CONCLUSIONS AND SUGGESTIONS

For a stable and growing economy of the areas, particularly in agriculture, proper and optimum utilization of the natural land, water and vegetation resources is essential. The concept of watershed management has been strongly advocated in most of the developing countries for optimum use of these resources in an integrated way. In India, of late, the watershed approach has become prominent in the various area development programmes viz., Drought Prone Areas Programme, National Wastelands Development Programme, National Watershed Development Programme for Rainfed Agriculture, etc. Besides, several exemplary institutional and voluntary efforts aimed at integrated resources development have been instrumental in popularizing this concept in the country, in the form of model watershed. The World Bank has also entered on large scale to finance some selected mega-watershed projects in the rainfed areas of the country. These projects spread over four states (Andhra Pradesh, Karnataka, Maharashtra and Madhya Pradesh) have almost reached the phase of completion, and have generated interesting outcomes in terms of their management practices and multi-dimensional impact.
The present study “A Study of Boltek Watershed Management” was undertaken in the year 2002, with an aim of analyzing and assessing the multi-dimensional impact of the project on the area and people. The specific objectives of the study were (i) to study the process of planning and management of Boltek watershed and peoples participation therein. (ii) to analyse the practical problem in planning and implementation, (iii) to study the impact of watershed development activities on agro-climatic and socio-economic aspects, (iv) to study the reactions of implementing officials and beneficiaries towards watershed development projects; and (v) to suggest suitable measure to overcome the problems in management of watershed.

The study was carried out during the year 2002-2007 in the watershed namely Boltek, located in Maharashtra.

For detailed investigation, a sample of 150 beneficiaries from the watershed was selected. The beneficiaries representing six villages of the watershed were selected in consultation with the concerned project officials. A total sample of 150 beneficiaries representing small (50), medium (50) and big (50) landholding categories were chosen. Besides, various sectoral officials working in the project and officials of other support services were also contacted for gathering additional relevant – information.
The primary data from sample beneficiaries and project officials was collected through structured interview schedules, and semi-structured interview guidelines, respectively. Besides, content analysis of office records, informal discussions, field visits etc., were other methods to gather the necessary information.

The planning process of watershed was studied with reference to organizational arrangements, criteria for selection of the watershed, training arrangements and infrastructural facilities available. Besides, other dimensions of planning such as identification and delineation of watershed, formulation of watershed plans, criteria for deciding the sites for project activities, sectoral investment in watershed planning, funding arrangements, mechanism of integration, extension strategies adopted, etc., were examined. The implementation of various sectoral activities with procedure for plan execution, various treatment measures adopted in watershed, people’s involvement in planning and execution of watershed plans were also analysed.

The need for adequate training to orient the project staff at different levels towards the integrated resources development was emphasized in the Master Plan. But, barring a few instance, no organized training programmes were conducted. The training programmes for farmers as envisaged, were rarely organized.
The basic surveys were carried out by GRASP & the soil conservation staff and detailed plans were formulated which contained basic data (agro-physiographic and socio-economic) of the watershed, problems therein, suitable treatment measures and probable benefits therefrom. Different maps showing delineation of watersheds, drainage pattern were also included in the plan. However, it is felt that the surveys were not as detailed as claimed. Many socio-economic components viz. livestock development, non-farm income generating activities in secondary sectors, were lacking.

Though it was claimed, the need assessment of the people in watershed was not done with their consultation. In fact, watershed people were not involved at plan formulation stage. They were only informed in general meetings about the proposed watershed project and benefits therefrom. The data also confirmed this observation. Nevertheless, people learnt about watershed or something of that sort at the time of preliminary land use survey carried out much ahead of plan formulation. Similarly, it were GRASP & soil conservation staff who conducted the baseline surveys and prepared watershed plans. The involvement of forest, horticulture and agriculture departments was almost intangible.
Criteria for selecting the sites for implementing the suitable measures, were: problems of area (viz., soil erosion, poor drainage, lack of fule, fodder, etc); suitability of sites (viz., nala bunding, gully plugging, water harvesting structures), availability of culturable waste lands (for tree planting and pasture development); community lands (community plantation) & non-arable lands (agro-forestry, horticulture, silvi-pasture, etc.).

