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RAPPORTEURS' REPORTS

Rapporteur's Report on Watershed Development

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The concept of integrated treatment of all lands on a watershed basis to improve the soil moisture retention capacity and minimise the soil erosion by effectively checking the flow of excess run-off of rain water is not completely new. It has been initiated in the past also but in an isolated manner. The one notable example is the watershed development approach initiated in 1949 by Damodar Valley Corporation (Vaidyanathan, 1991).

Though a watershed refers to the area lying above a given drainage point in physical terms, in functional terms it becomes area development as it increases in size. In the past, watershed development programme has concentrated mainly as the treatment of preventing siltation in reservoirs, but at present its aim is to improve the productivity of dryland, which includes crops management, soil moisture conservation, water harvesting, alternative land use system, etc. (Venkateshwarlu *et al.*, 1985).

The watershed approach refers to both the types of farming, *i.e.*, irrigated and rainfed (dryland) and widely differs in their approach but the concept remains more or less the same. There are evidences that seed-fertiliser technology was biased toward irrigation and the so-called green revolution had widened development gap between irrigated and dryland. The earlier effort of improving dryland agriculture such as Drought-Prone Area Programme (DPAP) was targeted for narrow base of clientele and coverage. Development intervention such as watershed development, soil and water conservation, reclamation of problem soils, dry farming and backward area development programme, besides drought relief and environmental protection, has also invited common criticism in that the results of these programmes have been partial and incomplete. They have not been effective in asset improvement and have not helped the poor farmers. Therefore, poverty still coexists with plenty. Also there is lack of technical information suitable to site specific problem (Rajagopalan, 1991).

Dryland areas contribute about half of the coarse grain cereals, pulses, oilseeds and cotton in the country. But despite that, the dryland agriculture has remained neglected for a long time. Therefore, the one way to improve the dryland agriculture is to follow the concept of watershed development approach, where soil moisture is a major constraint and soil erosion is severe. It is estimated that about 600 million tons of soil is eroded every year from 80 million ha of cultivated land, losing 8.4 million tons of nutrients which are more than currently used today (Ramanna, 1991).

During the last two decades the watershed development approach received increased attention and some corrective measures have been initiated to improve the concept and organisational structure of these programmes in a more integrated way. Watershed includes both arable and non-arable land and therefore should focus on the process to improve and sustain production of all categories of land at higher levels. The specific objective of the programme includes promotion of soil and water conservation, optimal use of land resources,

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proper management of non-arable land and effective use of water resources and maintaining ecological balance.

Some of the major problems of the watershed relate to lack of adequate information about the resources and requirement of the people of the area for proper planning of the project. Quite often research and extension recommendations are too general and inappropriate and inadequate to meet the site specific requirements. Because of these constraints people's participation is very low. These watershed projects have also generated controversy about their effectiveness in improving the overall socio-economic condition of the farmers. Most of these projects have demonstrated higher monetary returns and overall improvement of the regions. But despite such a promising result, this technology has not spread to other areas without outside help. Thus this is the right time to document the experiences of these projects in terms of technology ingredients, organisational aspects, returns to investment, its impact on socio-economic development of the farming community, and conservation and upgradation of common property land. Hence, this topic on 'watershed development' was included for discussion in this Conference.

The importance of this topic can clearly be seen by the overwhelming response from researchers working in this area. In all, 40 papers submitted for discussion in the Conference are reviewed in this report. Some authors have attempted economic analysis by comparing with and without effects of watershed programme, while others have described mainly the functioning of the project. Most of the studies indicate increased profit and yield, change in cropping pattern, increase in employment potential, higher income and substitution of low value crops by high value remunerative crops. There are indications of shift in the consumer behaviour in favour of superior cereals and decline in poverty due to improvement in the income of the farming community. Some of the studies also indicate reduction in soil loss and improvement in water level due to various soil conservation methods.

A few of the papers have reviewed the performance of some major watershed projects and raised certain policy issues to remove constraints. The study by R.S. Deshpande and V. Ratna Reddy indicate that people and location are the two most important factors that should be considered while designing the project. They suggest that the watershed project needs improvement and can be implemented with modifications considering the needs of the people of the area and the major constraints faced by them. They also indicate that the economic impact of watershed treatment approach is always not dramatic but the dormant non-price benefits are quite important. The levels of inequality are lower in the watershed areas but sustenance of the flow of benefits as well as impact parameters is a direct function of community participation. Sitesh Bhatia addresses the issue of employment generation opportunities through integrated watershed development approach activities, such as soil and water conservation structures, afforestation, increase in cropping intensity through supplementary irrigation, horticulture, fisheries, dairy, etc., based on the results of some studies on the impact of watershed programmes. She suggests that the aim of watershed approach should be a socio-economic transformation of the entire region. Besides fullest use of available land and water resources, fullest use of manpower and improvement in the quality of life should be the main focus of these projects. All these can be broadly grouped into five categories, namely, approach guidelines, employment generation, watershed performance, soil conservation and use of improved technology.

Y.V. Reddy *et al.* examine the approach for watershed development programme in India.

