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MEASUREMENT OF THE IMPACTS OF WATERSHED MANAGEMENT PROGRAMME ON LIVELIHOODS OF A WATERSHED COMMUNITY

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ABSTRACT

Watershed management has increasingly been realized to be an essential component of rural development in many developing countries including India. However, studies related to the socio-economic implication of Watershed Management Programme (WMP) are often ambiguous. The present study assesses the impacts of WMP on livelihoods of the watershed community in an experimental watershed in the state of Karnataka, India, using Sustainable Livelihood Approach (SLA). This was accomplished with the help of Livelihood Assets Tracking (LAST) method which is based on SLA. The study illustrates that use of SLA with mixed method evaluation approach (combination of quantitative and qualitative assessment methods), can objectively assess the impacts of WMP. The methodology can be helpful in monitoring and evaluation of WMPs and the feedback given is important in continual improvement of the programme. It could also aid in better designing of the future programmes.

INTRODUCTION

Arid and semi arid regions in the world are characterized by low and erratic rainfall, food insecurity and income poverty. Theseregions also face the challenge of resource degradation and low agricultural productivity. Watershed management has been seen as a solution to confront such problems (Wani *et al.*, 2009). The principal element in the watershed management is capturing of the rainfall in the wet season and increasing availability of water during dry periods. This offers several potential benefit including increasing soil moisture for rainfed agriculture, augmenting ground water recharge for dry season irrigation or drinking water purposes, arresting runoff in to storage structures (eg. tanks, reservoirs etc.) for various consumptive and productive usages. Benefits from adoption of watershed management approach are reported from many arid and semi arid tropic regions, where it has helped enhancing agricultural productivity, improving livelihoods of the watershed community and alleviating poverty (Hope, 2007). In India, watershed management is considered as the main vehicle of rural development (Turton, 2000). The approach for watershed management has significantly evolved since its initial years of implementation in 1950s (Reddy *et al*., 2004; Wani *et al*., 2008). It has progressed from being merely externally imposed biophysical interventions to a more people–centered and participatory approaches encompassing a broader range of activities (GoI, 2008). Now, poverty alleviation and improving living standards by enhancing sustainable livelihood opportunities for the watershed community is the focal point of most of the WMP. This approach has implications for all capital assets defined in the SLA (Sreedevi, 2005; DFID, 1999). Despite the growing importance of watershed management as an approach to rural development and natural resource development, to date there has been relatively little research on their socio-economic implications of WMP. Very less information is available on success of WMP in terms of improvement of livelihoods of the watershed community and poverty alleviation, even though it uses huge budget (Hope, 2007). Government bodies mostly evaluate projects success in terms of physical and financial achievements. Other studies confines to qualitatively evaluated or quantitatively analysed, heavily supervised projects, with no information about long-term impacts (Kerr, 2002). Evaluative methodology that could measure the changing livelihood profiles of the watershed community quantitatively is needed as it would help determine that how far the project has been successful in achieving the basic objective of WMP i.e

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livelihood improvement and poverty alleviation of watershed community. To accomplish this, a livelihood assessment framework for timely monitoring and evaluation is required that could aid in continual improvements in WMP based on feedback mechanism.

MATERIALS AND METHODS

Study area and Sample selection

Two criteria were identified for the selection of experimental watershed (a) WMP should be completed as per government criteria; and (b) WMP should be viewed as successful in terms of implementation and impact, as per the government reports. Based on these criteria Lakshmipura watershed was selected as an experimental watershed. The watershed is present in the Kanva river catchment (area 352 km^2), Ramanagram district, Karnataka state in southern India (Figure1). The treated Lakshmipura watershed comprises of 8 villages-*Lakshmipura, Chikkasullkere, Doddasullkere, Melahalli, Honahalli, Ibbalakahalli, Bommachanahalli and Kempavaderahall*. Between years 2002–2003 to 2007–2008, WMP was implemented in Lakshmipura watershed, by Karnataka Watershed Department. According to the government reports, various structural (*ex–situ* and *in–situ* structures for soil and water conservation) and non–structural (setting up of micro financing institutions, capacity building, skill development for livelihood diversification, etc.) interventions were adopted in all the eight villages as a part of WMP. Out of the eight treated villages, two villages (*Lakshmipura* and *Mellehalli*) were selected as sample villages on the principle that more than 50% of the village population had participated in WMP. For evaluating the change in livelihood of watershed community a methodology involving assessing livelihood 'before/after' the WMP was used.

