.
NEPAL
(data 1991)

General characteristics:

- Land area: 140,791 km²
- Population:
  - number: 19,612,000
  - annual growth rate: 2.4%
  - population doubling time: 29 years
  - urban population: 7.0%
- Main towns - number of inhabitants:
  - Kathmandu - 235,000
  - Sallit - 152,000
  - Pyuthan - 148,000

Economic performance:

- Gross National Product: US$ 3,514 million
- Sectoral breakdown:
  - agriculture: 58%
  - industry: 10%
  - services: 32%
- Annual GNP growth: 4.7%
- GNP per caput: US$ 179.06
- Main exports: Foodstuffs, livestock, machinery, vehicles
- Main imports: Manufactured goods, machinery, vehicles, chemicals

Health:

- Life expectancy at birth:
  - male: 51 years
  - female: 50 years
- Crude birth rate: 39/1000
- Crude death rate: 15/1000
- Infant mortality: 98/1000

Adult literacy rate: 26%
Introduction

Nepal is situated along the Himalayas with two thirds of the country being hills and mountains. It has a monsoon type of climate with extreme changes due to variance in altitude, slope and the presence of mountains.

The country can be divided into four distinct vertical zones: a hot monsoon climate in Terai, Bhabar and Churia areas up to an altitude of 1000 m, a warm temperate monsoon climate between 1000 m and 2000 m, a cool temperate climate found predominantly in the middle parts of the Mahabharat range of an altitude from 2000 m to 3000 m, and an alpine climate above of 3000 m.

Approximately 16% of the country is under cultivation. The population density based on cultivated area is one of the highest in the world. Nepal is one of the poorest countries in the world by UN standards.

Human Health

Vector-borne Diseases

Malaria

Until the 1950s, most parts of Terai were covered with dense forest and only few people lived in the area partly because of the high prevalence of malaria. During the 1970s, with the successful implementation of the malaria eradication programme, Nepal was declared free from malaria. Nevertheless, in the 1980s, malaria reportedly reoccurred in the now densely populated areas of Terai. These areas have poor drainage, sanitation and the development of resistance by the vector to DDT was a major attributing factor to the reoccurrence of malaria.

Filariasis

Filariasis is transmitted by mosquitoes of the species *Culex* and *Anopheles*. Filariasis was controlled to a greater extent along with the eradication of malaria and only found in defined areas. At present, mortality due to both malaria and filariasis is very rare in Nepal mainly due a high level of awareness about the disease among the people, leading to prompt case detection and treatment.

Japanese encephalitis (JE)

This disease was first reported to occur in Nepal in 1983 and since then, the number of cases and mortality caused by JE has steadily increased. JE has, since 1985, been a public health problem in the Terai districts of Nepal. Nine strains of the alphavirus Getah and two other untyped viruses have been isolated in the Sunsari district.

Agriculture Sector

The agricultural sector (including forestry and fisheries along with crops, livestock and horticulture) dominates the economy. It engages 90% of the country’s labour force, produces 60% of the gross domestic product (GDP), and provides nearly 60% of the country’s export earning. Therefore, the country’s economic performance is dependent on the achievements in agricultural productivity and input. The agricultural sector has grown at the rate of 4% annually since the beginning of the decade. Food grain production has grown 2.7%.
Agriculatural exports represent over 80% of the total Nepalese exports, i.e. rice, wheat, maize, oil seeds, pulses, cardamom, dry ginger, tea, sugar, jute, skin and hides, timber and herbs. Cottage industry products constitute the remaining 20% of the export goods. There are five major food crops in Nepal, i.e., paddy, maize, wheat, millet and barley, and they account for almost 80% of crop sector output. Buck wheat (phaper), naked barley (locally known as uwa), minor millet, niger and amaranth are grown as subsistence crops. Contrary to the cash crops, subsistence crops are grown mainly in the hilly and mountainous regions of Nepal.

Women in agriculture

Women constitute about 49% of the total Nepalese population. Studies have shown that most of the agricultural work is done by women. They participate not only in planting and harvesting of crops but also in field preparation before planting and in weeding. The labour input of men is concentrated mainly around the planting and harvesting of crops. The average working day of a Nepalese women is 10 hours 50 minutes a day, whereas the corresponding figure for men is 7 hours 30 minutes.

Irrigation development

Many farmer-operated irrigation systems exist in the country. Most of these irrigation systems are based on the use of local materials.

Plant diseases and pests

The introduction and adoption of high yielding varieties of cereal and cash crops without the necessary plant quarantine, crop rotation and the absence of effective plant protection programmes have brought about significant yield loss due to plant diseases and pests.

Though Nepal has not experienced any serious epidemics caused by plant diseases and pests, there have been several reports of sporadic incidence of damage due to insects, pests and diseases in the last 25 years. Some of the most common plant/pest diseases found in Nepal are blast and bacterial blight in rice, downy mildew, stalk/cob rot in maize, rust, loose smut/leaf blight in wheat, late blight and brown rot in potato.

The major diseases that have occurred in Nepal in cash crops are red rot in sugar cane, cercospora leaf spot in groundnut, and orobanche in mustard and tobacco.

The major pests of paddy are leaf roller, rice hispa and stem borer. Wheat pests are the wire worms and army worms. Maize borer and army worms are causing serious damage to maize. Stem borer of sugarcane and tuber moth of potato are also causing some economic losses.

Structure and organization

At present, there are 447 agricultural organizations operating under the Ministry of Agriculture, with 8323 general staff, 929 technical officers, 4332 technical assistants, 48 administrative officers and 3014 clerical/administrative assistants.

At the central level, there are five departments including Central Food Research Laboratory and Nepal Agricultural Research Council. The other four departments are Livestock Services, Agriculture, Food and Agricultural Marketing Services and cooperatives. Other organizations (Corporations, Projects and Boards) under MOA include Agriculture Inputs, Dairy Development, Agriculture Lime, Nepal Tea, Agricultural Tools Factory, Cotton Development, Jute Development, Agriculture Project Service Centre (SPROSC) and Rural Save Grain Project.
Agriculture/Health Linkages

The rapid deforestation and declining soil fertility brought about by soil erosion mainly in the hills and mountains has led to a further deterioration of the dietary conditions of the poor farming communities. Moreover, rural women spend very little time on child care because of their heavy work burden and this often leads to malnutrition amongst their children.

Pesticide use

Farmers are often not aware of the risk of intoxication by insecticides and thus individual cases of poisoning are seldom reported. Some farmers in Kathmandu, Bhaktapur and Lalitpur utilize their paddy fields for fish culture and in such cases, insecticide run off can become disastrous for the fish culture or increase pesticide residues in fish to high risk levels. There is a need for integrated pest management in order to limit the use of pesticides and thereby reduce risk to humans, livestock and fish. The Government of Nepal recently approved the Pesticide Regulation Act 1991 which includes the chief of the Malaria Eradication Project of the Ministry of Health as one of the members of the oversight committee.