The implementation of sectoral activities was done by the respective sectors. The local people’s involvement however was confined to offering cultivable land for executing drainage channels, waterways, new techniques and intercropping, planting of tree species, etc. some landless people, small and marginal farmers, worked during execution on wages.

The maintenance and protection of assets, viz., plantation sites, grasslands, pasture plots, stop dams, check dams, nala training structures, contour guidelines, run-off management structures, etc, created in individual farmer’s field, was to be looked after by the concerned farmers. The assets created in public land / village common lands, were to be maintained and protected by the GRASP for 3 to 5 years. However, in absence of the definite mechanism, it was difficult to isolate the roles and responsibilities of both the people
and project staff, in this aspect. Cultivators were not happy with the vegetative barriers (khus bunds) hence, did not bother to maintain and protect the same. The water harvesting structures, nala check dams, run-off management structures etc., were well taken care of by them as these provided them water for irrigation. Some of the community plantations duly completed by the GRASP, were handed over to respective panchayats for further maintenance and protection.

By and large, the condition of the individual and community assets in the watershed was satisfactory. The khus keylines and vegetative barriers however, could not retain its form due to farmers apathy. Tree plantation on degraded lands were also in excellent condition.

A mechanism of monitoring and evaluation of the watershed project activities, was succinctly spelt out in the master plans. Monitoring of the programme at watershed level, state level and Government of India level, was defined in Maharashtra. At watershed level, regular meetings and field visits by supervisory staff, were the forms of regular monitoring while state level monitoring was performed by SWDC through periodic reports and returns and visits of the senior officials. However, state level monitoring was hampered due to absence of required staff.
No involvement of people from watershed in the evaluation or monitoring, was reported from watershed project.

Due to the absence of clearcut definition of the mechanism of ensuring inter-sectoral coordination at different levels, any effective inter-departmental coordination was not forthcoming to the desired extent in the project. The Team Leader was controlling the staff of soil conservation, forest and field staff of extension unit. However, other departments were not adequately enthusiastic in extending necessary cooperation. For instance, despite repeated requests from project staff, the Ground Water Survey department did not conduct the followup survey of existing wells and future potential. The representative of the GSD though invited, did not bother to attend the meetings of watershed committee, and the visits of the GRASP. In Maharashtra, the Cooperative Banks were not coming forward to extend the finance to needy farmers for enhancing irrigation facility. Role of other departments viz., minor irrigation, block agency, horticulture, etc., in planning and execution of watershed activities was minimal. However, the GRASP, had suggested the Horticulture unit at the project level as well as the State Horticulture department to step up the suitable treatment measures in the watershed.
Sample in study area mainly depended on agriculture while some supporting activities viz., caste occupation, labour were also resorted to in order to support the family. Average landholding among sample was 12.77 acres while the small, medium and big farmers possessed on an average, 3.8, 7.5 and 26.9 acres of land, respectively.

Though, more than three-fourth sample farmers were knowing the term watershed, their perception about watershed varied such as; vetiver (khus) plantation, tree plantation, soil and water conservation, putting check dams in nala, etc. Almost all of them learnt about the term watershed and its details through watershed project officials.

Most of them (78.4%), were quite aware about different surveys carried out in the watershed however, they were ignorant about the watershed action plan as it was already prepared by the GRASP.

The GRASP claimed to have extended the required information on watershed viz., activities to be implemented, benefits therefrom, objectives of the programme, etc., by contacting the watershed people individually or in group meetings. The general reaction to this information was positive in the sense that, they accepted the proposed activities as it was supposed to be done free of cost. However, the
project officials maintained that the cost of activities would be realized afterwards.

