The Andhra Agric. J 61(4): 921-926, 2014

Assessment of On-farm Employment Generation through Natural Resource Conservation Activities in the Semi-arid Region

Biswajit Mondal, R N Adhikari, S L Patil, A Raizada, M Prabhavathi, D Ramajayam and N Loganandhan
Central Soil & Water Conservation Research and Training Institute, Research Centre, Bellary-583104, Karnataka.

ABSTRACT

A watershed development programme in the backward and disadvantaged district of Karnataka (Chitradurga) was implemented in a participatory mode with 'demand driven' planning. Various kinds of soil and moisture conservation activities were carried out to treat the non-arable as well as arable lands with measures like construction of field bunds and waste weirs; treatment of drainage lines (DLT) through construction of rock fill dams, *nala* deepening; planting of forest tree and fruit seedlings, etc. A bulk of the budget (58%) was utilized for various land based activities covering engineering works, plantation and production enhancement activities including livestock improvement. Different engineering works alone created nearly 3623 mandays temporary employment, while plantation activities generated about 2375 man days. At the then prevailing wage rates for unskilled labour, nearly `8.78 lakhs worth of employment was generated. The cumulative effect of resource conservation activities on crop cultivation would definitely enhance regular labour absorption at the farm level. The above information clearly indicates that participatory planning and implementation can lead to the generation of significant employment opportunities in various natural resources conservation activities in the dry region.

Key words : *Bunds*, Employment generation, Horticulture, Natural resource conservation, Watershed.

In recent years, India accorded high priority to watershed development programmes as a strategy for improving livelihoods and sustainability in drought-prone areas. To assess the impact of watershed development programme on the rural poor, the most important aspect, which needs to be considered, is employment generation, since employment opportunities for rural population in dry land areas are very limited. Watershed management activities generate casual and regular employment opportunities, with the former being created during the implementation phase. In a study carried out by NABARD in Giridih, Jharkhand, it was revealed that more than 80% funds allotted for land development work such as soil and water conservation, soil health enhancement programmes, creation of water harvesting structures, check dam, micro-lift, dug well etc., and large scale horticulture development led to huge employment generation (Anonymous, 2008). In the Himalayas, integrated watershed development projects have led to significant casual and regular employment generation due to crop diversification to "high value-low volume" crops (Dhyani *et. al.,* 2009). Singh *et al.* (2010) also reported that integrated watershed development led to increased employment opportunities for the community members with better wage earnings in construction work during the implementation phase and engagement in agricultural fields during the post-watershed programmes.

Three fourths of the cultivable area in Karnataka is dry land and much of it is without any prospects of ever being able to receive irrigation facilities. It was therefore recognized that dry land development on watershed basis adopting improved, farm-tested cost effective technologies would increase the potential for enhancing crop yields and food security in this largely improvised region. Execution of watershed development programmes should be done involving various types of land based and non-land based activities for creation of employment for the rural masses as most farmers in the dry zones face acute hardships in obtaining

regular employment due to harsh climatic situations, uncertain rainfall, traditional crop cultivation methods, poor yields and poor marketing avenues. This paper reports the on-farm employment generation potentials in a watershed of the semi-arid region during the initial stages of development phase in various conservation activities.

MATERIAL AND METHODS

Study area

The Netrenahalli watershed located in the north of Chitradurga district, covers an area of 479.17 ha including arable and non-arable land with variable slopes of 3 to 5%. The climate of the region is characterized as arid to semi-arid with an average annual rainfall of 417.3 mm spread over 31 rainy days. About 80% of it received during the north east monsoon (September to November) and the trend of rainfall is highly erratic and maximum water goes waste as runoff. The soils of the watershed are shallow to medium in depth, mainly red sandy loam type with gravel and pebbles.

There are a total of 187 farm families in the two villages (Netrenahalli and Konnasagara) covered under this watershed; most of them (78%) belong to small land holding categories with low income potential (‘18967 per annum). Low productivity of land coupled with the lack of alternative sources of income has a severe impact on the investment capacity of the farmers. These factors combined with continuous soil erosion and non-availability of groundwater for irrigation leads the area into a perpetual trap of ever worsening living conditions. The watershed development programme at Netrenahalli has been initiated by CSWCRTI, Research Centre, Bellary during 2008-09 with the aim of soil and water conservation with proven technologies, dissemination of improved packages to increase production in terms of food, fodder, fuel and fruits and non-land based activities for the landless.