Agricultural extension

Agricultural extension in Nepal dates back to 1952-53 with the establishment of the Tribhuvan Village Development Department (TVDD). It initiated a Block Development Approach to attack rural problems from all sides through education, literacy campaigns, health, agricultural development and extension. The field based agricultural extension programme was launched under the banner of TVDD of the Ministry of Planning and Development, while the research-oriented agricultural programme was administered by the Department of Agriculture.

In many of the districts not covered by projects receiving foreign aid, agriculture extension has remained unmodified since its introduction and is characterized by inadequate physical facilities for the extension officers, a lack of specialists and low remuneration to agricultural assistants (AAs). One district agricultural development officer with almost 10 JTs and 20 JTAs per district is currently working in this system.

With the establishment of separate departments, namely the Department of Livestock Services and the Department of Horticulture, the scope of agricultural extension in the DOA has been limited to crops and fisheries development programmes. Programmes concerning cash crops are directly handled by MOA through the committees of such development programmes. Recently, the agricultural support services and technical guidance have been given together at field level. These “combined” arrangements were well received by the farmers and they are more cost-effective than implementing two separate programmes. The existing organizational structure needs to be modified to make such a new organizational structure possible.

Extension linkages

At the regional and district levels, regional and district agricultural development committees are constituted with the regional agricultural director and the district agricultural officer as chairpersons and the officers-in-charge of the ADB/N, AIC, Cooperatives, Irrigation etc. as members of the respective committees. The Agricultural Development Bank which was created under the Ministry of Agriculture is now under the Ministry of Finance and thus has fewer linkages with agricultural authorities at the regional and district level.

Women development in extension programmes

According to the 1981 population census, 40% of women over the age of 10 were economically active in Nepal. A situation analysis of children and women of Nepal conducted by UNICEF in 1987, revealed that 96% of economically active women were engaged in agriculture. Various programmes and projects have therefore been initiated to enhance the participation of women in the overall development from the sixth plan period (1980-81) but with little success.
Environmental issues dealt with by agricultural extension

The rapid population growth, in combination with poor drainage and sanitation and rapid deforestation are some of the main causes of environmental imbalances. The agricultural extension programme has not dealt with environmental and health issues in the past decades. But recently, with the inception and endorsement of the National Conservation Strategy (NCS) for Nepal, programmes are being implemented by the NCS, together with the formulation of an Environmental Core Group including representatives from 15 ministries, departments and National Planning Commission divisions.

Environmental management for vector control in agricultural extension

Vector control has never been part of the agricultural extension programme. Some peri-domestic areas serve as potential vector breeding ground. An example is the open pits used for the storage of cattle manure which provide a perfect mosquito breeding ground. There is the need for the agricultural extension programme to launch a special programme targeted at the farm women and aimed at encouraging them to establish kitchen gardens near the houses in order to keep the peri-domestic environment clean and clear from garbage and thereby reduce mosquito breeding inside and around their houses. Other areas needing the attention of extension officers are the edges of the canals and small water bodies which must be kept clean and free from weeds.

Constraints

- Constraints in the collaboration between the agricultural and the health sector are:
  - the nature of work and responsibility of the sectors differ greatly
  - the new concept of collaboration may not be well received
  - the bureaucratic structure of the government does not favour this intersectoral concept
  - lack of funding and experienced technical manpower may develop constraints to environmental management for vector control.

Conclusion

Agricultural development activities which started just after the end of the Rana reign in 1950 have improved the infra-structure in the country required by the agricultural sector. These include the setting up of agricultural development offices at the central, regional and district levels, agricultural/ farm stations, service centres etc. Technical capacity has also increased dramatically over the last 40 years. In addition, the government has given highest priority to the agriculture sector in all its successive development plans. The performance of the sector has nevertheless not improved significantly. This is largely because programmes are often implemented in the country without proper preparation and institutional arrangements, which are pre-requisites crucial to for their success.

As the farming communities are mostly served by agricultural extension/development officers at the district and field levels, there should be concerted efforts at maintaining a functional linkage between agriculture and health authorities, with training in vector management and other issues to the concerned technicians.
PHILIPPINES
(data 1991)

General characteristics:

- Land area: 300 000 km²
- Population:
  - number: 65 759 000
  - annual growth rate: 2.1 %
  - population doubling time: 33 years
  - urban population: 42 %
- Main towns - number of inhabitants:
  - Manila - 1 787 000
  - Quezon City - 1 323 000
  - Davao - 836 000

Economic performance:

- Gross National Product: US$ 42 754 million
- Sectoral breakdown:
  - agriculture: 25 %
  - industry: 32 %
  - services: 43 %
- Annual GNP growth: 0.0 %
- GNP per caput: US$ 650.00
- Main exports: Semi conductors, electrical products, coconut oil, electronics
- Main imports: Fuels, lubricants, electrical products, machinery

Health:

- Life expectancy at birth: male: 62 years, female: 67 years
- Crude birth rate: 29/1000
- Crude death rate: 7/1000
- Infant mortality: 54/1000

Adult literacy rate: 90 %
PHILIPPINES

by
C. Y. Asinas and S. C. Serrano

Introduction

The Philippines is one of the largest island groups in the world with its 7100 islands and islets. The country has a tropical climate. It is presently in a rapid development stage characterized by urbanization and an expanding economy.

Human Health

The health status of the population is improving which may be seen as a result of advancement in medical technology and improved environmental sanitation services.

Major public health problems in the rural environment

Acute communicable diseases (respiratory and gastrointestinal diseases) constitute a major public health problem and are the leading causes of morbidity and mortality in children.

Malnutrition is still common, particularly among mothers and their children. In 1990, avitaminooses and other nutritional deficiencies ranked fourth in the leading causes of illness.

Poor environmental sanitation: the lack of safe and conveniently accessible drinking water supplies and inadequate facilities for the disposal of excreta are common problems in the rural areas. These areas have a high incidence of communicable diseases, particularly common are diarrhoea, parasitic infections and skin diseases.

Malaria, schistosomiasis and filariasis are endemic vector-borne diseases in the rural areas. They are considered to be major health problems leading to economic losses in terms of morbidity, mortality and treatment.

Malaria

Malaria is presently considered a major public health and socio-economic problem in the country. It is a leading cause of morbidity affecting 73 out of 75 provinces. Nearly 12 million Filipinos are exposed to the risk of acquiring the disease.

The principal vector of malaria in the Philippines is *Anopheles flavirostris* which thrives in clear, clean, slow flowing and shaded streams. The secondary vectors are *A. mangyanus*, also a fresh water breeder, *A. litoralis*, a brackish water breeder and *A. balabacensis*. The latter thrives in forested areas and is found only in one province in the Southwest of the country.

Schistosomiasis

Schistosomiasis constitutes another major public health problem in the country. It is the principal cause of slow development in the affected areas. In 1987, there were 24 endemic provinces distributed in eight regions with an exposed population of 4.5 million. Cases reported in the 167 affected municipalities numbered 400 000 with a prevalence rate of 8.3%. The high cost of transmission control has caused the shift of strategy to morbidity control.
Filariasis

Filariasis remains one of the least understood of the common parasitic infections. Although filariasis is confined (endemic) to certain areas in the country, it is still considered an important health problem. It is caused by *Wuchereria bancrofti* and *Brugia malayi* whose principal vector is the *Aedes poecilus* mosquito which thrives mainly in the abaca and banana plantations. Thus, the disease mainly affects the agricultural workers in these areas.

