

MANAGEMENT APPROACH FOR INTEGRATED DEVELOPMENT OF A WATERSHED

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Watershed is an area that has common drainage. In other words, it is a manageable hydrological unit. Since water is the most scarce resource of rainfed areas, it goes waste in the rainy season due to seepage and at the same time cause heavy damage to fertile land by soil erosion. In India, 80 percent of total rains in a year are seen in the months of July to September and the same percent of rain water is lost in run-off. The watershed unit provides an opportunity to harvest rain water falling in the area of its ridge lines and manage it for irrigation purpose. It also allow excess water to flow through a common drainage, thereby, avoiding excessive soil erosion.

Keeping this is view, the Government of India took watershed as a development unit for rainfed areas in the country during the Seventh Five Year Plan period. Accordingly, about 4000 watersheds were proposed under different agro-climatic regions. The watershed programmes in different states were funded mainly by the Ministry of Agriculture and Rural Development through the State Department of Agriculture.

Watershed development is an interplay, interaction and trade-off of socio-economic and environmental/ natural resource development goals. Watershed is one of the few development projects where the goal of development of natural resources dominates socio-economic goals.

This paper draws on the conceptual approach based on personal experiences gained in the bench-mark survey conducted in Mandpa micro watershed in Himachal Pradesh and also by going through development plans of various other watersheds.

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Watershed Areas: Status

Watershed units are marred by a number of problems which are multidimensional. Keeping aside the non-availability of water, the areas have diminishing forest cover and excess soil erosion. The small bushes and weeds are fast catching up common property lands, which were hitherto providing timber, fuel and fodder to farmers of the areas. The farm productivity, instead of increasing is continuously decreasing due to low water table, low input use, weed infestation and widespread attack of insect-pests, which thrive on weeds and bushes of common property lands in the off-season. The overall peasantry in the areas has meager farm income and poor resource base. They are illiterate and following unsuitable cropping patterns is a barrier in productivity improvement. The livestock population of watershed areas is the most undesired one with respect to quality, quantity and composition. Last, but not the least among the major problems is the lack of infra-structural development. These, the areas have weak road linkages, feeble man and animal health services and absence of energy sources other than bio-based.

The interaction and inter-linkages of these problems makes development of watershed areas an uphill task. Numerous macro and micro watershed development projects were undertaken with financial help from World Bank but a few are successful. This experience reveals that in most of the watersheds, the development approach is either haphazard and/or unsystematic. In some cases, work started on all fronts though no proper account of the situation was taken through bench-mark survey and without drawing a work plan. No consideration was given as to which activity is the prerequisite, and which is the successor. The need is to single out a problem or a group of problems which have forward and backward linkages, to set the priorities and follow the sequence so that development can be achieved in reality. This is what the project management approach suggests. To identify crucial problems in a watershed, it is important to have better understanding of the cycle of degradation of watershed areas.

Watershed Resources: *Degradation Cycle*

The present state of degradation of watershed resources has been caught in a vicious circle (Fig-1). The inadequacy of water has permanently been there. Consequently, the much acclaimed seed-fertilizer-irrigation technology of the 'Green Revolution' did not improve farm production of rainfed areas. Over and above, it has replaced local strains of crops performing better in these areas. The other complementary farm enterprises like animal husbandry, agro-forestry, fruit cultivation, etc., involving additional farm investment, could not develop due to poor natural resource base. The poor farm income of household also hampers the general social status of people in the area like illiteracy, off-farm employment, family size, farmers' co-operation, etc. The poor farm investments increased dependency on forests for fuel and timber both for farm requirements and for income generation from their sale, leading to deforestation and soil erosion. The water table in these areas was lowered down due to less absorption of rainy water and heavy run-off from denuded forest surface. The low productivity of cereal crops in watershed causes shortage of food, employment and on-farm availability of fodder which induces grazing of animals in forest areas. The stray animals grazed up on the new plantation done and fasten silting of water tanks constructed with the objective of soil and water conservation.

Project Management Approach

By definition, project management means managing and directing time, material, personnel and cost to complete a particular project in an orderly, economic manner; and to meet established objectives in time, money and technical results.

There are various elements of project management like time, cost, objective and technical results. The most important is the orderly completion of activities. Once the sequence of activities is properly decided on, the basis of predecessor and successor activities, and planning for time becomes easy using networking. Subsequently, it ensures efficiency on the part of cost and attains desired objectives.