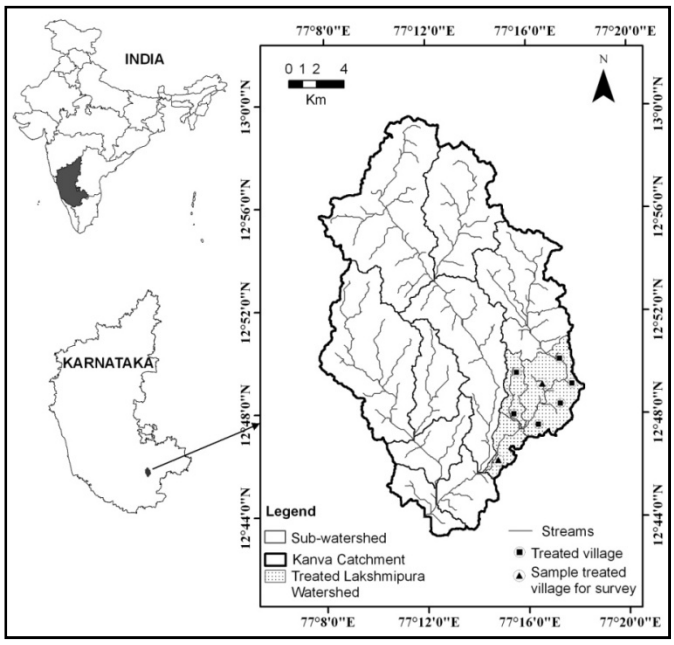

Figure 1. Map of Kanva River catchment, Lakshmipura watershed, Ramanagara district, southern Karnataka

The selected villages in the watershed were majorly inhabited by agriculture based communities. Agrarian systems range from subsistence agriculture to intensive cropping. Livestock keeping is another important occupation in the watershed. Landless community mostly worked as agricultural laborers. Non–farm based occupations in the villages includes small scale business such as grocery shops, tea stalls, basket making, incense stick making, carpentry, blacksmithing, private money lending etc. Some people are also employed in private/ government services. Landholding community is the direct participants in the WMP as they get benefitted by various *in-situ* and *ex-situ* interventions. Other are sought to be positively impacted by the increased employment opportunities during and after WMP, peripheral activities such as micro-financing institution (mainly Self Help Groups (SHGs)) set up during WMP and improved natural resource base. As all communities in the villages directly or indirectly participated in WMP, sample size for survey was randomly selected from the total households present in each of the two selected village. Sample size was calculated for each village at 95% confidence level, 5% confidence interval, 5% precision, 50% prevalence and a design effect of 2. A sample size of 180 households in *Lakshmipura* village (total 336 households) and 138 households in *Mellehalli* village (total 215 households) were selected. The sampled households were surveyed in each of the two villages using a questionnaire. Interview method was used for the data collection.

Livelihood assessment method

DFID's Sustainable Livelihood (SL) framework provides the base of livelihood assessment in the present study. Within the SL framework, Livelihood Assets Tracking (LAST) method (Bond and Mukherjee, 2002) was used to track down the ongoing dynamics of five capital assets essential to household livelihoods as a proxy for impact. At the outset, participatory workshops with stakeholders were conducted to yield comprehensive information about livelihoods of the people. Based on these, word pictures and the LAST assessment sheet (LAST–AS) were developed, which formed the main tool for data collection. The word picture represents a number of realistic stages of multiple criteria selected for each of the five capitals (see Table 1). The word picture depicts the worst known livelihood situation to the best within the area. From the word pictures, an assessment sheet was prepared describing five scenarios for each criterion representing a particular capital.

Using the assessment sheet, sample households were scored for the five capitals (zero to 100) and the five capitals scores were combined to give a LAST livelihood index for each household. The selected households were interviewed using the LAST-AS. Every criterion in each capital was judged for its position on a centile scale and was scored between zero to 100. The criteria under each capital asset were compared with the reality of the particular household and a rapid assessment is made to find which description or collection of criterion fits closest. Households were scored for every criterion under each of the five individual capitals. The scores of all criterions under one capital were averaged to give score of that particular capital. (as shown in equation 1). Mean of all five capitals gave the LAST index value for each household, termed as Household–LAST Index, $HH_{(LAST).}$ Equation 1 and 2 represents the step wise process of development of $HH_{(LAST)}$ derived from the set of five capitals– Human, Physical, Natural, Financial and Social.

$$\bar{I}_{qj} = \sum_{i=1}^{n} I_{ij} / n \quad (1)$$

$$\left[HH_{(LAST)}\right]_j = \sum \bar{I}_{qj} \Big/ 5 \quad (2)$$

where, $\bar{I}_{qj}$ is the mean SL–Capital Index for j^{th} household with respect to i^{th} criterion, n is the number of criteria in a capital and $HH_{(LAST)}$ for j^{th} household represents the average value of all five capitals estimated from equation 1.LAST Index developed at watershed level (which includes both the study villages) is termed as watershed–LAST–Index, $W_{(LAST)}$ and is represented as equation 3:

$$W_{(LAST)} = \sum_{i=1}^{Z} HH_{(LAST)} \Big/ Z \quad (3)$$

where, Z is the number of households in the watershed

capital. Their scores increased by 7.41, 7.32 and 6.34 points respectively during 2003 to 2010. Compared to these, increase

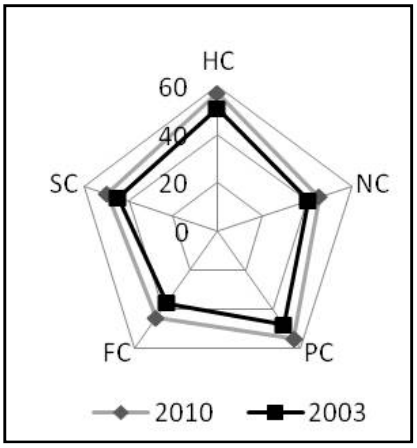

Figure 2. Livelihood capital asset pentagon of Lakshmipura watershed for year 2003 and 2010

