

The success of the ICRISAT model has propelled widespread up-scaling. Simultaneously with the benchmark watersheds set up in India in 1999, ICRISAT extended the demonstration of the model in Thailand, Vietnam, China and most recently in the Philippines.

## Impacts

The Indian Federal National Farmers Commission has made several recommendations to the Government based on ICRISAT's consortium watershed model. The model has also helped the convergence of related government agricultural programs around watersheds, the promotion of rainwater harvesting, the restoration of artificial water bodies, and widespread soil testing for micronutrients. Likewise, the state governments of Karnataka, Tamil Nadu, Rajasthan, and Andhra Pradesh have sought ICRISAT's assistance in establishing model watershed consortia and identifying policy measures for improved groundwater usage for enhancing rainfed agriculture. Also, the Government of India has funded ICRISAT to establish nine model watersheds in nine selected states.

In Thailand, the model has fostered better working relations with research and development

institutions and has contributed to a strong policy statement planning to ensure that every farm household in northeastern Thailand has access to a farm pond. Similarly, changes in the mindset of the policy makers in Vietnam, China, and India has shown its impact through a number of new R&D projects being scaled out in many rainfed areas.

At the global level, the active involvement of ICRISAT and its partners in the 'Comprehensive Assessment of Water Management in Agriculture' has been central in a new emphasis on the efficient use of water in rainfed agriculture. With such improved watershed management and policy implementation, the lives of at least 450,000 people in Asia have changed for the better.

## Conclusion

The future of the SAT is bright for further poverty alleviation through sustainable development and management of natural resources at landscape level. This applies not only to Asia but also to countries in sub-Saharan Africa. The seeds of success have been sown and germinated, and have given new hope to the poor of the semi-arid tropics who depend on rainfed agriculture.

# Community Watersheds

## Greening Landscapes and Improving Livelihoods



## About ICRISAT



Science with a human face

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that does innovative agricultural research and capacity building for sustainable development with a wide array of partners across the globe. ICRISAT's mission is to help empower 644 million poor people to overcome hunger, poverty and a degraded environment in the dry tropics through better agriculture. ICRISAT belongs to the Alliance of Centers of the Consultative Group on International Agricultural Research (CGIAR).

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INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS  
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## Introduction

Agriculture in the semi-arid tropics (SAT) is a major challenge as yields remain low, natural resources are degraded, floods and droughts afflict agriculture and the investment and policy climates are often not conducive to the small-scale farmers who live in these regions.

In response to the challenge, and drawing upon 25 years of preceding research, ICRISAT leads a watershed management consortia using the Integrated Genetic Natural Resources Management (IGNRM) approach to research, where multi-disciplinary activities are implemented at a landscape level. The consortia partnerships bring together institutions from research, NGO, government, and farmers groups to share their knowledge in an equitable and efficient manner.

## How it works

The consortia model has ensured improved productivity with the adoption of cost-efficient water harvesting structures as an entry point for improving livelihoods. Crop intensification and diversification with high-value crops then follows. Through enhanced participation, even the most vulnerable groups (women, landless poor) have been empowered, trained and developed. Self-help groups (SHGs) and environmental clubs are now common in Indian and Chinese watershed villages and the origin of these clubs can be traced to ICRISAT's work at the Bundi watershed in Rajasthan, India, where ideas of environmental protection, sanitation and hygiene amongst children have been inculcated.



Rainwater harvesting farm pond at Tirunelveli, Tamil Nadu, India.



Vermicomposting is undertaken by women farmers for extra income.

Building on social capital has made the main difference in addressing rural poverty. The classic exemplar is Kothapally watershed in Andhra Pradesh (AP) India. Today, Kothapally is a prosperous village on the path of long-term sustainability and has become a beacon for science-led rural development. During the hard drought year of 2002, Kothapally incomes were buffered by enterprise diversification. Between 2000 and 2003, investments in new livelihood enterprises such as a seed oil mill, tree nurseries, and vermicomposting increased average incomes by 77% in Powerguda, another exemplar village in AP. Ex-ante impact assessment studies for Andhra Pradesh's Rural Livelihoods Program in five districts with improved watersheds revealed impressive returns of US\$ 608 million in 10 years for four major crops (sorghum, groundnut, pigeonpea and maize).