The objectives of a watershed development is the all round development of the area. It has definite objectives of developing water resources, increase farm income and improve quality of natural resources. In a watershed, there is interplay, competition and complementarities at the same time between economic and environment objectives. To increase farm income or household income and upgrade and regenerate natural resources, it is imperative to know the cause and effect relationship between them. The activities decided on the basis of this are taken in proper order so that all round development can be ensured.

The observation of watershed development activities shows that little consideration is given for sequence of activities and thereby their timely completion. It happens so that activities to be taken in the beginning are taken in the end and some departments either start their activity late or take longer time than required to complete the activity and it does not fit well with other activities by other departments at the watershed. It has been observed that sometime construction of water harvest structures has been taken at the fag end of the watershed project period and there is no time left for farmers to practice modern farm technologies for which the training was given in the beginning of the project. Sometimes other activities like training, plantation, bunding, check dam, etc. consumed so much time and money that construction of water harvest structures- the most important activity of the project, could not be taken up. There are instances when plantation was done in the beginning of the project in the absence of any water source and plant died for wants of water. Such haphazard approach makes clientele skeptical of the developmental agencies and results in a lack of their participation. To avoid any such unpleasant situation and mismatch between activities, it is recommended that project management approach should be followed in sequencing of activities and their timely completion. Since, watershed development involves a number of departments/ organizations, thesequencing of activities becomes further important.

Socio-economic factors: *Crust of problems*

A. Theory Development

The various factors responsible for degradation of watershed areas and their sequence have been discussed in the previous section. These factors could be broadly categorized as common basic, socio-economic and technological in nature. The classification of these factors varies in number from author to author. Rajagplalan (1991) grouped them into technical, organizational and socio-economic, while Muthuraman (Feb., 1993) put them into five groups- common basic, technological, organizational and administrative, extension and social constraints. The common basic factors are water scarcity, soil erosion, deforestation, etc. while illiteracy, unemployment, low productivity, poor peasantry and feeble resource base are the socio-economic factors. The farm technologies developed in the past like HYVs. Fertilizers, etc. were neither optimal for watershed areas nor could be adopted because of its specific resource requirement and poor economic condition of the farmers. Therefore, these are the technological constraints.

Thus, guided by the cycle of degradation (Fig. 1), it appeared that the socio-economic factors are the backbone of watershed development. These factors, at the same time, are causes and effects of common basic and technological factors. Therefore, if the socio-economic factors are not initially taken care of, any progress made on the other two fronts i.e. common basic and technological problems, are not likely to bear fruits in the watershed development of rainfed areas.

An majority of the socio-economic factors refer to raising on-farm income, adding value to natural resources mainly land through irrigation, leveling and plantation, and through siphoning-off extra labor for off-farm employment.

B. Action Proposed

The actions suggested to remove socio-economic barriers have been grouped into four broad heads and discussed as following:

I. Increase On-Farm Income

1. Promote farm technologies suitable for soil and water conservation in rainfed areas: It requires selection of appropriate crop and varieties which thrive best in water stress conditions and apply agronomical practices of water conservation. The research suggested that crops like pulses and oilseeds especially taramira are draught resistant crops and can be taken for cultivation in these areas. The need is to motivate farmers for adoption through demonstration and provide economic incentive like repurchase of produce, indemnify losses, etc. The potential yield of these crops and varieties could further be achieved with the adoption of suitable agronomic practices for rainfed areas. These practices are mulching, shallow ploughing, contour plantation and balanced use of FYM and fertilizer.
2. Adoption of efficient farming systems: These farming systems may consist of either one or more than one components. These components are crop production, farm forestry, animal husbandry, agro-horticultural and silvi-pastoral components. The adoption of such diversified farming systems will increase the income of the farmer, on the one hand and decrease dependency on forests, increase water absorption and avoid soil erosion, on the other. The economic viability of farming systems suggested that forestry based cropping system provided high returns by virtue of reducing labor hour requirement and relieves the problem of fodder scarcity.
3. Improve livestock composition: The livestock of watershed areas requires comprehensive reorganization both in quantity and quality bases. The size of herd per household in these areas is not only large but also totally consists of local breed. The study of livestock composition in these areas showed that the number of cows per herd were more than buffalo. The reason being that local breed is small and light and can easily be let loose for grazing in forest areas and are able to climb steep slopes. Therefore, to increase the number of crossbred cows and buffaloes in a herd will discourage grazing and reduce herd size. Higher milk yield from improved livestock will increase income of the farmers. Stall-feeding of animals will help to feed balance ration and maintain productivity of the animals. It could only be possible if meager fodder resources of the area are pooled and arrangements are made

for their equal distribution through peoples' participation. There is a need to open fodder banks to augment the scarce fodder supply of rainfed areas.