Table 1. Livelihood capital assets scores and $W_{(LAST)}$ score of Lakshmipura watershed community for year 2003 and 2010

Capital	Criterions	2003		2010	
		CS	ACS	CS	ACS
Human capital (HC)	Diet	49.19	50.89	57.41	57.23
	Education	41.18		48.31	
	HH size/labor force	47.53		53.56	
	Health	62.18		66.24	
	Medical treatment	48.57		56.65	
	Dependent family member/s	56.65		61.23	
Natural capital (NC)	Land holding size	32.93	40.64	35.06	45.16
	Fertility and location of land	48.73		53.63	
	Subsistence/cash crops	44.82		52.68	
	Access to irrigation water	32.88		36.08	
	Livestock size	38.19		44.74	
	Fodder for livestock	47.70		50.76	
	Supplemented food	39.27		43.15	
Physical capital (PC)	HH condition/domestic assets	47.42	47.89	54.73	55.30
	Animal house	41.56		48.25	
	Access to infrastructure (eg. water, electricity, cooking fuel and others)	55.72		61.52	
	Economically productive assets (eg. manure, fertilizer, use of labor, etc.)	52.42		58.60	
	Transport facility/frequency of travel	52.41		60.86	
	Access to information (phone, newspaper, etc.)	37.78		47.87	
Financial capital (FC)	Occupation and number of working days	45.87	37.10	54.49	44.42
	Access to debt/loan	40.91		48.60	
	Access to bank/financial institution	44.71		53.98	
	Remittances	16.91		20.59	
Social capital (SC)	Membership of formal group/institution (eg Gram panchayat, village committee, etc.)	34.10	44.82	43.40	49.43
	Caste	53.38		54.98	
	Participation in meetings	39.34		43.03	
	Network/interconnectedness	52.48		56.32	
Watershed LAST Index, $W_{(LAST)}$			44.27		50.31

CS: Criterion Score; ACS: Average Capital Score

RESULTS AND DISCUSSION

Comparison of changes in livelihood capital assets from 2003 to 2010

Table 2 presents the change in livelihood capital assets scores and watershed LAST index, ($W_{(LAST)}$) for Lakshmipura watershed from years 2003 to 2010. The LAST livelihood index score in year 2003 is 44.27, while in year 2010 it is 50.31. Though the watershed community shows improvement in all five livelihood capital assets between 2003 and 2010, however there was difference in rate of change among different capitals. The physical capital increased the maximum among five capitals followed by financial capital and human in the scores of social capital and natural capital was less and these capital improved by 4.61 and 4.52 points, respectively. Figure 2 depicts the Livelihood capital assets pentagon of the Lakshmipura treatment watershed for year 2003 and 2010. Increase in physical capital can be attributed to improved access to information mainly through mobile phones which enabled information sharing within as well as outside the village. Increase in frequency of travel to nearby town, mainly for market purposes, was also noticed. Improvement in the ownership of domestic assets also contributed to increase in score of physical capital of the watershed community. Improvement in human capital is attributed to better diet intake, enhanced capacity to spend on medical services, and improved education level in the watershed community.

Increase in the number of mandays of work of landowners in their own field and moderate increase in number of working days for agricultural laborers from pre watershed treatment period to post treatment period contributed to improvement in the overall financial capital of the watershed. Access to financial institution, mainly Self Help Group (SHG), also improved during this period. Increase in the fertility of land which can be notably attributed to reduced soil erosion and runoff and enhanced soil moisture content helped improve the natural capital of the watershed. It also led to increase in production of subsistence/cash crops in year 2010 compared to that of year 2003. However, resources such as fodder for livestock from common land did not show much improvement as no specific interventions were adopted for management of Common Property Resources (CPR) during WMP. Social capital gained in the watershed mainly due to increased participation of village members in institutions such as SHGs and village level societies.

Conclusion

SLA can objectively assess the impacts of watershed management on livelihoods of the watershed community as used in the present study. Results advocate that the Lakshmipura watershed reported an improvement in livelihood from pre WMP to post WMP period. The results also indicate the capital wise change in the livelihoods of the watershed community has been appreciable. Many of these changes can be attributed to the interventions adopted during WMP. Quantitative assessment of livelihoods capital assets using this approach can be quite useful in assessing similar type of development works. The methodology provides the advantage of tracking the livelihood over time at different levels of aggregation. The livelihood score can be tracked, say at the level of socio-economic grouping of respondents on the basis of wealth ranking, landholding size, caste system, village and watershed level, by simple averaging method. The approach can also be useful in conceptualizing watershed management plan during the commencement of WMP. Quantitative assessment of livelihood capital can help prioritize the watershed management activities as well as designing the interventions targeted at specific capital. The approach is also helpful in monitoring and evaluation of the programme and the feedback is important in continual improvement of the programme and better designing of the future programmes.

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