

Companion Modelling for Resilient Water Management:

Objectives :

- To offer tools and a methodology to promote the expression of different stakeholders' perceptions, to facilitate a collective assessment of the problems at stake, and to improve coordination among users through the collective identification and assessment of scenarios of change leading to agreed-upon action plans.
- To train a group of scientists and development officers engaged in action-research to use this methodology and its tools. Participants belong to universities, government agencies, and non-governmental organizations. They will test and adapt the methodologies and tools at key sites. A network of local users will be created and linked to an international one.

- To analyze concrete water and land management issues at the catchment level, and stakeholders' interactions that are specific to the respective water-related problems identified in each context. These participatory analyses will lead to a collective assessment of potential changes to increase water productivity and suitable and feasible scenarios of (technological and organizational) adaptation to these changes and to reach the desired situation.

Companion Modelling for Resilient Water Management:

Assessing stakeholders' perceptions of water dynamics and collective learning at the catchment scale.

Establishing communication platforms is a means for ensuring that marginalized groups are not left out in the decision making process. Agent-based modelling (ABM) provides a means for linking the biophysical and socioeconomic characteristics of a catchment system. By using ABM in a participatory manner to examine scenarios of resource sharing, it may be possible to elicit stakeholders' knowledge and perceptions of water dynamics, stimulate dialogue, and promote better coordination among users. The target catchments and watershed of this Challenge Program project are located, in northern Thailand, northeast Thailand, and the Mekong Delta in Vietnam, at different elevations in the Mekong River Basin. An additional site located in Bhutan provides another complementary situation at higher altitude. In these watersheds, diverse stakeholders with differing perceptions of water dynamics and its use adopt coping strategies to handle water-related problems. Project specific objectives are threefold. They deal with methodological development, capacity building, and the participatory construction of propositions for local adaptations to increase water productivity:



Photo Credit: Challenge Program on Water and Food

Participatory Irrigation Management and Development (PIMD) in Cambodia

The Cambodian Government is working towards the transfer of operation and maintenance of small scale irrigation systems to communities, through the development of functional water user committees. A collaborative initiative with Cambodia's Ministry of Water Resources and Meteorology (MOWRAM) has seen IWMI involved in policy development, research, information sharing and capacity building since 2002. The project focuses on assisting the Cambodian Government to adopt Participatory Irrigation Management and Development (PIMD) in irrigated agriculture. PIMD effectively allows farmers to take over the management of their irrigation systems, in order to increase productivity and improve incomes and living conditions. The majority of irrigation systems in Cambodia suffer from poor design, have had limited maintenance and upgrading, and are badly managed. Consequently they suffer from inefficiencies and low productivity. IWMI has been working on aspects of participatory irrigation management in Cambodia in assisting in the formulation of policy and preparation of a framework for PIMD adoption and providing practical support to implementation of PIMD. The present activities of the project are mainly concentrated to providing practical support and capacity building in the implementation of PIMD in 11 pilot irrigation systems where water user committees are being established and are at various levels of functionality.

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IWMI Research in Southeast Asia

- Integrated Water Resources Management
- Improving Water Productivity and Water Quality
- Rehabilitation of Degraded Lands
- Livelihood Strategies and " Best Practices"
- Health and Environmental impacts of Cadmium Contamination in Crops



IWMI's Mission

Improving the management of land and water, for food, livelihoods and nature.

About IWMI

IWMI is an international non-profit scientific organization supported by the Consultative Group on International Agricultural Research (CGIAR). IWMI's international headquarters are in Sri Lanka and the institute has regional offices in Africa and Asia.

Research Themes

1. Basin Water Management
2. Land, Water and Livelihoods
3. Agriculture, Water and Cities
4. Water Management and Environment

IWMI's Asia office is located in Colombo, Sri Lanka. This office oversees activities carried out in South Asia, Central Asia and Southeast Asia. Specific activities in Southeast Asia are coordinated from the WorldFish Centre, Penang, Malaysia, where IWMI-SEA has its regional office and from national offices in Vientiane Laos, Hanoi Vietnam and Phnom Penh Cambodia.