Health Sector

At the national level, the Department of Health is headed by a Secretary. Under him are five offices; the Office of Public Health Services with ten services, the Office for Hospitals and Facilities Services with four services, the Office for Standards and Regulations with six services, the Office of the Chief of Staff with seven services, and the Executive Committee for National Field Operations which oversee 13 Regional Health Offices and Special Hospitals.

Vector-borne Disease Control

Malaria Control Programme

The Malaria Control Programme is implemented by the Malaria Control Service which is under the Department of Health. The Central Office coordinates the programme while the responsibility of programme's implementation has been given to the provincial health offices. The malaria control programme delivery follow the Primary Health Care (PHC) approach.

The presence of *P. falciparum* strains resistant to some anti-malaria drugs has been recorded in the Philippines. Drug resistance is becoming a major problem in the control of the diseases. Three foci of drug resistance have been identified since 1968 and 500 cases of drug resistance have been recorded.

Generally, there is a lack of trained malaria personnel partly due to the jobs not being attractive and partly due to a general lack of resources.

Schistosomiasis Control Programme

The Schistosomiasis Control Programme under the country's Health Department is being implemented by the field health services. The Schistosomiasis Control Service is under the Office of the Public Health Services.

Filariasis Control Programme

Filariasis control is included in a non-specific control programme of the Department of Health with other communicable diseases in the Communicable Disease Control Service. Implementation is carried out by only three service units stationed in three highly endemic regions of the country.

Health Education Manpower Development and Training Service

The Health Education Manpower Development and Training Service (HEMDTS) is in charge of manpower development and training of personnel in the Department of Health. This is done by providing consultative training and advisory services to implementing agencies, conducting studies/research and developing plans and programmes for improved recruitment, deployment of personnel.
Vector Control in Water Resource Development and Integrated Area Development

The Philippine Malaria Control Project is presently involved, under a Memorandum of Agreement with the National Power Corporation, in supporting the latter's water resource development projects. Health impact assessment surveys which began in 1990 are now being undertaken in water resource development before the final approval of the projects.

The Agriculture Sector

The eight most important exports from the agricultural sector are: coconut, shrimps, prawns, banana, tuna, sugar, pineapple, and fertilizer. The majority of Filipino farmers are small scale cultivators.

Role of Women in Agriculture

The rural women have organized themselves under an umbrella organization, the Assembly of Women. With the Philippine Development Plan of 1990 approved by the President and the Family Code of the Philippines in operation, women have become involved in training in agriculture and rural development. This includes education on food security, environmental protection, nutritional issues, family planning, and maternal health and child care.

Plant Diseases and Pests

The losses due to plant pests and diseases ranges from 5 to 20% in the Philippines. Biological control measures as well as the use of pesticides have significantly reduced infestation of crops.

Agriculture/Health Linkages

The educational programmes on nutrition implemented by the agricultural extension services is linked to education on health, hygiene and sanitation and also integrated into the following programmes and concerns:

- Maternal health and child care;
- Sustainable selective food production and distribution;
- Environmental protection and integrity;
- Land and water resource management and conservation;
- Population education in formal and non-formal education curricula and modules;
- Food selection, preparation and processing with precautions to conserve the nutritive value of foods.

Agricultural Extension Programmes on Agro-Ecosystems and Vector-Borne Diseases

Agricultural extension programmes on agro-ecosystems and vector-borne diseases are collaborating with the Department of Health, Bureau of Irrigation, Bureau of Animal Industry (BAI), and the Bureau of Fisheries and Aquatic Resources (BFAR) on vector-borne diseases; with the Department of Environment and Natural Resources (DENR) and the Bureau of Soils and Water Management (BSWM) on agro-ecosystems.

Agricultural Extension Programme

The goal of the agricultural development plan (under the Department of Agriculture) is to help small farming and fishing communities move from their current subsistence state to a level of profitable enterprises, in order to improve living standards and contribute to national
development and stability. The Department of Agriculture shall provide the policy framework, help direct the public investments, extend the support services for the agriculture and agri-based enterprises profitable, and help spread the benefits of development to the poor, particularly to those in the rural areas.

**Extension Linkages**

Planning, budgeting, implementation, monitoring and evaluation of research within the Department is coordinated by the Bureau of Agricultural Research (BAR) which in turn coordinates with the Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development (PCARRD) and the Philippine Council for Aquatic Marine Resources Research and Development (PCAMARRD) of the Department of Science and Technology (DOST).

**Women Development in Extension Programmes**

About 2,780,034 rural women actively participate in agricultural extension programmes and rural development services. They have organized themselves in groups such as the Rural Improvement Clubs, Balikatan sa Kaunlaran (Cooperation for Progress), Family Life and Role of Filipino Women, and Civic Assembly of Women in the Philippines.

**Environmental Issues Dealt With by Agricultural Extension**

The agricultural extension programme deals with safe pesticide use, forest resources rehabilitation management and conservation, and fisheries resources management and conservation programmes.

**Health Issues Dealt With by Agricultural Extension**

*The following health related issues are dealt with by the agricultural extension programme:*

- distribution of Food Balance Sheets indicating deficits, adequacy, or surplus of energy foods, protein foods, regulatory foods as basis for planning and budgeting of food production programmes supported by agricultural extension service. This approach focus on providing the recommended diet for the population;
- farm and home resources management to attain balanced family sizes and family resources;
- linking population education to food security, nutrition concern, environmental integrity and sustainable agriculture and rural development;
- farm and home safety in the use of pesticides and fertilizer and the banning of the not easily bio-degradable pesticides;
- bio-technology in food production as in bio-intensive gardening, organic farming, biological control of pests and diseases, and composting of farm residues with the use of trichoderma;
- environmental safety through health care, hygiene and sanitation;
- continuing education on vector-borne animal diseases transmissible to humans or vector-borne toxins poisonous to humans;
- pesticides residues on crops affecting human health;
- quarantine and quality control services to safeguard the health of the population; and
- common forms of malnutrition such as protein deficiency, Vitamin A deficiency, anaemia, and iodine deficiency.
Incorporation of Environmental Management for Vector Control in Agricultural Extension

Possibilities for Immediate Action

- Identification of vectors, the prevention and control of causal organisms/pests;
- hygiene and sanitation and observance of approved practices in animal production;
- approved practices in crop and fish production;
- quarantine and quality control on genetic sources for animals, crops and fish juveniles; and
- maintenance of environmental integrity and balanced ecosystems.