Data and Tools

The study uses both primary as well as secondary data for meeting out the objective. The primary data pertaining to socio-economic characteristics, crop details, employment generation, etc. were collected by personal interview of all the beneficiary households during 2011-12. Corresponding to the actual amount spent on labour intensive activities like construction of engineering structures, horticulture plantation etc. number of mandays created was estimated from the roster of people employed and time period required to complete each of the activities. The worth of employment generation was then estimated considering the prevailing wage rate for un-skilled labour in the area.

RESULTS AND DISCUSSION

General characteristics of the watershed

The general characteristics of the watershed and the beneficiary households in regard to the land use and demography were analyzed and presented in Table 1. Major portion of the watershed area is rainfed (87%) and only 7% get irrigation from bore-wells. The average family size in the watershed was 5 and labour force per family was 3 which indicated there was surplus of workable persons in the watershed. Most of the farmers (78%) belonged to marginal (upto 1 ha) and small holding categories (upto 2 ha) and their asset-to-debt ratio was estimated to be 0.72 which indicated the economic fragility of households in the watershed.

Brief description of the watershed-based interventions

Different types of treatment activities were carried out in the watersheds under study. These included soil and moisture conservation measures in agricultural lands, drainage line treatment, water resources development/management, crop demonstration, horticultural plantations and afforestation works as per the needs and priorities of the watershed community and their technical feasibility (Table 2). In order to conserve soil and water *in-situ* in arable lands, contour and field *bunding* was taken up on 150 ha from ridge to the valley using manual labour only. Contour/field *bunding* of 0.81sqm cross section was taken up in the fields and loose stone waste weirs (209 nos.) were constructed in order to dispose off the excess runoff safely. Necessary loose stone revetment (392 metres) was also provided on either side of the waste weirs where the natural waterway is shallow, in order to protect the *bund* on either side of waste weirs. Field boundaries were also

Table 1. General characteristics of the watershed.

Sl. No.	Particulars	Value
A.	**Land use**	
1.	Rainfed land	358.22 ha
2.	Irrigated land	30.70 ha
3.	Wasteland	21.50 ha
B.	**Socio-economic characteristics**	
1.	No. of beneficiary households	187.00
2.	Average family size	4.93
3.	Average labour force	2.95
4.	Marginal and small farmers	78%
5.	Asset-debt ratio	0.72

Table 2. Watershed-based interventions undertaken in Netrenahalli watershed.

Sl. No.	Name of interventions	Unit	Quantity
1.	*Bunding*	ha	150
2.	Waste weirs	No.	209
3.	Revetment	Meter	392.45
4.	Construction of Recharge filter	No.	4
5.	De-siltation done by machines *	Cu m	4438.91
6.	Gabion structures	No.	5
7.	Horticultural plantation	ha	45.3
8.	Construction of vermi-compost pits	No.	25
9.	Crop production and diversification	ha	80
10.	Grass sodding on *bunds*	ha	30
11	Afforestation, trenching and TBO plantation	ha	14
12.	Construction of drinking water tank	No.	1

* de-siltation of upstream side of one *nala bund* and waterways

Table 3. Share of different components under programme budget.

Sl. No.	Particulars	Share (% of total expenditure)
1.	Soil and water conservation works	23.02
2.	Production enhancement activities	13.19
3.	Horticulture/plantation works	21.47
4.	Livelihood development activities	10.55
5.	Training and extension activities	6.67
6.	Equipments/tools and contractual services	18.43
7.	Administration and management	6.67
	Total	100.00

renovated with the same cross section where *bunds* existed before the interventions.

The watershed drains out through a single drain with a length of 7600 m and a catchment area of 479 ha. Due to high intensity storms and large volumes of expected run off these lengths were treated by a series of gabion structures at critical points and one rock filled dam was also constructed to reduce sediment load during storms and allow movement of clean sediment free water out of the watershed and into storage reservoirs.