Overview of Research in Southeast Asia.

Research at IWMI-SEA has an overall focus on poverty alleviation and food security through the sustainable management of land and water resources. Inappropriate management of these resources in the context of a tropical environment has led to widespread degradation of land resources. This degradation includes nutrient depletion, salinization and excessive sediment discharge associated with erosion in upper catchments. Issues of water quality associated with the indiscriminate discharge of waste water and the impact of inappropriate land management practices in highly incised catchments have a negative impact on downstream users and communities dependent on these resources for their livelihoods. As the economies of the Greater Mekong Sub-region grow there will be demands by the public for better stewardship and equity in managing these resources. Against a backdrop of limited agricultural expansion and competition for water by the industrial and urban sectors, there is an urgent need to enhance the productivity of both 'green' and 'blue' water as well as land resources. IWMI's research portfolio in the region includes the development and adoption of appropriate management practices that enhance water quality in upper catchments of Lao PDR, Vietnam and Thailand; the establishment of functional water users associations to manage rehabilitated irrigation schemes in Cambodia and the rehabilitation of degraded rainfed production systems in Northeast Thailand. IWMI has studied heavy metal contamination of rice crops and provided guidelines and recommendations for policy makers; has helped resolve conflicts between rice growers and fishers through appropriate water allocation in the Mekong delta; and carried out research on the multiple use of water at farm levels in Northeast Thailand. IWMI-SEA research is supported by staff seconded from the French research organization Institut de recherche pour le développement (IRD).

Increasing soil and water productivity in rainfed production systems of Southeast Asia.

Declining soil fertility is a major problem encountered throughout tropical Asia. This problem is especially acute in upland areas on soils that are naturally light and sandy in texture. Intense cultivation in such areas degrades the nutrient-holding and water-retention capacity of soil, leading to poor crop production. In Northeast Thailand, farmers traditionally use cattle manure and composts derived from household waste and leaves to rejuvenate soil. However, this practice has limited success and the effect is short lived. Collaborative research with Khon Kaen University and the Land Development Department of the Royal Thai Government have investigated alternative approaches to the rejuvenation of these degraded production systems that include the application of clays and co-composted waste bentonites from the processing of vegetable oils, commonly produced in the region. Dramatic increases in the productivity of these systems have been achieved through a combination of enhanced nutrient supplying capacity and increased soil water holding capacity. The adoption of these approaches is currently being promoted through farmer networks in the region.



Intense cultivation of land in Southeast Asia often degrades the nutrient holding and water retention capacity of soil, leading to poor crop production. IWMI and partners in Thailand have investigated alternative approaches to soil rejuvenation, resulting in increased crop productivity.

Local Partners

Bac Lieu People's Committee (BLPC), Vietnam

Can Tho University (CTU), Vietnam

University of Agriculture and Forestry (UAF), Vietnam

Sub-Institute for Water Resources Planning (SIWRP), Vietnam

Research Institute for Aquaculture No. 2 (RIA2), Vietnam
Integrated Resource Mapping Center (IRMC), Vietnam

Bangladesh Rice Research Institute (BRRI), Bangladesh

Bangladesh Fisheries Research Institute (BFRI), Bangladesh

Bangladesh Water Development Board (BWDB), Bangladesh

Local Government Engineering Department, Bangladesh

Education & Economic Development, Bangladesh

SocioConsult Ltd., Bangladesh

Ministry of Agriculture of Bhutan

Land Development Department, Thailand

Department of Agriculture, Thailand

Department of Agriculture and Extension, Thailand

National Parks, Wildlife and Plant Conservation Department, Thailand

Khon Kaen University, Thailand

Ubon Ratchathani University, Thailand

Chiang Mai University, Thailand

Mahidol University, Thailand

Chulalongkorn University, Thailand

Ministry of Water Resources and Meteorology (MOWRAM), Cambodia

National Forestry and Agricultural Research Institute (NAFRI), Laos

National Institute for Soils and Fertilizers (NISF), Vietnam

International Partners

International Rice Research Institute (IRRI)