Better crop-livestock integration is another tool for poverty reduction. The Lucheba watershed, Guizhou province S. China, has transformed its economy to improve their roads and water supply. With technical support from the consortium, the farming system was intensified/diversified from rice and rape to tending livestock and horticultural crops. Forage production (wild buckwheat as an alley crop) has controlled erosion and increased farm income from sloping lands. The raising of pigs assisted bio-gas production (using pig excreta) and reduced the need to cut trees. This holds true in many watersheds, where improved fodder production intensified livestock profitability following measures for improving breed and health.

Efficient management of rainwater with in-situ conservation improved water availability in the watersheds, and the establishment of water harvesting structures improved groundwater levels. For example, at Bundi, the average rise in groundwater recharge was at 5.7 m and the irrigated area could then be increased from 207 ha to 343 ha.

The two-pronged achievements of the watersheds are (a) protecting the environment and (b) sustaining



A farm pond recharged from runoff in Wang Chai, Thailand.

development. The effectiveness of improved watershed technologies was evident in all the sites in four countries. This is particularly significant in sloping topography such as in Tad Fa, Thailand, where interventions such as contour cultivation, vegetative bunds and fruit trees grown on steep slopes reduced seasonal runoff to less than half (194 mm) and soil loss to less than 1/7th ( $4.21 \text{ t ha}^{-1}$ ) as compared to the conventional system.

Improved soil quality - In addition to low productivity of fields in the SAT, a large majority of the area was found to be severely deficient in micro-nutrients (Zn, B, S). Application of fertilizers to amend this deficiency increased crop yields by up to 70% over farmers practice. Similarly, the introduction of integrated pest management decreased the use of pesticides by up to US\$ 66  $\text{ha}^{-1}$ . Other improved land, soil and water management practices such as the improved use of crop residues, vermicomposting and crop diversification with legumes not only enhanced productivity but also improved soil quality. Increased carbon sequestration of  $7.4 \text{ t ha}^{-1}$  in 24 years was observed with improved management options in a long-term watershed experiment at ICRISAT HQ.

Conserving biodiversity in the watersheds was engendered through participatory IGNRM. Pronounced agro-biodiversity impacts were observed in Kothapally watershed where farmers now grow 22 crops in a season with a shift in cropping pattern away from cotton (200 ha in 1998 to 100 ha in 2002) to a maize/pigeonpea intercrop system (40 ha to 180 ha).

Promoting natural resource management (NRM) at landscape level - The study of data collected through remote sensing devices provides a comprehensive understanding of the effects of the changes (ie, vegetation cover on degraded lands) in the watersheds. This in turn has provided the indicators to assess improvements in agricultural productivity and environment protection. While there were interventions at plot to farm level, the impact factors

of NRM, such as the sustainability of production and soil and water quality, have been examined from a landscape-level perspective (upstream and downstream). This helps to address concerns on equity issues such as benefits for the poorest people (landless) who are necessarily unable to take advantage of improved soil/water conditions.

Enhancing partnerships and institutional innovations through the consortium approach proved to be the major impetus for harnessing the potential of watersheds to reduce household poverty. Complex issues were effectively addressed by the joint efforts of ICRISAT and their key partners—NARS, NGOs, local government agencies, agricultural universities and other private interest groups—while retaining farm households as the key decision-makers of substantive change. The consortia provided information to the villages, thus avoiding subsidy-dependent development. SHGs undertook income generating activities, such as village seedbanks, that were established not only to provide timely and quality seed but also to create the venue for receiving technical support and building the capacity of all members for conservation and livelihood development activities.

Other CGIAR Alliance Centers – IWMI, ILRI, IFPRI, ICARDA, and the World Wildlife Fund and international and national NGOs, such as Catholic Relief Services and Bhartiya Agro-Industries Foundation, have become ICRISAT's main allies because of our common development goals. Also, regional networks such as ASARECA and the Cereals and Legumes Asia Network (CLAN) have provided an added venue for exchange and collaboration. This led to strong south-south partnerships.



Rock earth dams convert gullies into reservoirs.