Development of horticulture has potential to create both casual and regular employment generation and also provide nutritious food supplement to farmers. Several studies in the Himalayan region (Dhyani *et al.,* 2009) have clearly established that crop diversification, horticulture and animal husbandry activities can provide regular employment in small watersheds. In the study watershed, establishment of dry land horticulture was carried out over 45 ha covering more than 50 farmers. Prior to taking up the activities, selection of site and choice of fruit plants was done. After excavating the pits of required size and spacing in the selected site by the farmer themselves, one year old healthy plants of mango (variety *Baneshan, Mallika, Alphanso, Aishwarya*), sapota (var. *Cricket ball* and *kalipatti*), guava (var. *L-49*), lime (var. *Balaji*), coconut (var. *Tiptur tall*), pomegranate (var. *Bhagwa*), tamarind (var.*DTS-1*), moringa (var. *Dhanraaj*) and papaya (var. *Surya*) were planted under protective irrigated conditions (due to extremely hot summers in the watershed). The performance of the fruit plants has been satisfactory with an average mortality of about 27%. The survival of sapota is the highest averaging about 75% and lowest in coconut (50%) due to low level of irrigation which is constrained by low ground water levels during 2011 because of deficit rain and acute power shortage.

An effort has been made in this study to examine the expenditure incurred upto 31st March 2012, under different programme components and it was observed that various land-based activities like engineering works, plantation and production enhancement activities utilized nearly 58% of the budget (Table 3). Livelihood promotional activities and training and extension activities utilized 11 and 7% of the programme budget respectively, during the period.

Bio-physical impact of watershed interventions

Biophysical impact of watershed development programmes are a direct manifestation of various land-based positive externalities and are important determinants of the productivity potential of watersheds. Since, the project is still under intervention period and a long gestation period is required to notice a perceptible change, the impact could not be measured by standard indicators. However, a significant shift in productivity was

Table 4. Groundnut yields of improved cultivars in *bunded* areas.

	Grain yield (kg/ha)	Straw yield (q/ha)	Cost of cultivation (Rs/ha)	Grossreturns (Rs/ha)	Net returns (Rs/ha)
Cluster I					
Farmers variety (Control)	403	8.02	11268	13290	2023
Improved variety (TMV-2)	545	10.67	12273	17962	5689
	(35)	(33)	—	(35)	(181)
CD at 5%	80.2	1.71	12056	2646	2160
Cluster II					
Farmers variety (Control)	471	7.36	12776	15239	3183
Improved variety (K-6)	613	13.00	—	20334	7558
	(30)	(77)		(33)	(137)
CD at 5%	125	2.48		4094	3398

Figures in bracket indicate % increase over control

Table 5. Casual employment generated through engineering measures over different years.

Sl.No	Name of the work	Mandays generated during the Year			Total mandays generated (2009-2011)	Worth of man days generated* (Rs in lakhs)
		2009	2010	2011		
1.	*Bunding*	1123	525	745	2393	3.50
2.	Waste weirs	362	306	232	900	1.31
3.	Revetments	77	23	55	155	0.23
4.	Gabion structures	-	90	-	90	0.13
5.	Other structures	85	-	-	85	0.12
	Total	1647	944	1032	3623	5.29

*@Rs146 per day for un-skilled labour.

Table 6. Employment generated through development of fruit orchards.

Sl. No.	Particulars	Year		Total
		2010-11	2011-12	
1.	Area covered (ha)	10.9	34.4	45.3
2.	No. of pits excavated	1603	5524	7127
3.	Mandays utilized (nos.) (@ 3 pits per day of 1 cu m each)	534	1841	2375
4.	Average man days per ha generated (no.)	49	54	52
5.	Worth of employment generated per ha of fruit trees planted (‘)	7154	7884	
6.	Total worth of employment* (Rs in lakhs)	0.78	2.71	3.49

*@Rs146 per day

observed during crop demonstration in the case of groundnut crop (which is the dominant crop in the watershed) through introduction of high yielding cultivars along with soil conservation measures (Table 4). Grain yield increased by 35 and 30% in the case of cultivar TMV-2 and K-6 over control, leading to increase in gross returns by 35% and 33%, respectively.

