Socio-Economic and Institutional Aspects of Soil and Water Conservation – Indian Experiences

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Abstract

About 57% geographical area of India is subject to varying forms of soil erosion. The government is attempting to mitigate this process and put the degraded area back in to most suitable production system through stakeholder participatory integrated watershed management programme (WSM). Government had invested INR 92.66 billion (US$ 2.08 billion) till 2000 for treating 25.22 million ha and budgeted to invest INR 90 billion (US $ 2.02 billion) to treat 15.0 million ha area in Xth Five Year Plan (2002-07) through WSM. The paper highlights the finding of a good number of impact evaluation studies on WSM implemented and evaluated by different agencies. The study found that WSM had positive impact on every aspect of rural and national development. However, the extent of impact is subjected by bio-physical, socio-economic condition of the area and the competence of watershed development team in different aspects of WSM.

Resume (French version may kindly be translated at your level)

Introduction

Out of 329m ha total geographical area of the country, 313m ha (95.13%) is drained by major rivers and have problem of water erosion. About 107.4 million ha area of India is subject to varying forms of soil erosion and yield soil loss to the tune of 5333 m t/yr i.e. 16.35t/ha/yr (Narayana & Ram Babu, 1983). Monitory value of agricultural output through soil degradation, deforestation and rangeland degradation is estimated to be 110.54 billion Indian rupees equivalent to US$ 2.484 billion @ US$ = Rs.44.5 (Bradon & Homon, 1995). Declining productivity, under-nourishment, unemployment and water scarcity are direct consequences of our poor land management system. High volume of runoff, soil loss, sedimentation rates and increasing loss through natural calamities (floods, droughts, mass wasting, nutrient losses, etc) are the indirect effects of irrational utilization of natural resources. The Union Government of India realized the gravity of these gigantic problems of land degradation since independence (1947) and initiated efforts right from the First Five Year Plan

(1951-55) to develop appropriate strategies for efficient utilization of land, water and other biological resources through community participation to ensure social equity and better life quality.

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Soil and water conservation programs in the country may be grouped into four phases e.g. Consent phase (1950 to 1970), Consultation phase (1971 to 1988), Contribution phase (1989 to 1998) and Participatory phase (1998 to date) based on strategies and approaches and explained by Dhyani and Samra (2004). Up to 2000, an amount of INR (Indian Rupee) 92.66 billion (US$ 2.08 billion) has been spent for treating 25.22 million ha land under various watershed development programmes by the Dept. of Agriculture, Dept. of Land Resources, Ministry of Forests Environment and Ministry of Rural Development. An amount of INR 90 billion (US$ 2.02 billion) have been allocated for reclamation/development of an area of 15.0 million ha with active participation and sharing of benefits and investment as well as operational costs by people/beneficiaries during Xth Five Year Plan (2002-07).

Material and Methods

Ex-post evaluation of natural resources management (NRM) technology was started by National Agriculture Research System (NARS) in early eighties and of field level projects after nineties. Beside NARS, there are many other external evaluation agencies like ASCI, FCI, IRDAS, DCA, ISRO, CMD, LBSNAA, CES, TERI and different task forces constituted for specific purposes and generally headed by eminent economist of the country. But in the absence of regularly monitored data, majority of the evaluation used two point data either before or after (if base line data are available) or with and without project approach for evaluation of WSM programmes. Since project evaluation is a challenge and subjected to socio-economic forces, there are no clear-cut indicators, criteria and uniform methodology for project evaluation. Therefore, different studies used different indicators for measurement of socio-economic performance of the technology or programme. The selection criteria and evaluation methodology as such depends on the requirement of the sponsoring agency i.e. client, knowledge of the evaluator and the data availability. The clients of evaluation studies were also not very much clear among themselves about the precise possible use of these evaluation studies. However, evaluation studies assessed the bio-physical impact of watershed management projects generally an increase in irrigated area, gross cropped area, cropping intensity, productivity of arable and non-arable land. Incremental benefits in the form of total production of different watershed products and a change in per unit cost of production were the major indicators for it. Benefit Cost Ratio, Net Present Value (NPV), Pay Bank Period (PBP), Internal Rate of Return (IRR) and annual family income with distributional aspects were the important economic criterion of project evaluation. Few studies assessed the environmental impact by measuring the change in soil loss, runoff and ground water recharge in participatory mode. Recent studies tries to capture social impacts institutional mechanism and participatory issues to indicate the sustainability of these programmes.