The technological practices were based on the recommendations of the research unit while the prescribed treatment measures were suggested on the basis of and capability classes. The measures were advocated by project staff to the farmer beneficiaries. Almost all of them mentioned that bunding was recommended in their fields. Other activates indicated were: tree plantation, contour keylines, gully plugging & horticultural activities.

The sample farmers were thoroughly convinced about the land treatment measures such as contour / graded bunding, water ways, land smoothening, etc., due to their potential benefits such as arresting soil erosion, conserving soil moisture, generation of employment for the poor and improving soil fertility. Besides, they were also confident about gaining additional income through horticultural plantation. However, 50 per cent farmers suggested the officials not to take up vetiver bunds in their fields but the later ignored this suggestion. The rejection of khus was prompted by lack of conviction about it among them.
The activities implemented in sample farmers’ fields were; gully plugging, construction of check dams, farm pond and tree plantation. Majority of the sample farmers kept themselves away at the time of implementation of proposed watershed activities whereas, some of them worked as labourers on these works. However, they were advised by the project officials to take up the repairs to structures and causalities in tree plantation/horticultural plantations.

Barring offering land for implementing the treatment measures and working as labourers at the time of its execution, there was no evidence of people’s involvement in planning and implementation of watershed plans.

By and large, the condition of field activities except the bunds, was good in the watershed. Some sporadic breaches and damages to earthen bunds were caused due to ploughing and other cultural operations. Their negative attitude towards vetivera was an outcome of some problems viz., delay in establishment, incompatibility in arresting soil erosion and run-off compared to earthen bunds, difficulties in cultural operations, requirement of water at the time of establishment and non-availability of slips for replacement of casualties.
As a follow-up of land development activities, the suitable dryland technological options were recommended by the project officials to the watershed farmers. Autumn (kharif) was the main cropping season with cotton and sorghum as main crops in the watershed. During rabi season, safflower was predominantly grown in the watershed while wheat and chickpea were also cultivated.

The data on sample’s awareness or recommended dryland technology revealed that they perceived the technology with different meanings such as, sowing across the slope, inter-cropping, use of improved seeds, fertilizers and pesticides, contour cultivation, etc.

As regards the adoption behaviour of respondents, it was observed that, over one-third farmers in the watershed were following the practice of sowing across the slope while use of improved seeds was observed in case of nearly half of them. Besides, intercropping of sorghum + pigeonpea, cotton + pigeonpea was also adopted. A few farmers also started growing safflower during rabi season in the watershed. Use of soyabean was predominant since last 10-12 years in the State and improved varieties were being adopted since long, however, intercropping of soyabean + pigeonpea was followed by fairly good number of farmers. Recommended doses of fertilizers were not adopted by many farmers due to high cost and lack of
technical knowledge. It was suggested to farmers to use the farm residue for making super compost to restore the soil fertility.

Horticultural crops like pomegranate, mango, emblica sp, cashew, custard apple were recommended in the study area. Besides, renovation of local zyzyphus trees through budding and local mango by grafting was also recommended on large scale. Horticultural activities were almost nil in earlier period but when the horticulture aided under state run Employment Guarantee Scheme was implemented at a larger stage. Although, more than one-third sample farmers were aware of the horticulture crops and detailed cultural practices thereof, only 25 per cent adopted the fruit crops viz., guava, zyzyphus, mango, sapota, emblica sps. in their fields.

The check dams, gully plugging structures and farm ponds in the watershed helped to either directly facilitate the irrigation of crops or accelerate the groundwater recharge and enhance the water levels in the wells. However, in the watershed, some sample farmers dug out new wells after the inception of watershed programme while other farmers got deepened their existing wells. This had obviously helped in expanding area under irrigation and taking second crop in winter season.
It was observed that 60 per cent of sample farmers knew of the location of tree plantation, species planted therein and probable benefits there from. The species known were fuelwood, fodder, small timber types while the benefits perceived by them were: reduction in atmospheric temperature, lowering the velocity of gushing water towards drainage point, prevention in soil loss, fulfillment of local people's demands for fuelwood, fodder, small timber, pollution control, etc. Pasture plots and tree plantations were protected by some beneficiaries by not sending their cattle for grazing in the plots as well as not allowing others cattle in the plantation. Some of them also reported to have helped by way of providing irrigation, replacement of casualties, etc. Under farm forestry programme, the sample farmers reported to have got various species free of cost and planted in their farm boundaries, field bunds or in the main field.