4. Agricultural Marketing: Watershed areas have been surplus in inferior fruits like galgal, mushami, local mango, etc., coarse grains, oilseeds and pulses. But farmers could not sell their produce in the absence of proper marketing system. The demand for these products is high but there is a need to Channelise these products to processing factories and demand areas. The assured market for agricultural produce for these areas will encourage farmers in adoption of new technologies/ enterprises for higher farm income. This could be done efficiently done by agricultural co-operative societies with little encouragement from the government side to procure even one kilogram of marketable surplus of a single crop and sell it collectively either in the local market or transport it to the town while going to make purchases for the society.

II. Generate Off- Farm Employment

The population living in rainfed areas has high illiteracy percentage and depend heavily on natural resources like forests. The lack of off-farm employment further results into surplus agricultural labour and selling of forest products for their livelihood. Since, farm production is already low, selling of fuel wood and timber to earn money is another major reason of large scale deforestation. Any effort to provide off-farm employment will have a multiplier effect on the socio-economic development of the population. There will be less population pressure on farm and forest areas. The off-farm employment that is relevant in watershed areas is:

1. Small village and cottage industries based on locally available raw material.
2. Permit to establish industry in these areas with the promise to employ local people.
3. Form labour co-operatives to provide contract labour in demand areas.
4. Provide technical training to youth in respective villages.

5. Encourage youth for self employment through loans and technical guidance.

III. Encourage On-Farm Investment

Due to small returns from farming in watershed areas, people have made a few investments on their farms. Therefore, the resource base of agriculture is very feeble in these areas. The investments on the farm are likely to increase production and income of the farmers. The on-farm investments relevant for the area be suggested as following:

1. Farm forestry and pasture development.
2. Taking up rainfed supplementary enterprises like sub-tropical fruit cultivation, poultry, bee keeping, etc.
3. Construction of farm ponds, polyline tanks, etc. for survival irrigation.
4. Land terracing and leveling.

There is a need to popularize and guide the farmer about these investments and provide all type of technical help. The availability of financial facility will encourage these investments. These investments will not only improve soil & water conservation and farm income but also increase on-farm availability of fuel wood, fodder, timber, etc., thereby, relieve pressure on common property resources (CPRs).

IV. Peoples' Participation

For the success of any project with socio-economic objectives, peoples' participation is very necessary. No doubt, it is very difficult to achieve. Peoples' participation is often confused with preaching their voluntary involvement. The attempt in this direction is likely to fail until and unless their participation generates economic or physical benefits to them. Peoples' participation could be ensured in the following cases:

1. The people of the area must be exposed to the socio-economic benefits of the project as well as organize groups.

2. The people ready for stall-feeding to their animals may be provided subsidized feed and fodder during lean period.
3. The economic benefits that can be ensured to the people for their participation and weaning them away from forests and CRPs for their fuel, fodder and timber requirements could be given priority in gas connections and bio-gas installation as well as timber allocation in established forest areas.
4. The organization/group of the people who are ready to work for the objectives of the watershed project may be termed as PARSANSA {PARIYAVARAN SANSADHAN SAURAKSA GROUP}
5. The people of the group may be provided soft loans for the construction of ponds, taking up supplementary enterprises and distribute quality seed and planting material of these groups.
6. These groups may take up procurement and marketing of inputs and produce of the area.

Phasing out Integrated Watershed Development: A project management approach

It is a well know fact that water is the most scare resource of watershed areas and any field activity has some minimum water requirement (survival irrigation). Only after availability of this minimum water requirement, the water conservation measures could be advocated. Therefore, in the Phase I of a watershed development, maximum efforts must be made to explore water sources. It may be tanks, water harvest system, Kuhls, tubewells farm ponds, etc. There should be no hesitation on the part of planners to provide lift irrigation if it is feasible. In this phase, the people of these areas should be educated about the project and involved in the project work. It is here when people's participation should be taken care off on the lines suggested above.

In Phase II, before going to afforestation and rehabilitation of CPRs, the emphasis has to be laid to increase farm production and on-farm investment.