Research Needs

- Control of vectors and causal organisms in animal diseases transmissible to humans;
- identification, prevention and control of different varieties of causative agents on aflatoxins on crops;
- immediate on-site detection of levels of pesticide residues in fruits, vegetables and other food crops;
- prevention and control of red tide, and
- development and maintenance of good genetic sources for animals, crops and fish juveniles;

Training Needs

- Identification of vectors, the prevention and control of causal organisms in animal diseases transmissible to humans;
- cost-effective rehabilitation and maintenance of environmental integrity and balanced ecosystems;
- programmes on environmental and ecosystems management for implementation in local pilot areas incorporated in vector control through agricultural extension service;
- secure additional financial support from local and foreign funding sources for incorporation of environmental management for vector control using the agricultural extension organization in a given administrative region; and
- development of a manual for incorporating environmental management for vector control in agricultural extension programmes.

Long Term Possibilities

- Prepare a national programme proposal for local and foreign funding match and implement the programme.
Concluding Remarks

Agricultural extension and education programmes and services can play a vital role in the promotion of environmental management for vector control considering that agricultural extension personnel reaches the majority of population who are farmers, fishermen and agricultural labourers. Agricultural extension agents should know and possess concrete information on disease vectors and their control.

The development of suitable materials for incorporating environmental management for vector control in agricultural extension programmes will enhance the institutionalization of the intersectoral collaboration.
SRI LANKA
(data 1991)

General characteristics:

- Land area: 65 610 km²
- Population: 17 424 000
  - number
  - annual growth rate: 1.2 %
  - population doubling time: 58 years
  - urban population: 22 %
- Main towns - number of inhabitants:
  - Colombo: 683 000
  - Dehiwala: 191 000
  - Jaffna: 143 000

Economic performance:

- Gross National Product: US$ 7 906 million
- Sectoral breakdown:
  - agriculture: 23 %
  - industry: 27 %
  - services: 50 %
- Annual GNP growth: 4.3 %
- GNP per caput: US$ 454.00
- Main exports: Tea, rubber, precious stones, coconut products
- Main imports: Petroleum, machinery, vehicles, sugar

Health:

- Life expectancy at birth:
  - male: 69 years
  - female: 74 years
- Crude birth rate: 20/1000
- Crude death rate: 6/1000
- Infant mortality: 21/1000

Adult literacy rate: 86 %
Introduction

Sri Lanka is a tropical island situated in the Indian Ocean. A mountainous area rises in the south-central region of the country and its highest peak (2484 meters) is surrounded on all sides by coastal plains. This topography and the monsoon winds determine the climate zones, particular in relation to precipitation. About three quarters of the population live in the south-western wet zone which is only about 23% of the total land area whereas in the dry zone, the population density is low (30-50/sq.km).

Human Health

Vector-borne diseases

The most important vector-borne diseases in Sri Lanka are all mosquito-borne: malaria, filariasis, dengue, dengue haemorrhagic fever and Japanese encephalitis.

Malaria

Malaria has been endemic in Sri Lanka from ancient times. At present, transmission takes place in an area covering three-fifths of the country, exposing approximately 4 million people to the risk of getting the infection. In a substantial number of cases the disease-causing agent is *Plasmodium vivax*, thus it the disease is rarely fatal. The physical environmental factors are favourable to the perennial transmission of malaria in Sri Lanka.

Filariasis

Filariasis is mostly found in densely populated urban areas. The “endemic belt” is confined to the south-western coastal part where approximately 25% of the total population lives. However, few foci remain outside this belt. The number of filariasis cases is presently increasing.

Dengue fever and dengue haemorrhagic fever (DHF)

Dengue fever and DHF are mainly found in urban areas. DHF is characterized by high mortality. The number of infected individuals is presently increasing.

Japanese encephalitis

The rice field breeding *Culex tritaeniorhynchus* is the principal vector of this viral disease in Sri Lanka. Since the first isolation of the virus in Sri Lanka in 1968, the disease has been found to be endemic in certain districts of Anuradhapura, Kurunegala, and Puttalam. Outbreaks in these districts are seasonal and closely related to the monsoon rain from November to February. The distribution of cases in the country is widening.

Health Sector

Health Education Programmes

The Health Education Bureau, under the Ministry of Health, is responsible for formulating a national policy and implementing and monitoring the programmes of health education throughout the country. Under the guidance of central bureau, each provincial health programme implements its own provincial health education programme.
The main objective of the Health Education Bureau is to motivate people to improve their health. Medical officers and health education officers (graduate-level) are involved in the programme. Health Education activities are carried out at the community, school and hospital levels.

Agriculture Sector

The agricultural sector is the major contributor to the Gross Domestic Product, contributing 40% of export earnings and 45% of employment.

Rice is the predominant crop grown in Sri Lanka followed by vegetables, other crops and fruits. These crops are mainly grown on a non-subsistence type of farming in the dry zone. The use of fertilizer, high yielding varieties, weed control, and pest control are common.

Tea, rubber and coconut are the three major plantation crops mainly grown in the wet zone. Most of the tea and rubber are exported while the coconuts are consumed locally. Also, a few spice and beverage crops such as black pepper, cinnamon, cloves, cardamoms, coffee and cocoa are grown.

At present, the organization of public sector services to agriculture is characterized by a multiplicity of institutions (some 13 ministries and about 75 departments and para-statals), resulting in fragmentation and/or duplication of responsibilities.

Future arrangements will be aimed at coordinating the planning, implementation and management of settlement, irrigation and agriculture in inter-provincial schemes with the provincial system of administration.

Agricultural Research

The agricultural research in Sri Lanka, excluding research in fisheries and forestry, is divided among 15 different institutions in six ministries. A focal point for agricultural research and development on most crops (other than tea, rubber, coconut and cashew) exists to coordinate these activities.

Agricultural Extension Programme

Under the country's constitution, agricultural extension is a devolved subject and therefore the responsibility of the provinces. The Agricultural Extension Programmes are operated by the Department of Agriculture (DOA), Department of Public Health (DOPH), the Coconut Cultivation Board (CCB), the Tea Smallholders Development Authority (TSDHA), the Rubber Research Institute (RRI), the Forest Department, Mahaweli Authority and private sector organizations. These services, with the exception of DOA's Extension Division (ED), are largely orientated to administration and input supply with incidental advisory activities.

In the DOA, extension is the responsibility of the Technology Transfer Division which is headed by a Deputy Director of Agriculture. The Head Office in Peradeniya has a staff of three.

Role of Women in Agriculture

The Sri Lankan women have their own extension service, the Farm Women's Agricultural Extension Unit (FWAE), which was established in 1970. Its target group is rural women. It had 41 staff members in 1988 but this number has however been reduced to ten due to the decentralization of agriculture extension.
In the plantation estate sector of Sri Lanka, the women carry out specialized tasks such as tea plucking on tea plantations, harvesting, weeding and transplanting on the rice farms and other annual crop cultivation and harvesting in grain legume cultivation. In all the sectors, heavier jobs are done by the men.

Irrigation Development and Types

Parts of the Sri Lankan irrigation systems are very ancient. The construction of reservoirs for irrigation of rice fields were reported B.C. Some of these have been re-constructed during the last few years. Irrigated agriculture in Sri Lanka prior to the 1960s used to be synonymous with irrigated rice culture.