Results and Discussion

The paper summarizes the finding of more than 75 such case studies of Indian WSM which were financed, implemented and evaluated by different agencies all over the country. These studies

showed that WSM projects enhanced irrigation potential by 40 to 360 percent and cropping intensity by 36%. The productivity of arable and non-arable land increased by1.2 to 22.4 q/ha and 0.6 to 17.0 t/ha respectively. Milk production has also increased tremendously. The overall increase in family income varied from 50 percent to seven times. Implementation of mechanical measures generated casual (short period) employment opportunities to the tune of 215 man days per ha and regular employment of 47 man days/ha/yr through various WSM activities. Hydrological studies from more than 50 stations showed that WSM programs substantially reduced the runoff (5 to 42%) and soil loss (10 to 80%) in different parts of the country. Unit hydrograph studies have also shown that WSM treatment reduced runoff peak and volume by 30-34%. Thus *in-situ* moisture is conserved, flood damage is minimized and premature siltation in ponds/reservoirs is avoided. Studies conducted in more than 75 watersheds (area 300-500 ha) showed a rise in ground water table from 0.2 to 3.4m in WSM programme area. It was also found that ground water rise was 1.36m in heavy soils as compared to 1.72m in light soils (Sastry *et al.*, 2004). WSM projects help a shift in energy consumption pattern in rural house holds. Efficient use of energy (biogas, electricity, LPG etc.) have become popular and their by reduced pressure on forest vegetation up to 20.5% and saving of dung cake (use as fuel) which ranged from 14 to 44%.

Community empowerment through strengthening local institutions is the new paradigm of sustainable development of rural areas in general and through WSM in particular. Local institutions at the watershed level were created in the form of Resource Management Societies (RMS) and entrusted with the responsibility to protect natural resources; assets created to ensure equal sharing of costs and benefits from common property resources (CPRs) and their maintenance from their own resources. The studies reveal that the strength of RMS and its continuity depend on success of CPRs of the area. For example, Hills Resource Management Societies at Bunga and Sukhumajri watersheds in Haryana state earned a net revenue of INR 1.31 million (US$ 27810) and 1.12 million (US$ 23830) over a period of 15 years from water charges, sale of grass from catchment and fishing (table 1). The farmers are now self sufficient in maintaining the CPRs as well as developing new CPRs. The income and expenditure pattern of some of the local institutions through management of the developed CPR's is presented in table 1.

Table 1: Income and expenditure (IRS) details of selected Hill Resource Management Societies in the state of Haryana, India

S. No.	HRMS	Period	Income INR	Expenditure/ Investment* INR	Major common Property resource	Net saving INR
1.	Sukhomajri	1986-1999	11,18,815	10,41,688	Water harvesting	77,127
2.	Dhamala	1989-1999	6,12,882	4,30,169	Water harvesting	1,82,713
3.	Bunga	1984-2000	13,07,408	10,70,437	Water harvesting	2,36,971
4.	Lohagarh	1990-1999	15,37,737	11,62,756	Water harvesting	3,74,981
5.	Gobindpur & Mandappa	1988-1999	1,92,137	1,33,557	Water harvesting	58,580
6.	Masoompur	1988-1999	5,27,670	4,21,794	Industrial & fodder grass (contract only)	1,05,876
7.	Raina	1988-1999	5,67,240	4,51,918	Industrial & fodder grass (contract only)	1,15,322

8.	Khera & Basaula	1995-1999	3,92,175	3,17,260	Industrial & fodder grass (contract only)	74,915
9.	Mirpur	1991-1999	1,89,704	1,67,360	Industrial & fodder grass (contract only)	22,344
10.	Nada	1994-1999	1,03,136	70,332	Water harvesting	32,804
	Total		65,48,904	52,67,271		12,81,633

* The figure includes maintenance and operational cost of the major CPR and investment on new CPR's developed in the watershed.

Under Integrated Watershed Development Project in the state of Uttaranchal (a World Bank funded project during 1999 to 2004), 497 SHGs and 774 Water Users Groups (WUGs) raised their funds to the tune of INR 8.08 million and INR 2.48 million (US$ 0.182 million and US$ 0.056 million) respectively. These local institutions utilized this amount for managing the operation and maintenance of structures and systems and helped to develop forward and backward linkages which are an indicator of the sustainability of the programme.

Economic analysis of more than 75 WSM case studies showed that these programmes are economically viable having benefit cost ratio (BCR) ranging from 1.10 to 3.40 and internal rate of return (IRR) higher than 15% considering on site tangible benefits alone.

Synchronized policy guidelines, improved coordination among line departments and better market information with proper entrepreneurship development in a cooperative and cohesive mode would boost the efficiency of future WSM programme in the country.

Conclusion

The implementation of soil and water conservation works on watershed basis is being given prime importance to cater the needs of its human and livestock population and to mitigate land degradation and environmental hazards. These programmes have been found to enhance the productivity of all forms of landuses and reduce runoff volumes, peaks and soil and nutrient losses substantially. It helps in rising the ground water table and also shift in energy consumption pattern in rural areas. The investment on these project was found to be a profitable proposition based on productive benefits alone.

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