This is a very crucial phase, which will improve socio-economic conditions of the farmers of the area and reduce dependence on forests and CPRs. In the Phase III and the last phase of the watershed development, there is a need to generate off-farm employment and take up work like afforestation, rehabilitation of CPRs, soil conservation measures, etc.

Table 1 shows different activities under each phase and their predecessor activities. The flow chart (Fig. 2) developed on the basis of these activities ensures fixing priorities and systematic development.

Table 1: Phases and associated activities of Watershed Development

Phase	Activities	Leaders	Associated Departments	Preceding activity
Phase I (Water resource & off- farm income)	A: Bench mark survey	Research Institute,	Dept of Agriculture& AH, Soil & water conservation	-
	B: Delineation of work plan & explain to people for their participation	-do-	-do-	A
	C: Explore & build water resources, water harvesting, farm ponds	SWC	Agri Engineering	B
	D: Develop irrigation and distribution system,	IPH	Dept. of soil & water conservation	C
	E: Nursery raising of fruits and trees of agro-forestry importance.	Dept. of Agro-forestry	-	B
	F: Training for off-farm employment	Dept of industry	vocational education	B
Phase II (Farm income & investment)	G: Training on use of modern agricultural technologies	SAU	DOA	D, E
	H: Farm leveling and bunding	SWC	-	C
	I: Distribution of inputs, fruits & Agro-forestry nursery	DOA	Horticulture & forestry	G
	J: Open agricultural marketing outlets	-do-	District authority	H, F

Phase	Activities	Leaders	Associated Departments	Preceding activity
Phase III				
(Afforestation)	K: Distribution of feed, fodder and cooking gas to wean away from CPRs and forests	District authority	DOA	I
	L: Plantation of forests & CPR	SWC	-	K
	M: Soil & water conservation like check dams	Forest Dept.	-	J
	N: Participatory management of forests & CPRs	Research Institute	Forest Department	L, M
	O: Maintenance and redressal mechanism	SWC	-	N

