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日本沙漠学会誌「沙漠研究」
第14巻 S 2004年 別 冊
Journal of Arid Land Studies
Vol. 14, S, October 2004

沙漠研究 14S 115-118 (2004)
Journal of Arid Land Studies

—Special Issue— Desert Technology VII
Refereed Paper

Combating Land Degradation for Better Livelihoods: The Integrated Watershed Approach

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Abstract - The integrated watershed management approach addresses the issues of land degradation effectively as it attempts to bring desirable changes in a holistic and systematic way including problem of rural poverty and protecting the natural resources An innovative multi-institutional consortium model for increasing productivity of rainfed systems holistically through technical backstopping is developed and evaluated at Adarsha watershed, Kothapally in Ranga Reddy district of Andhra Pradesh The model is scaled-up in three districts under the Andhra Pradesh Rural Livelihoods Program (APRLP) supported by DFID and in Madhya Pradesh and Rajasthan supported by Sir Dorabji Tata Trust These approaches enabled to have "win-win" situations for sustaining productivity, enhanced rural employment opportunities and reduced land degradation In this paper we describe the approach and progress adopted for scaling up the model

1. Introduction

Land is the most valuable natural resource and the primary basis for production of food, fuel and feed. Continued unplanned and unscientific exploitation leads to land degradation and to a non-renewable state However, it is facing serious threats of deterioration due to unrelenting human pressures, inappropriate management practices and utilization incompatible with its capacity The economic and social effects of agricultural land degradation are much more significant in developing countries such as China, India and Vietnam where large number of poor people reside than in industrialized countries This process starts a vicious downward spiral of poverty – low productivity and land degradation Along with soil degradation, it is estimated that by 2025 most of the developing countries will be facing severe water scarcity (Rockstrom *et al* 2003, Spencer and Ryan, 2001) There is an urgent need to halt the process of land degradation to protect large SAT areas from the threat of desertification

2. Innovative Integrated Participatory Watershed Model

The watershed research was initiated by ICRISAT three decades back in partnership with National Agricultural Research Systems (NARSs) with the objectives to increase productivity and sustainability of the SAT systems through environment- friendly resource management practices that will conserve soil and water resources The strategy is three pronged (i) On-station watersheds for strategic research (ii) Real-world on-farm watershed research for fine tuning the technologies, and (iii) Scaling up and scaling out potential technologies for greater impact People's participation is critical for sustainable development and management of watersheds Based on the lessons learnt over the years, ICRISAT in partnership with NARSs developed an innovative farmer participatory consortium model for management of watersheds with the ADB's support (Wani *et al*, 2002a)

2.1 On-station Watersheds for Strategic Research : Wani *et al* (2003a) successfully assessed the sustainability of the integrated natural resource management (INRM) options in the long-term watershed experiments at ICRISAT campus using the yield production time series data during 1977 to 2002 along with soil quality parameters Sorghum and pigeon pea together recorded an average grain yield of 4 7 t ha^{-1} yr^{-1} compared with 0 9 t ha^{-1} yr^{-1} average yield of sole sorghum in the traditional system The improved INRM options not only increased mean grain yield productivity over the traditional farmers' management practice but the annual productivity gain was 77 kg ha^{-1} along with increased C sequestration of 7 4 t C ha^{-1} yr^{-1} in soil, in case of improved INRM system as that of 26 kg ha^{-1} gain in the farmers' management

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2.2 Real-world On-farm Watersheds : Adarsha Watershed, Kothapally – A Success Story: The new integrated genetic and natural resource management (IGNRM) approach was evaluated through in the consortium model at five on-farm and three on-station watersheds in India, Thailand and Vietnam with technical backstopping by ICRISAT-led consortium since 1999. In the Adarsha watershed, Kothapally in Ranga Reddy district of Andhra Pradesh farmers evaluated improved crop management practices (INM, IPM and soil and water management) along with researchers. Farmers obtained increased maize yield ranging from 2.2 to 2.5 times with improved technologies as compared to the yields of sole maize (1.5 t ha^{-1}) in 1998 (Table 1). Three fold increase in sorghum yield within one year with improved practices was observed. (Wani *et al.* 2002b).

Table 1. Average yields with improved technologies in Adarsha watershed, 1999–2002.