Agriculture/Health Sector

Nutrition

The Department of Agriculture is involved in motivating farmers to produce foods of high nutritional value. Under the normal agriculture extension programme, cultivation of grain legumes such as soya, mungbeans, etc., is promoted. The farm women in the Agricultural Extension Section promote the utilization of nutritional foods such as soya, green gram, leafy vegetables etc.

Agro-eco systems and vector-borne diseases

Vectors of Japanese encephalitis (JE) breed in the irrigated rice fields, and those of malaria in the irrigation canals and drainage ditches. It is estimated that 70% of the breeding of the Japanese encephalitis vector occur in the rice fields. Stagnant water in the irrigation canals during non-flowing periods provide good breeding ground for malaria vectors. Where extensive rice cultivation is associated with pig breeding it may give rise to outbreaks of Japanese encephalitis.

During the last few years newly irrigated areas have been populated by resettlers coming from malaria free areas. This phenomenon has brought about an increase in the outbreaks of malaria.

Extension Linkages

The formal linkage starts at the regional (provincial) level where technical working groups consisting of research and extension staff meet to review their respective programmes and plan future programmes. The two divisions also have strong links at the departmental level. In addition to responding to farmers' problems, the research division provide resource persons for in-service training which may include the preparation of media materials (leaflets etc.). In addition to this, the extension services link with policy makers, health sector and irrigation in a non-formal manner.

Problems and constraints in agriculture extension

The major problem at present is the withdrawal of the village level extension officers which has created vacuum on the field. Thus, the agriculture instructor is expected to do more work in order make up for this deficiency at the community level.
Incorporation of environmental management for vector control in agricultural extension

Possibilities for immediate action.

- The agricultural extension programme should educate farmers to control malaria and Japanese encephalitis vectors by applying recommended technology.

- The agricultural extension service could provide information feedback on the malaria and Japanese encephalitis situation to health officers in charge of control for bringing about more effective control programmes.

- In areas where irrigated rice is grown pig breeding should be discouraged except if Japanese encephalitis immunization campaigns are taking place.

- Agricultural extension workers should promote the introduction and breeding of small fish called “guppy” (Poecelia reticulata) that feed on vector mosquito larvae in streams and rice fields.

Research Needs

- Studies on the problems associated with agricultural production and outbreak of malaria and Japanese encephalitis.

- Studies on methods to reduce or control malaria vector and Japanese encephalitis vector in rice fields.

- Studies on how the agricultural use of pesticides affects the malaria and Japanese encephalitis vectors.

Long Term Possibilities

- Development of public health engineering guides for use in the field and of design guides for proper irrigation structures which will effectively contribute to the control of malaria and Japanese encephalitis vector.

- Education programmes which will change human risk behaviour with a view to reducing the number of vector borne diseases.
THAILAND
(data 1991)

General characteristics:

- Land area: 514 090 km²
- Population:
  - number: 56 814 000
  - annual growth rate: 1.4%
  - population doubling time: 50 years
  - urban population: 18%
- Main towns - number of inhabitants:
  - Bangkok: 5 609 000
  - Makhon Ratchasima: 207 000
  - Sangkhla: 173 000

Economic performance:

- Gross National Product: US$ 71 128 million
- Sectoral breakdown:
  - agriculture: 16%
  - industry: 35%
  - services: 49%
- Annual GNP growth: 5.8%
- GNP per capita: US$ 1 270.00
- Main exports: Foodstuffs, livestock, manufactured goods, machinery
- Main imports: Machinery, vehicles, manufactured goods, chemicals

Health:

- Life expectancy at birth:
  - male: 66 years
  - female: 71 years
- Crude birth rate: 20/1000
- Crude death rate: 6/1000
- Infant mortality: 37/1000

Adult literacy rate: 93%
THAILAND

by

Suthas Nutsathapana and Surarit Sriarunothai

Introduction

Thailand has a tropical climate with two seasons: the rainy season which begins with the onset of the monsoon in May and lasts until October, and the dry season.

Thailand is a constitutional monarchy with a centralized government which controls all important power agencies and directs their policies. The administrative structure is focused around the Prime Minister's office. There are thirteen functional ministries. The country is divided into 73 provinces, 711 districts, 83 subdistricts, 7016 tambons (groups of villages), and 63,689 villages (June, 1991).

It has a predominantly rural population. The urban population makes up less than 20% of the country's population with the majority living in the Bangkok metropolitan area. There is wide variation in the population density across the country. The northern and southern regions are sparsely populated.

Nearly three-fourths of the population work in the agricultural sector. A few minority groups living in the forested, mountain and hilly areas in northern Thailand practise shifting forest cultivation.

The Thai economy has achieved an impressive record of economic expansion since 1986 with a record annual growth rate of up to 10.3%. Population growth has significantly declined from 3.2% in 1970 to 1.4% in 1980.

Human Health

The objectives of the policies and strategies contained in the Sixth National Health Development Plan (1987-1991) are: to achieve an equal distribution of health services, intensified community involvement in primary health care and improvement of quality of medical services at all levels.

Death rate has reduced to a very low level. Mortality due to infectious diseases, infant mortality, especially those related to pregnancy and delivery have all reduced significantly. However, there has been a recent rise in mortality resulting from accidents and chronic noncommunicable diseases. The rapid urbanization of the country has brought about some problems relating to the deteriorating of the natural environment, income distribution, and the quality of life for the disadvantaged groups such as labourers and rural farmers. The consequent social pressures created could lead to an increased incidence of mental health problems, drug abuse, and crime.

Vector-Borne Diseases

Malaria

The National Malaria Control Programme under the Malaria Division was launched in 1951. The long-term malaria control strategy is operated mainly in the forest and hill areas, referred to as "controlled areas" and covering a population of 12.8 million people, while the prevention of the re-establishment of malaria transmission is implemented in the remaining regions or "eradicated areas" which cover 39.9 million people.
The three species of anopheline mosquito responsible for most of the malaria transmission in Thailand, are *Anopheles minimus*, which is the most important vector, *A. dirus* and *A. maculatus*. The latter species is important in southern Thailand. Two additional species, *A. sundaicus* and *A. aconitus*, are classified as vectors in some regions, while *A. culicifacies* and *A. campestris* are considered eradicated vectors.

**The parasites show the following distribution:**

- *Plasmodium falciparum* 56%
- *P. vivax* 43%
- *P. malariae, P. ovale* 1%

The *P. falciparum* strains are highly resistant to chloroquine and demonstrate different levels of resistance to sulfadoxine-pyrimethamine.

**The main malaria control measures include the following**

- Residual insecticide (mainly DDT/Fenitrothion) indoor house spraying. This method has been in use since 1949.
- Case detection and treatment. The operation of malaria clinics, particularly in high incidence areas, functions as a network of peripheral case detection and treatment facilities.
- Health education campaigns for school children, village and subdistrict leaders and for the general public, especially in areas with a high malaria incidence.
- Handing over the responsibility of the prevention and control to the villagers.