Fig. 1: Schematic Diagram of Watershed Degradation

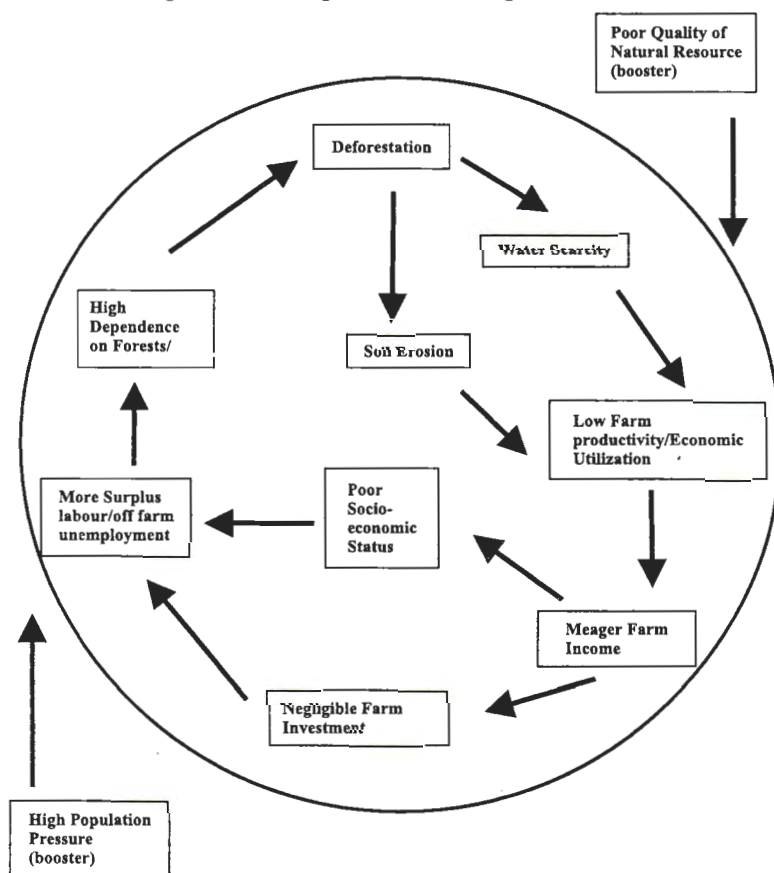
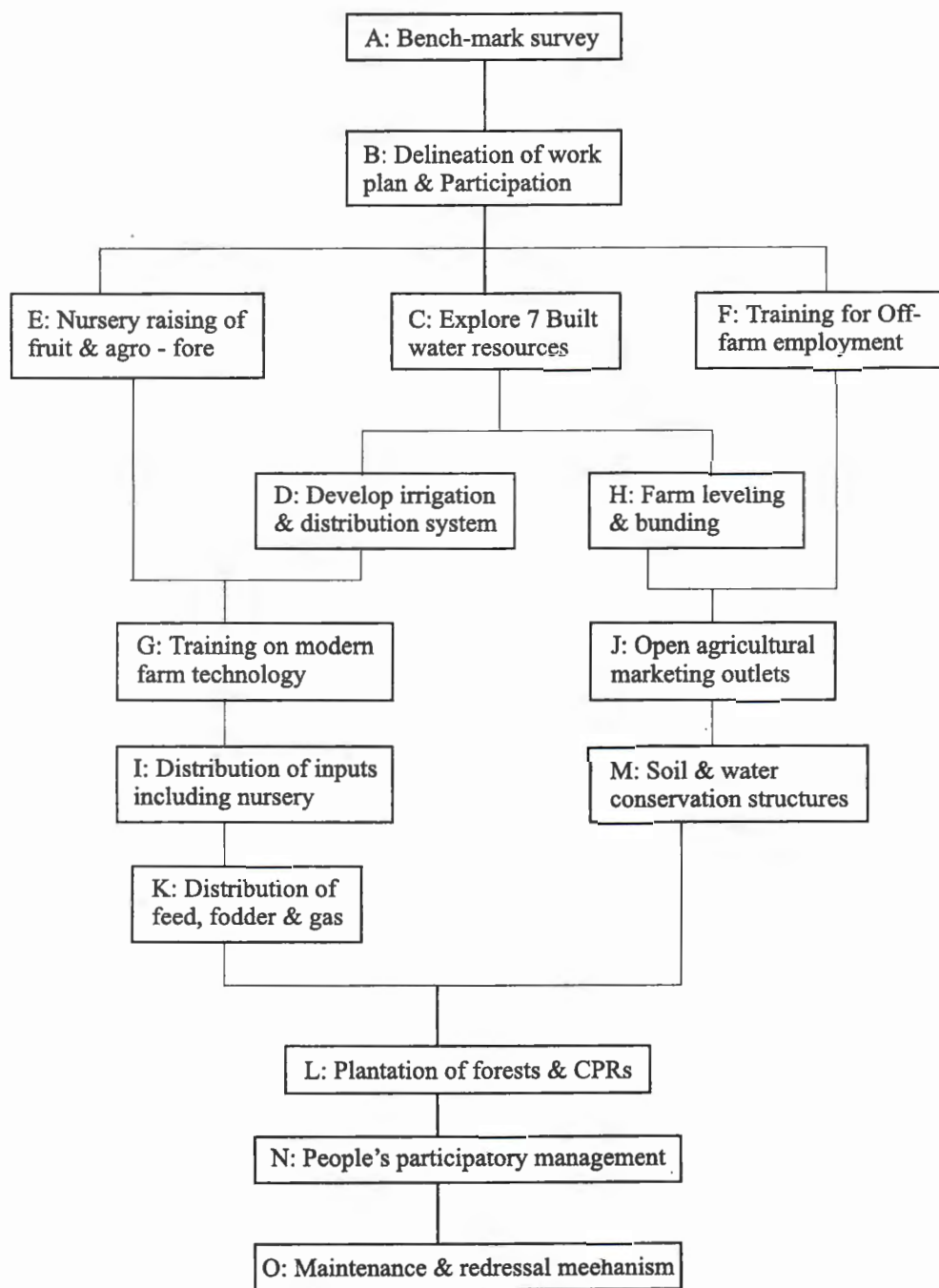


Fig. 2: Flow diagram of watershed development activities



Conclusion

All these activities have been a part of watershed development in the past, but in my view and as suggested by the review of literature, the activities of watershed development require to be prioritized in the sequence of their significance and on the basis of forward and backward linkages. The three phases suggested above will certainly provide systematic approach for the watershed development and avoid failure of the project. Successful watershed development or water harvest to be very specific, taken up in a mission mode approach appears to be the first and the last resort for overall development of dry and rainfed areas and specifically agricultural development in these areas.

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