Crop	1998 baseline data	Yield (kg ha^{-1})			
		1999	2000	2001	2002
Sole maize	1500	3250	3750	3300	3480
Intercrop maize	-	2700	2790	2800	3083
(farmers' practice)		700	1600	1600	1800
Intercrop pigeonpea	190	640	940	800	720
(farmers' practice)	-	200	180	-	-
Sole sorghum	1070	3050	3170	2600	2425
Intercrop sorghum	-	1770	1940	2200	-

The impact of integrated watershed management interventions on poverty and livelihoods of rural communities clearly showed that average net returns per hectare for dryland cereals doubled and pulses are 45% higher even with irrigation, while the net returns on rainfed cereal crops have more than doubled. Adoption of the improved varieties has, not only increased crop yields, but also enhanced the economic profitability of other soil and water conservation investments, which may otherwise be economically not attractive to farmers. Average household income from crop production activities within and outside the watershed is 15400 and 12700 rupees respectively. This shows a significant impact of watershed intervention activities (initiated in 1999) towards poverty reduction in Kothapally watershed through increased incomes from the poor from crop production activities.

2.3 Scaling-up and Scaling-out. The Andhra Pradesh Rural Livelihoods Program (APRLP) has selected this model for scaling up the benefits. The objectives of APRLP supported by DFID-UK are:

- *To be facilitator* for new paradigm of sustainable rural development and achieve convergence in development efforts in Andhra Pradesh, leveraging the ongoing watershed movement as a primary platform,
- *To establish* new practices which aim to bring within the ambit of sustainable livelihood initiatives groups such as the landless, women and poor who are marginalized in current watershed development projects:
- *To draw upon* the tools and understandings generated by different arenas and act as a catalyst and guide for new practices, innovation, learning, convergent actions and enlightened policy making

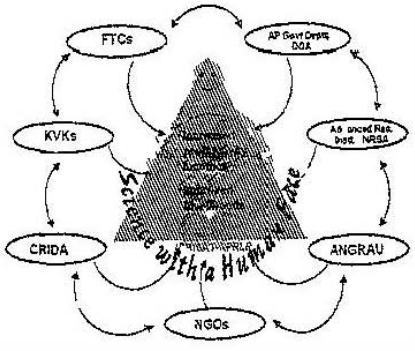

Figure 1 Farmer participatory ICRISAT-APRLP

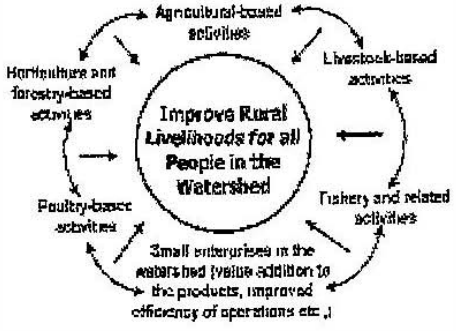

Figure 2 Convergence in watershed consortium for integrated watershed development

It was recognized that to shift the community participation from contractual to consultative and collegiate mode, tangible private economic benefits to individuals are must. Such tangible benefits to individuals could come from *in-situ* rainwater conservation and translating through increased farm productivity by adopting IGNRM approach. Adopting the principle that "users pay" provided no subsidies for investments on individual's farms for technologies, inputs and conservation measures. Through convergence of activities in the watersheds improved rural livelihoods and sustainable use of resources were attempted (Fig. 2). The nucleus watersheds are serving as the sites of learning where farmers are conducting the experiments with improved soil, water, crop nutrient, and pest management options with the technical support from the consortium partners. The farmers from nucleus watersheds are gradually empowered to become the trainers for satellite watersheds in the district. In each district 3-4 nucleus watersheds with 4 satellite watersheds per nucleus watershed were established.

3. Process

ICRISAT converged various agencies at watershed level through a consortium of national and state agricultural research institutions, government departments, Krishi Vignan Kendras (KVKs), non-governmental organizations (NGOs), farmers' organizations, and women's self-help groups (SHGs) for effective delivery at watershed level. Following activities were undertaken in ten nucleus watersheds.

3.1 Baseline Surveys and Constraint Analysis: Detailed PRA and stratified household surveys for all the nucleus watersheds, soil information along with historical rainfall and minimum and maximum temperature data enabled us to calculate the length of the growing period (LGP). The LGP in the target districts varied from 60 to 180 days.