**Constraints in the malaria control programme**

Extensive population movement to and from highly malarious areas, leading to difficulty in tracing and treating cases.

- Refusal of insecticide spraying by individual households.
- Suspected outdoor transmission, which makes the indoor spraying approach ineffective.
- Difficulty in finding and spraying field shelters where transmission is particularly active.
- Difficult access to highly malaria endemic areas during the rainy season.
- The malaria situation in the areas along the inter-country borders was affected by the status of malaria eradication/control programmes in these countries. This has delayed the project along Thailand’s frontiers with Myanmar, Laos and Kampuchea.

**Refractory behaviour of malaria vectors in Thailand.**

*Dengue Haemorrhagic Fever*

Dengue Haemorrhagic fever (DHF) first occurred in Thailand about 30 years ago. It is now considered an endemic disease for all areas of the country.
The Control Programme for DHF was established in 1974 under the responsibility of the Division of General Communicable Diseases, Department of Communicable Disease Control. The 1990 objective of the control programme was to keep the case rate below 85 per 100,000 population. Control activities are performed at peripheral levels by provincial health personnel while technical and logistical support are provided by the Division of General Communicable Diseases through 12 Regional General Communicable Diseases Centres.

**Filaria**

Brugian filariasis has been highly prevalent in the southern provinces along the eastern coast of the peninsula, whereas bancroftian filariasis has been found in the province of the western part, particularly along the area close to the Thai-Myanmar border.

A sample survey of mosquitoes in *Wuchereria bancrofti* endemic areas was performed along the Thai-Myanmar border provinces. The same operation was carried out among endemic areas of *Brugia malayi* in the southern part. The results showed that *Aedes niveus*, *A. annandalei* and *A. desmotes* were heavily infected with *W. bancrofti* and *Mansonia bonneae, M. dives, M. uniformis* with *B. malayi*. The highest densities of vectors were found in swamps, forests and bamboo forests.

**Filaria**

**Filaria**

**Control Measures**

**The regular measures for filariasis control are:**

- Case detection by blood surveys and provision of adequate treatment to all infected cases.
- Follow-up of all active cases every three to six months after the initial treatment for a total period of two years.
- Evaluation of the outcome of control by blood examination in the areas every two years for a total period of ten years.

The filariasis control programme proposed by the Filaria Division includes the following objectives:

1. to reduce human filariasis to a level where it is no longer a public health problem or preferably to eradicate the disease.
2. to prevent reoccurrence of filariasis in the controlled areas.

**Health Sector**

The Ministry of Public Health has the responsibility for the organization, management, and administration of public health services and the majority of the medical services of the government, especially in the rural areas. The Ministry is organized into six major components as follows:

The Office of the Permanent Secretary of Public Health which has 10 divisions (Health Planning, Health Statistics, Rural Health, Provincial Hospital, Primary Health Care, Personnel, Health Education, Health Training, International Health, Epidemiology), Nursing College, Central Administration and Finance, Legal Affairs, Maintenance and Repair, Medical Registration, Construction and Design.

There are four Deputy Permanent Secretaries who assist the permanent Secretary in all these functions and coordinate the work of the five Departments. The office supervises and controls the Provincial Health Administration which is headed by the 72 Provincial Chief Medical Officers (PCMO), who are in charge of the medical and health services in the provinces.
Nearly all of the 6754 Tambons have at least one health centre. Each health centre is usually staffed by a midwife and a junior sanitarian (a technical nurse is being added to many health centres). Major preventive and promotive health services are integrated into the tasks of these two health workers. The midwife and sanitarian are responsible for prenatal, delivery and postnatal services, immunization, nutrition, family planning, water supply, and sanitation activities. Health Centres also provide limited treatment for emergency or minor illness beyond which they provide a referral service to district or provincial hospitals. The health centre also serves as a referral unit at the primary level of the health care delivery system.

Non-Governmental Organizations

Numerous private non-governmental organizations (NGOs) render health services to the public. Some of these organizations have their own specific scope of work, while others have activities meeting the demands of the public. The NGOs are requested to register with the Office of the National Cultural Committee in the Ministry of Education.

The Nutrition Programme in the 6th National Economic and Social Development Plan (1987-1991) was approved by the National Food and Nutrition Committee in 1986. Its objectives are to achieve the production and distribution of sufficient amounts of food and nutrition for all.

The Nutrition Programme is under the responsibility of Nutrition Division of the Department of Health. It includes education on the prevention of protein and energy malnutrition of the under-five year old, of iron deficiency anaemia of preschool and school children and pregnant women, iodine deficiency disorders of school children, and the nutrition of adults and school children in urban areas.

Agriculture Sector

The most important crops in Thailand are rice, wet and dry season maize, sorghum, sugar cane, cassava, groundnut, mungbean, soybean, sesame, oil palm, kenaf, kapok, coconut, rubber production, and coffee.

Role of Women in Agriculture

The agricultural sector accounts for the greatest number of women workers in the Thai economy. Approximately 53% of the women labour force works in the agricultural sector. Over the last 30 years, food production has increased every year for domestic consumption and also for increased export. Farm women have never been recognized for their roles in agricultural development and therefore, they are often excluded from technology inputs, and only participating in traditional activities. Farm women should be able to contribute to both the society and their families through agriculture based activities. The training given by the agricultural extension workers should emphasize improvement in agricultural products or introduction of different types of activities.

Pesticide Use

Pesticides are widely used in agriculture and farmers are frequently exposed to varying amounts of pesticides. This results in cases of acute and chronic intoxication.

Agricultural Extension and Education

The Department of Agricultural Extension (DOAE) is responsible for Agricultural Extension Tasks under the Ministry of Agriculture and Cooperatives.
Presently, DOAE is implementing various programmes under the 6th Plan of Agricultural Extension Development in the context of the 6th National Socio-economic Development Plan. The DOAE's plan emphasizes the adjustment of the agricultural production structure and production to optimize the economical outcome of the sector. DOAE's main programmes are on:

- Improvement of agricultural production structures.
- Development of agricultural extension in dis-advantaged areas.
- Development of agricultural extension systems.
- Development of farmer institutions.
- Development of agricultural technology transfer.
- Improvement of extension personnel.

Some of these had to finish due to the termination of DOAE's sixth plan (1987-1991).

Extension Linkages

By the DOAE's Agricultural Extension plan (1987-1991), there are links from the ministry level down to field level (province, District, subdistrict and village). At the ministerial level, Ministry of Agriculture and Cooperatives, Ministry of Interior Affairs, Ministry of Public Health and Ministry of Education are collaborating on rural development. At the grass root level, DOAE has subdistrict agricultural officers, as the MOAC representatives join other sections.

Training Needs

Training programmes are needed for the three major categories of staff: the unskilled/semi-skilled workers, the semi-professional workers, and the professional workers. The semi-professional staff, especially those involved in activities connected with pre-operational and post-operational evaluation, need appropriate field and laboratory training. Professional personnel who may be involved in environmental management for vector control include biologists, chemists, ecologists, economists, engineers, entomologists, epidemiologists, health educators, parasitologists, planners and managers, public health administrators, sociologists, and statisticians.