The agronomic and socio-economic impact of the watershed established that, various soil conservation measures had helped in preventing soil erosion, as well as surface run-off from the farmers fields. This was attributed to earthen structures only and vetivera bunds were discarded by them. Similarly, the nala training, gully check dams and loose boulder structures were also said to be useful in reducing the erosion and run-off intensity. The reclamation of gully
beds and gullied lands helped to bring in additional area under cultivation as well as growing more than one crop in a year, which ultimately enhance the cropping intensity of the areas, though not remarkable.

The water harvesting structures and nala check dams facilitated the enhancement in groundwater recharge in the watershed, remarkably. With this, the wells once going dry during earlier period, were now in a position to store water even during summer.

Following the recommended cropping pattern, the watershed farmers were able to include new crops viz., safflower, sunflower, pearlmillet in their cropping system, apart from enhancing the area under green gram and black gram. Similarly, wheat and chickpea were grown in winter under irrigated conditions.

There was an enhancement of fertilizer consumption in per hectare doses by sample farmers, in both the states. The consumption was particularly high in case of cash crops like cotton, sugarcane & vegetables.

Increase in soil moisture contents and optimum level of fertilizer application enabled the farmers enhance the productivity of major crops grown by them. For example, in the watershed the sorghum yield increased by 67 per cent over the base year while the
increase was beyond 300 per cent in case of pearlmillet, black gram, cotton, pigeonpea and green gram. However, cropping intensity rose marginally. On the other hand, the enhancement in productivity of soyabean over baseyear was 120 per cent while the cropping intensity indicated a marginal rise.

Under socio-economic impact, the generation of employment to watershed people was the major indicator. The land development activities which were labour oriented in nature, could provide the employment of about 236 mandays per family in the watershed (base year 176 mandays).

Some of the land development activities in watershed impressed the sample farmers so much that they adopted these activities in their area falling outside the watershed. The activities were, construction of graded bunds, land ploughing across the slope, contour cultivation and tree plantation. Though the percentage of such farmers was not very high the conviction and enthusiasm of the farmers is worth appreciating.
Lessons Learnt

The following suggestions for improving the planning and management of watersheds would be relevant.

1. As is evident, the planning process would not be effective unless it is initiated at the lower level. In watershed planning it was observed that, first a watershed was identified and planned. Keeping in view the principle of planning from below it would be worthwhile to identify and manage small scale watersheds right from the beginning. It would enable to use the manpower, time and financial resources in a judicious manner.

2. The findings of the report have clearly established that the desired level of integration of various sectoral activities was not forthcoming due to the non-involvement of the concerned departments at various stages of management. Partly, inadequacy of staff and their belated deployment is also responsible for such a lack of integration. Most importantly, the leadership in Maharashtra, in the form of Team Leader was not available to the staff on sustained basis.
Furthermore, it was disclosed during the informal discussions with the officials that, in special project like Boltek watershed, the tendency on the part of concerned department was often to depute the unwanted officials. It would, therefore, be appropriate to induct or depute the required number of staff with adequate motivation and dedication, sufficiently in time so as to derive maximum benefits therefrom.

3. There is a need for adequate infrastructural facilities to watershed project staff particularly at field level. Although, it appears that the transport support to the staff was adequate, it was often experienced by the research team, that the one or two jeeps of the project were often requisitioned by the law enforcing authorities on the pretext by the authorities for quite a long time and returned in bad condition. Such incidents obviously disturbed the mobility of vital field staff. This needs to be stopped.