3.2 Knowledge-based Entry Point: We adopted knowledge-based (soil health diagnosis) novel entry point activity for building the rapport with the farmers in the watersheds.

3.3 Demand-driven Interventions and Participatory Evaluations: Through PRA and regular discussions in ten nucleus watersheds about 1550 farmers evaluated improved crop and land management options, and responses to B and S amendments under their practices on no subsidy basis with green gram, maize, sorghum, pigeon pea, castor, and groundnut. Farmers observed increased yields (46 to 158%) with improved management as compared to their normal practices. Number of livelihoods options such as nursery rising, vermicomposting, village-based seed banks, and *Dal* making were identified and evaluated.

3.4 Empowerment of Rural Community and Other Stakeholders through Capacity Building: In this project emphasis is on empowerment of stakeholders through capacity of all the stakeholders to scale-up the benefits from the nucleus and satellite watersheds in the target districts (Figure 3). The nucleus watershed PIAs and farmers serve as trainers to the rest of the watersheds in a given agro-ecosystem for rapid extension of technologies.

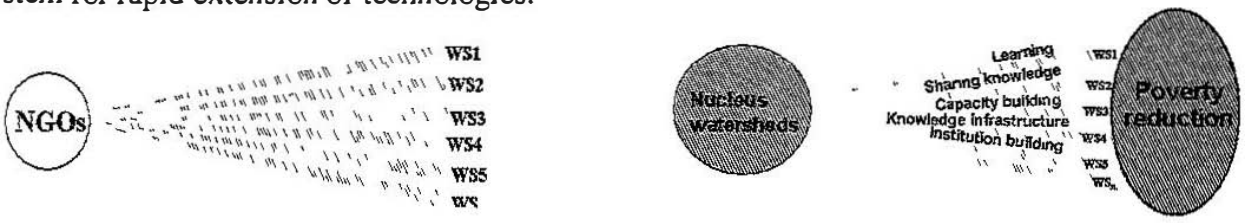

Figure 3. Knowledge transfer within the institution and the region

3.5 ICT-enabled Farmer-centered Learning Systems for Knowledge Exchange: The community center managed by the PIAs is functioning as a Rural Information Hub (RIH) connecting participating villages and also with other internet connected web sites. Each RIH center has a PC with modem or VSAT technology and is managed by women or youth SHGs The Adarsha society RIH is managed by the women SHG members. The agriculture related information detailing strategies to mange soil, water nutrients. crops, pests and diseases are available at RIH in Telugu and English.

Training materials and information brochures on management of integrated watershed in English and Telugu (local language) are prepared and distributed.

4. Conclusion

The problem of land degradation is most serious where food production at subsistence level can't adequately provide survival options to the rural poor resulting in migration in search of livelihoods. High population pressure and low yields are accelerating the land degradation and affecting the livelihoods of millions of poor residing in the drought-prone areas. The innovative participatory consortium watershed management model is to help reduce poverty by protecting the fragile environment, promoting inclusiveness through participatory and convergence approach and creating diversified opportunities for the rural poor.

The consortium of research institutions put together through number of workshops and tem building exercises helped to provide solutions to varying problems in the watersheds. The emphasis on empowerment of community, gender equity, and knowledge-based bottom-up approach and through convergence proved beneficial and farmers could decide and manage their natural resources for improving livelihoods. The nucleus watersheds are continuously monitored and evaluated jointly by farmers and partners for agroclimatic, biophysical and economic parameters. Farmers are fully involved in the on-farm trials and are confidently talking with other farmers from neighboring villages what they are doing and what results they have observed for scaling up of benefits. This approach enables to have "win-win" solutions for sustaining the productivity and reducing the land degradation, which are the main, causes of poverty in the rainfed areas of Asia with improved livelihood opportunities.

Acknowledgements

We thank to Drs HP Singh, CRIDA; A Padmaraju, ANGRAU: S.P. Tucker, APRLP and district Project Directors of Mahabubnagar, Kurnool and Nalgonda, the PIAs, farmers and scientists of the consortium for their wholehearted support and help. The financial assistance provided by ADB and DFID is gratefully acknowledged.

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