Long-Term Possibilities

For longer-term possibilities of environmental management for vector control, the following recommendations are proposed:

- Establishment of a coordinating body with representatives from governmental agencies involved in health, agriculture, and education. This body would be responsible for reviewing proposals, plans and for advising on action to be taken in the prevention and control of vector-borne diseases.

- Strengthening of collaboration between interested parties at the operational level with respect to joint programming, budgeting and implementation of environmental management measures for the control of vector-borne diseases.

(This article was written before the 1994-95 outbreak in Surat.)
ANNEX 1

List of Workshop Participants

Country participants

People’s Republic of China

Dr Xu Bozhao
Director, Institute of Parasitic Diseases, Hubei Academy of Medical Sciences, Beijing

Mr Jun Wu
National Agro-technology Extension Centre, Ministry of Agriculture, Beijing

India

Mr C. Krishna Rao
Assistant Director, Directorate of the National Malaria Eradication Programme (NMEP), New Delhi

Mr K. Rajan
Joint Secretary, Ministry of Agriculture, New Delhi

Indonesia

Dr Soesilo Soerjosembodo
Director, Vector-borne Disease Control, Ministry of Health, Jakarta

Mrs Soelbijati Soebroto
Director for Food Crop Extension, Directorate General of Food Crops, Ministry of Agriculture, Jakarta

Malaysia

Dr Tham Ah Seng
Entomologist, Vector-borne Disease Control Programme, Ministry of Health, Kuala Lumpur

Ms Azizah bte Ns. Jan
Agricultural Officer, Extension branch, Department of Agriculture, Kuala Lumpur

Nepal

Mr Muri Lal das
Entomologist, Regional Health Directorate, Malaria Section, Hetauda

Mr Shyam Kazi Shakya
Chief, Agricultural Extension Coordination Division, Department of Agriculture, Kathmandu

Philippines

Dr C.Y. Asinas
Director, Malaria Control Service, Department of Health, Manila
Mr. S.C. Serrano  
*Director, Agricultural Training Institute, Department of Agriculture, Quezon City*

**Sri Lanka**

Dr. W.P. Fernando  
*Deputy Director, Anti-malaria Campaign, Colombo*

Mr. S. Wirasinghe  
*Deputy Director of Agriculture, Technology Transfer Division, Department of Agriculture, Peradenya*

**Thailand**

Mr. Suthas Nutsathapan  
*Chief, Entomology Branch, Malaria Division, Ministry of Health, Bangkok*

Mr. Surarit Sri-arunothai  
*Director, Plant Protection Service Division, Department of Agricultural Extension, Ministry of Agriculture and Cooperatives, Bangkok*

**Resource persons/Temporary Advisers**

Dr. R. André  
*Vector Biology and Control Project (USAID), Washington D.C., USA*

Dr. A. Erle  
*AAAS Fellow, United States Agency for International Development, Washington D.C., USA*

Dr. N.G. Gratz  
*Consultant in Vector Biology and Control, Commugny, Switzerland*

Professor C. Hoelscher  
*Extension entomologist, Texas A & M University, College Station, Texas, USA*

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

**Secretariat**

Mr. R. Bos  
*Executive Secretary, joint WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental Management for Vector Control (PEEM), Division of Environmental Health, World Health Organization, Geneva, Switzerland*

Dr. A.M. El Zoobi  
*Senior Officer, Agricultural Education and Extension Service Food and Agriculture Organization of the United Nations, Rome, Italy*

Mr. A. Kandiah  
*Technical Officer, Water Resources, Development and Management Service, Food and Agriculture Organization of the United Nations, Rome, Italy*

Mr. P.K. Saha  
*Technical Assistant, Crops Section, FAO Regional Office for Asia and the Pacific, Bangkok, Thailand*
Dr M. Simpson-Hebert
Scientist, Division of Environmental Health, World Health Organization, Geneva, Switzerland

Mr Punjab Singh
Consultant, Crop Sector, FAO Regional Office for Asia and the Pacific, Bangkok, Thailand

Mr H. Verhoef
Associate Professional Officer, Division of Environmental Health, World Health Organization, Geneva, Switzerland

Dr B.G. Waiyaki
Programme Officer, Environmental Management Service, United Nations Environmental Programme, Nairobi, Kenya

Representative of other organizations

Mr Geny Enriquez
Consultant (agriculture), Nichimen Corporation, Manila, Philippines

Mr P. Furu
Parasitologist, Danish Bilharziasis Laboratory, Copenhagen, Denmark

Dr Kiyoshi Koga
Associate Professor, Agricultural Land and Water Management, Asian Institute of Technology, Bangkok, Thailand

National observers

Mr Suphaphol Balankura
Soil Scientist, department of Land Development, Ministry of Agriculture and Cooperatives, Bangkok, Thailand

Mr Pana Chandrasiri
Agrochemical Division, Nichimen Corporation, Bangkok, Thailand

Mr Charoen Charoenchamratcheep
Agronomist, Department of Land Development, Ministry of Agriculture and Cooperatives, Bangkok, Thailand

Mr Kangsadarn Devahastin
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Mrs Spiradee Im-Emb
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Mr Auychai Puckpibul
Disease Control Officer, Malaria Division, Ministry of Public Health, Bangkok, Thailand

Mr Rangsarit Sampaopol
Agriculturalist, Department of Land Development, Ministry of Agriculture and Cooperatives, Bangkok, Thailand

Mrs Sawanee Sukhotu
Rural Development Technical Officer, Office of the Accelerated Rural Development, Bangkok, Thailand

Ms Pranee Supanpong
Rural Development Technical Officer, Office of the Accelerated Rural Development, Bangkok, Thailand

Mrs Nitayaporn Tonmanee
Soil Chemist, Department of Land Development, Ministry of Agriculture and Cooperatives, Bangkok, Thailand
ANNEX 2

Agenda and Programme of Work

Adopted agenda

1. Formal opening of the workshop.
2. Selection of chairman and rapporteurs.
3. Statement of the objectives and expected outputs of the workshop.
4. Introducing vector-borne diseases, disease vector control and the links between agricultural development and vector-borne disease transmission.
5. Introducing agricultural extension, its history, basic concepts, forms of implementation in the regions, constraints.
6. Methodological, technical and organizational aspects of incorporating environmental management promotion into agricultural extension programmes in the region.
7. Options for research and demonstration projects.
8. Formulation and adoption of conclusions and recommendations.
9. Closure of the workshop.