4. Being a special project, there is a need to maintain the morale and enthusiasm of the staff at high order, by announcing incentives, rewards, special allowances etc.,
for the staff in general and those outstanding, in particular.

5. Though prescribed in Master Plan and Implementation Manual, the training of the watershed was quite inadequate and less frequent. As a result, the desired level of conceptual understanding about watershed for integrated development was not uniformly seen among them. There was a tendency to view the own sectoral activity as the only suitable activity. Such a lack of orientation was glaring even among higher level officials.

6. The extension and publicity front of the watershed project was not very satisfactory. This has not only affected the popularization of suitable technologies but also deprived the people in general, of the information on outstanding achievements under the watershed programme. There is therefore, a need to adopt an organized extension strategy. Intensive visits of other farmers to watershed area, discussion over field problems therein and necessary solution etc., could be useful. Telecasting of effectively developed video films on
watershed projects in educational institutions, fairs, kisan melas would be helpful.

7. During planning, apart from major land development activities there is a need to incorporate other relevant activities of the secondary and tertiary sectors in the watershed plan. Government of Maharashtra’s effort to include Apiculture, Lac-culture in watershed project is worth appreciating. Likewise, activities such as extraction of “Katha” from Acacia catechu, oil extraction from marking nut can also be thought of.

8. The concept of ‘Charai Bandi’ (ban on grazing) is gaining wider acceptance in Maharashtra state. It exercises a self-imposed social control over the village population on the indiscriminate grazing of village common lands, community lands and forest areas. The concept has paid good dividends in Maharashtra and can be replicated in other states.

9. It is pertinent that in a medium-term development project like Boltek watershed, the first year of the project period should be exclusively devoted to institution and infrastructure building. Once, the entire project
machinery and necessary infrastructure is available, it would smoothen the process of planning and management of a project.

10. The recommendation of vetivera vegetative bunding / barrier by the World Bank replacing the earthen bunding, was found to be overemphasized. The efficacy of earthen bunds in soil and moisture conservation cannot be undermined. However, earthen bunds with reduced cross section along with vegetative bunds in combination, may be useful. Some research efforts are needed to establish this technology.

11. Research unit has excellent contribution in the watershed project; a research focus was needed on field trials and impact of various technologies. Evaluation experiments on farmers’ fields to assess the impact on run-off, sedimentation yield, soil loss, etc., are utmost necessary in the project.

12. The non-acceptance of vetivera (khus) by farmers in the study area can be attributed to various management related problems. Belated establishment due to late planting of slips, non-availability of moisture at the time
of planting, time lost in between transport of slips from nursery and actual planting, non-compatibility to lighter soils in view of low moisture holding capacity are some of the reasons found to be adversely affecting its performance. These can be overcome, by substituting with local grass species, such as sheda, pavanya, marvel, soma, etc.

13. Absence of well defined inbuilt mechanism of maintenance and protection of community forestry plots and pasture plots and benefits therefrom have jeopardised the very purpose of these activities. After the handing over to the panchayats (village level organization), these common properties have ceased to be a protected property and face a bleak future. A well defined system on the lines of Joint Forest Management may help to overcome this problem.

14. There may be many native species of the area which can be identified and included in the afforestation programme. Similarly, the tree species of economic value such as Marking nut (Semicarpus anacardium),
Charoli (*Buchanania lanzan*), Mahua (*Madhuca indica*) may be considered for including in the plan.

15. There was an urgent need for conduction research to identify the tree/plant, grass species suited to the marginal lands.

16. In Maharashtra, the watershed project activities were carried out as per the guidelines provided under the Project Implementation Manual. For smooth operationalization of the watershed project such comprehensive manual is utmost necessary.

There may be many more suggestions to improve upon the management strategy. It is however, the attitudinal dimensions and orientation of the project implementing agency towards the concept of integrated watershed management that will help in successful planning and management of watersheds.

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