World Fish Center (WFC)

The World Conservation Union (IUCN)

CIRAD

United States Department of Agriculture (USDA)

Institut de recherché pour le développement (IRD)

Understanding Farmers' Strategies and Land Use Change in the Northern Uplands of Vietnam

Over the past two decades Vietnam underwent significant changes through land reforms that had significant impacts on land use systems throughout the country. Farmers shifted from collective agricultural systems managed by cooperatives, to household farm systems governed by individual decision-making. Land tenure changes and economic liberalization has led to significant increases in agricultural productivity and poverty reduction. In the uplands however, economic development has been slow and communities still face periodic food shortages. Hence rural development in the uplands is a critical issue for policy-makers, donors and non-governmental organizations (NGOs). Government concern has been embodied in a series of policies specifically directed towards mountainous regions including settlement programs, reforestation projects and forest land allocation to individual households. One of the approaches that the government is taking is to improve or substitute supposedly backward traditional land-use systems of ethnic minorities living in the uplands. In addition the Government is promoting the protection of existing forests and "re-greening" barren hills in order to promote watershed and land protection. A PhD study is currently being undertaken to assess to what extent national policies have actually impacted land use and livelihoods and to examine the gap between policy-makers intentions and land use change in the northern uplands of Vietnam. The study is being carried out in a catchment 60 km north of Hanoi and is yielding interesting perspectives on the decision making processes of individuals.



Rural development in upland areas is a critical issue for policy makers, donors and NGOs as many communities living in upper catchments face periodic food shortages. IWMI and partners in Vietnam are studying the extent to which national policies have impacted land use and livelihoods in the northern uplands of the country.

Management of Soil Erosion Consortium (MSEC).

Soil erosion and the inappropriate management of agricultural land resources in degraded catchments in Southeast Asia have ramifications for both up and down stream communities. The catchments of the region are often inhabited by marginalized ethnic minority communities that have limited capacity to address issues of resource degradation. The Management of Soil Erosion Consortium or MSEC is one of the four consortia established through the soil, water, and nutrient management (SWNM) program of the Consultative Group on International Agricultural Research (CGIAR). It uses an integrated, interdisciplinary, participatory, and community-based approach to research that engages the land users and other stakeholders on a catchment scale. The project focuses on the on-and off-site impacts of soil erosion, emphasizes community involvement, and provides scientific data for rational decision making. The project was initiated in late 1998 in six countries in Asia, namely, Indonesia, Laos, Nepal, Philippines, Thailand, and Vietnam with the objective of:

- evaluating the effects of different land management practices on water and nutrient flows in selected representative catchments;
- capacity building of participating national agricultural research and extension services on integrated catchment management and soil erosion;
- the dissemination of research results for enhanced adoption of land management technologies.

Intensive monitoring of gauged catchments is currently being carried out in Laos, Thailand, Vietnam, Indonesia and the Philippines with IWMI's partners that include, the National Agricultural and Forestry Research Institute (NAFRI) in Laos, National Institute for Soils and Fertilizers (NISF) Vietnam, as well as the National Parks and Wildlife and Plant Conservation Department Thailand.

Managing Water and Land Resources for Sustainable Livelihoods at the Interface between Fresh and Saline Water Environments in Vietnam and Bangladesh

Project Objectives:

- To enhance our understanding of livelihood changes resulting from regional resource management and farm-level technological interventions.
- To assess the impacts of agricultural and aquacultural land and water uses on water quality, aquatic biodiversity, and inland fisheries.
- To develop ecologically friendly and socially acceptable techniques for rice and rice-aquaculture production systems.
- To develop decision-support tools and an institutional framework for integrated multipurpose management of a dual fresh- and brackish-water regimes to meet the needs of diverse water users, without an adverse impact on users and the environment.
- To enhance human resource capacity and develop recommendations for resource management at farm and regional levels.