Generation of employment

Adoption of soil and water conservation practices on watershed basis generated two types of employment, as described below:

Temporary/ casual employment

Different types of watershed based treatment activities like soil and moisture conservation measures in agricultural lands, drainage line treatment measures, horticulture plantation, etc. were executed by manual labour only. Construction of mechanical structures in the watershed was carried out with the active participation of the farmers in the watershed. *Bunding* has been done as per survey number of fields and this work alone generated 2393 mandays during 2009 to 2011. A total of 3623 mandays employment worth of ‘5.29 lakhs (Table 5) have been generated under different engineering works. The results also indicated that around 2375 mandays of temporary employment worth of ‘3.49 lakhs have been generated for plantation/afforestation works during the same period (Table 6). The magnitude of employment is significant; further these activities will help in generating recurring employment in the future when the trees would mature and yield fruits.

Permanent/ Regular employment

Before the initiation of the programme activities, regular labour absorption for crop cultivation ranged between 88 and 121 mandays

per family per year under different holding categories. Reviewing of literature indicated that introduction of watershed technologies increased the cropping intensity, production levels and shifted farming activities from less labour intensive (low value) to more labour intensive (high value) crops, livestock and other enterprises which in turn increased the labour absorption per ha of cultivated area or per head of livestock or income per household (Arya *et al*., 1994; Math *et al*., 1997 and Ram Babu *et al*., 1997). Mishra and Mondal (2008) also observed from an ex-post analysis of three ORP watersheds at Karnataka that not only temporary employment but regular employment opportunities in agriculture increased significantly during the post-intervention period. Therefore, initiation of programme activities in the study watershed is also expected to shift the cropping pattern, productivity and labour absorption per hectare of cultivated area.

CONCLUSION

It is evident from above analysis that watershed development programmes have helped to create employment in dry regions where employment opportunities are very limited. If maintenance programmes could be taken up as envisaged in the technical plan of the watershed development programme, it is possible to further improve the employment opportunities, which will help to stabilize annual incomes of the landless in particular and farming community in general. This proves beyond doubt that soil and water conservation programmes on watershed basis are ideally suited for rural employment generation and there is a potential to dovetail land development and resource conservation activities in centrally sponsored schemes currently in operation all over the country. Hence, efforts should be made to plan activities in future watershed programmes which aim for maximizing the total on-farm and off-farm employment by integrating various land-based and non-land-based measures.

LITERATURE CITED

Anonymous 2008 *District Agriculture Plan*, Giridih District, NABARD Consultancy Services, Jharkhand Regional Office, Ranchi.

Arya S L, Kaushal R C and Grewal S S 1994 Economic Viability of Watershed Management Project Selected to Rehabilitate Degraded Aravali Foot Hills of Haryana. *Indian Journal of Agricultural Economics,* 49(4): 591-600.

Dhyani B L, Raizada A, Ghosh BN and Juyal G P 2009 Impact of technology extension on land use changes, food security and economic prosperity in a central Himalayan watershed. *Indian Journal of Soil Conservation,* 37(2): 133-143.

Math S KN, Rao M S R and Padmaiah M 1997 Joladarasi Model Watershed Development Programme in Bellary District of Karnataka: A Diagnostic Evaluation. *Journal of Rural Development,* 16(2): 313-328.

Mishra P K and Mondal B 2008 Employment generation in watershed development programme – A micro analysis. In: *Advances in Soil and Water Conservation in Indian Perspective*, Soil Conservation Society of India and IGKV, Raipur (C.G.). pp: 256-263.

Singh P, Behera HC and Singh A 2010 *Impact and Effectiveness of Watershed Development Programmes in India*. Centre for Rural Studies, National Institute of Administrative Research, Lal Bahadur Shastri National Academy of Administration (LBSNAA), Mussoorie.

Rambabu, Dhyani B L, Agarwal M C and Samra J S 1997 *Economic Evaluation of Watershed Management Projects*. Central Soil and Water Conservation Research and Training Institute, Bulletin No. T-33/D-23, Dehradun.

(Received on 16.01.2013 and revised on 19.03.2013)