Approved programme of work

Monday, 28 October 1991

08.00-08.30 Agenda item 1
Formal opening of the workshop
Inaugural session
Opening statement by the PEEM Executive Secretary
Opening statement by the Head of the UNEP Regional Office for Asia and the Pacific
Opening address by the FAO Regional Director for Asia and the Pacific

08.30-09.00 Coffee/tea break

09.00-12.00 Introduction of participants

Agenda item 2
Selection of chairman and rapporteurs

Agenda item 3
Statement on the objectives and expected outputs of the workshop by the secretariat

Agenda item 4
Introducing vector-borne diseases, disease vector control and the links between agricultural development and vector-borne disease transmission

Presentation of working papers:

Human health in the context of sustainable development: linkages between agricultural development and vector-borne disease transmission
- Mr R. Bos (WHO/Geneva)
Rice ecosystems and disease vectors
- Mr. H. Verhoef (WHO/Geneva)

Videos:
Our Common Future, by the World Commission on Environment and Development, and Environment and Health, a critical connection, by the USAID Vector Biology and Control Project

12.00-13.00 Lunch

13.00-16.00 Debate

Workshop participants organized themselves into two groups and prepared a debate on a thesis formulated and presented by the secretariat. The afternoon session closed with the debate in various sessions where each group defended their assigned viewpoint.

Tuesday, 29 October 1991

Agenda item 5
Introducing agricultural extension, its history, basic concepts, forms of implementation in the region, constraints.

Presentation of working papers:

Introduction of agricultural extension: a brief history and basic concepts
- Professor C. Hoelscher (Texas A&M)

FAO’s strategy for promoting agricultural extension in the 1990s
- Dr. A.M. El-Zoobi (FAO/Rome)

Working group discussions on the constraints that may be encountered in promoting environmental management through agricultural extension

10.15-10.30 Coffee/tea break from

12.00-13.00 Lunch

13.00-14.30 Presentation outcome working group discussions

14.30-14.45 Coffee/tea break

14.45-16.00 Agenda item 6
Technical, methodological and organizational aspects of incorporating environmental management promotion into agricultural extension programmes in the region.

Presentation of working papers:

Community participation in disease vector control in India
Dr. V.P. Sharma (MRC, India)

The potential for increased collaboration between health education, agricultural extension and general education systems at the community and district level
- Dr. M. Simpson-Hébert (WHO/Geneva)
Integration of pest management and vector control at the community level  
- Dr N.G. Gratz (Geneva)

**Wednesday, 30 October 1991**

08.00-12.00 **Agenda item 6 - cont’d**

*Following the presentations of the first two days, the workshop participants organized themselves into three groups and addressed technical, methodological and organizational issues in further detail and formulated conclusions and recommendations.*

Coffee/tea breaks from 10.15 to 10.30.

12.00-13.00 Lunch

13.00-14.30 **Agenda item 6 - cont’d**

Working group sessions - *cont’d.*

14.30-14.45 **Agenda item 6 - cont’d**

Presentation of working group findings.

**Thursday, 31 October 1991**

08.00-10.15 **Agenda item 7**

*Options for research and demonstration projects*

Working group discussions

10.15-10.30 Coffee/tea break

10.30-12.00 **Agenda item 7**

Options for research and demonstration projects - *cont’d.*

Presentation of project ideas

12.00-13.00 Lunch

13.00-16.00 **Agenda item 8**

*Formulation and adoption of conclusions and recommendations.*

Discussion and approval of final conclusions and recommendations for the workshop report

**Agenda item 10**

*Closure of the workshop*
ANNEX 3

Workshop evaluation

On the last day of the workshop, the participants were asked to fill in a questionnaire designed to evaluate the various programme components of the workshop and to submit specific comments relating to the acceptability and effectiveness of the workshop. The results are summarized below:

<table>
<thead>
<tr>
<th>Programme score</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERY HELPFUL</td>
</tr>
</tbody>
</table>

Day 1

- Formal opening: 11
- Orientation to topic: 13
  - lectures: 5
  - videos: 5
- Presentations of country reports on vector-borne disease situation: 11
- Debate: 14

Day 2

- Presentations agricultural extension by resource persons: 14
- Country presentations on agricultural extension: 8
- Presentations on technical, methodological and organizational aspects: 13
- Group work on reviewing constraints: 14

Day 3

- Working groups on solutions: 14
- Working group presentations: 10

Day 4

- Working groups on demonstration projects: 11
- Presentation country proposals: 10
Questions

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th>DON'T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think there is a potential for incorporating environmental management for vector control into agricultural extension programmes in your country?</td>
<td>16</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Do you think that following this workshop you and your counterpart will initiate research and/or demonstration projects in your country?</td>
<td>15</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Specific remarks

Participants could give additional remarks with respect to each day as well as to the overall workshop and these are summarized below.

A general comment received from almost all participants was that four days for this workshop was too short. Some wanted more time for presentations, others for group discussions and on the whole the programme was considered rather crowded.

With respect to day 1 several participants expressed themselves favourable about the debate in the afternoon:

- it set the stage for further discussions because it convincingly brought out the feasibility of the concept under discussion;
- it led to a lively discussion and the resulting exchange of arguments was stimulating, informative and critical;
- it served to break the ice and start communications;
- it convinced the participants of the possibilities and need to collaborate;
- the preparatory groups for the debate immediately created a good atmosphere for information exchange.

One participant felt, however, that the debate should have taken place after the country presentations. Other critical comments included:

- the time for presentations was too short (mentioned twice),
- there should be more videos to illustrate the subject and the method of introducing the participants should be changed.

With respect to day 2 it was felt by some participants that there should have been a clearer indication of the objectives of the presentations on technical, methodological and institutional issues and that these presentations could have been focused better. One participant stated that country report presentations on agricultural extension were too detailed, but another found that the time for them had been too short. It was suggested that in the next workshop participants should be asked to prepare summaries in advance, which can then be circulated for all to read. The presentations by the resource persons were considered to be informative and their guidance in the group discussions to be constructive.

Day 3 was considered to be very participatory, but the plenary discussions following the group presentations were considered inadequate. As one participant stated: too much time was spent
on identifying constraints and too little on finding solutions. The working group sessions were considered useful and well organized and the resource persons very supportive. It was also mentioned by one participant that the working group presentations really clarified the distinction between the three areas of constraints.

Participants were asked to give their ideas for improvements to be introduced into the next workshop. These are summarized below:

1. In view of the policy and organizational needs to promote environmental management through agricultural extension, it is suggested:
   - to send a questionnaire to the participating countries to find out about the interest in starting a collaborative programme
   - if a positive response is received: ask the country participants to start preparing a proposal
   - if a negative response is received: ask the country participants to prepare a report on the constraints
   - the questionnaire should be given wide distribution.

2. The next workshop should be expanded by 2-3 days to allow for field visits to relevant sites. The discussion of real-life case studies would also be productive and participants should be asked to present such case studies. There should be more time for country reports and presentations by resource persons.

3. The constraints should be identified in a separate group discussion, rather than the secretariat listing them on the basis of the debate.

4. There should be introductory presentations on PEEM and its activities, on environmental management, and there should be more in-depth presentations on vector biology and ecology.

5. The proceedings of previous workshops should be made available to the participants prior to their workshop and the participants should receive an individual briefing on the expected outcome. Project proposals should be better focused on the subject.

6. PEEM should maintain contacts with the participants of all workshops.