The project is led by the International Rice Research Institute (IRRI) and has numerous national and international partners who are involved in its implementation.

Peer Review of River Basin Organizations in the NARBO

In 2004, the Asian Development Bank (ADB) and the International Water Management Institute (IWMI), in collaboration with Network of Asian River Basin Organizations (NARBO) member organizations, spearheaded the development of the NARBO performance benchmarking service for river basin organizations (RBOs) with peer review process, through a series of benchmarking activities. The performance benchmarking service for RBOs is a management tool (i) to track an organization's progress; (ii) to enable comparisons with the performance of other organizations; and (iii) to improve the efficiency and effectiveness of service delivery and achieve the highest level of performance.

The peer review process is a mechanism for improving performance, providing a venue for policy dialogue, building capacity, exchanging experiences, good practices and information amongst similar organizations, creating synergy within the sector and strengthening the cooperation among NARBO members.

Under this project, IWMI will: (1) assist the RBOs in carrying out self-assessment, and (2) design and implement a training course on Peer Review for RBOs. IWMI will design and conduct the training course covering the core functions of RBOs and the mechanics and procedures for the peer review process, including self-evaluation. IWMI will certify completion of peer reviewers training and provide technical assistance to all certified peer reviewers throughout the review period.

Managing Water and Land Resources for Sustainable Livelihoods at the Interface between Fresh and Saline Water Environments in Vietnam and Bangladesh

Millions of people living in the tidal ecosystem in South and Southeast Asia are among the poorest and most food-insecure because agricultural production is hindered by seawater intrusion during the dry season. Conventional management interventions fail to recognize the diversity of rural livelihoods in the coastal zones, and the environmental consequences for water quality and aquatic biodiversity. By taking into account diverse stakeholder interests and complex multi-scale upstream-downstream interactions, this project, funded through the Challenge Program, will carry out an INRM research for development program to increase land and water productivity for improved food security and livelihoods, in a manner that is environmentally sustainable and socially acceptable to various resource users at two coastal sites in the Mekong River Delta (Vietnam) and the Gangetic Delta (Bangladesh).

Cadmium contamination of rice-based systems in Southeast Asia

Rice is the staple diet of millions of people throughout South and Southeast Asia. However, limited research has been conducted outside of Japan and China to quantify the extent and magnitude of rice food chain cadmium (Cd) contamination and determine its negative impacts on public health, food security and livelihoods. IWMI collaborative research has identified significantly elevated levels of cadmium in soils and crops in an isolated 2000 hectare intensive rice production systems in Northwestern Thailand that are a potential health threat. Researchers have developed a simple but effective risk-assessment model (called Irr-Cad) that predicts cadmium distribution within a cascading irrigation system. Using the Irr-Cad model, IWMI and its Thai partners identified and zoned high-risk fields within the affected communities. The study outcomes have underpinned the Thai government's response to the crisis and led to the development of comprehensive action plans. For the long term, adjusting cropping patterns and growing non-food crops are among the practices being promoted in the affected areas. These measures are aimed at eliminating the potential long-term health risks associated with cadmium contamination. Ongoing research associated with plant species that assimilate high levels of cadmium is currently being undertaken. IWMI's partners in this research include Mahidol University, Georgia State University and the United States Department of Agriculture (USDA).



A study area in Thailand where IWMI conducted research on cadmium contamination in crops IWMI together with Thai partners identified and zoned high risk fields where elevated levels of cadmium were present in rice crops, posing a threat to health and livelihoods. Rice is a staple food for millions of people in Southeast Asia. Changes in cropping patterns and the cultivation of cash crops were recommended as long term measures to mitigate the associated health risks.