They provide the history of watershed development, its concepts and scope. They have not discussed the results of any specific watershed but have discussed the performance of the watershed programme in general. They suggest various policy modifications for improving land and water management, input supply, tractor hiring, watershed/forest land development, credit and insurance, extension education and marketing which are useful for future development of the watershed programme. V.B. Angadi mentions that the watershed policy thrust has been more on crisis management than on developing risk aversion mechanisms. Lot of expenses are incurred on minimising immediate stress of drought, not on 'drought proofing' and thus avoiding recurrence of risk and uncertainty arising from drought. He indicates that there are significant improvements in the yield level of many crops due to watershed development. But the performance of all projects is not equally satisfactory and there are a number of weaknesses, such as lack of proper comprehensive plan and lack of co-ordination among departments, no active involvement of local people and organisations, lack of motivated staff and flexibility in the use of funds and cumbersome loan procedure. Besides, two main constraints, *viz.*, alternative use of increased production and proper marketing facilities have also been ignored. He suggests that better co-ordination between development agencies and voluntary organisations is essential for effective implementation of the watershed project.

Katar Singh critically analyses the farmers' participation aspect in four main watershed projects, such as Mittemari (Karnataka), Participative and Integrated Development of Watersheds (PIDOW) (Karnataka), Ralegaon-Sidhi (Maharashtra) and Sukhomajri (Haryana). He indicates that active people's participation in watershed development and management depends on expected private benefits and costs of participation; organisation of farmers in small groups; honest and good local leadership, existence and enforcement of rules for fair and equitable benefits from collective action; involvement of non-governmental organisations in organising, training and motivating the farmers; besides willingness and ability of the government to provide financial and technical support. In another study, R.S. Sidhu *et al.* have assessed the impact of three major projects (Makkowal, Katour-Manhota and Atwarapur Dam) on productivity and income of the beneficiaries by using cost-benefit analysis of the projects. Their study indicates that two out of the three projects are economically viable and significantly helped in enhancing the productivity and income of the beneficiaries. The cropping intensity increased and more fallow land is brought under cultivation. But the third project miserably failed because of inappropriate location of the project and heavy cost compared to low catchment area and seasonal nature of the rivulet feeding the dam.

A.J. Singh *et al.* and H.S. Sandhu *et al.* have analysed various components of watershed development projects in the Shivalik hills (known as Kandi Project) in the Punjab. They indicate that the progress of forestry and tree plantation was remarkable. But the progress in bhabbar/fodder grass was deplorable mainly due to lack of choice for proper fodder plantation, overgrazing by animals and lack of co-ordination between animal husbandry and forest departments. The progress of horticulture project was remarkable as the number of trees planted was much higher than planned and the estimated internal rate of return (IRR) varied from 26 to 44 per cent and the benefit-cost ratio was 2.2 to 2.5 at 12 per cent discount rate for different orchards. Various soil conservation methods, such as land levelling and bund terracing activities were quite good and resulted in an increase in the cultivated area.

The gross margin increased by 68 per cent during three years of the project. The livestock, such as buffaloes, cross-bred cows and goats provided to cattle owners were insured against death and natural calamities at 50 per cent cost of insurance borne by the animal husbandry department. Also, cattle feed and fodder provided at subsidised rate were quite helpful in making this project a success. A new programme of cattle exchange introduced was quite effective. However, livestock components of the project faced some constraints because balance feed as assured was not given by the department concerned. Poultry and piggery were also partially successful. Targeted ponds could not be renovated as originally planned. Irrigation and drainage remained under-developed and under-utilised. But whatever limited irrigation was developed, it helped in improving cropping pattern and productivity. The economic rate of return was relatively low (8 per cent) against the expected 12 to 20 per cent for various components of watershed. The project was partially successful as it helped in solving the major problem of ecological degradation. Despite theoretically excellent organisational set-up, practically integration and cohesion between the departments were not satisfactory.

Amar S. Guleria's study deals with watershed approach for sustainable development (Gamrola and Kotgarh) in the Sutlej catchment of Himachal Pradesh. He assesses the carrying capacity of land with respect to human and cattle population under existing and improved levels of technologies and suggests that for sustainable development some key variables like livestock and population pressure on land should be kept in mind while designing the watershed plans. Similarly, the study by J.P. Bhati *et al.* indicates that economic and environmental considerations should be integrated in such a way that it is consistent with the basic socio-economic needs of the people for sustainable resource management of their highly vulnerable habitat. They suggest that there is a need for watershed project to consider soil conservation, restoration of trees/grass cover on common pastures and forest land, improvement in soil moisture storage, construction of tanks/ponds and other minor irrigation structure for efficient water harvesting. The study stresses on the integrated development of food, fodder, fuel sub-component and income generation for the farming system in each watershed. They further suggest that accurate information regarding topography and development of micro-watershed based on natural boundaries of each tributary or drainage area is necessary for designing a proper project. Planting of high value crops and generation of gainful employment through agro-processing activities should be promoted.

S.P.R. Chaurasia and L.R. Singh have examined soil loss caused by planting crops on different soil terraces during rainy season and tried to identify alternative cropping systems to minimise soil loss. They have classified the cultivable land into five groups based on traditional and improved terraced land with and without access to irrigation. Using linear programming technique they found that soil loss was minimum on terraced (both improved and traditional) land compared to unterraced land. They suggest that avoiding planting crops on land having steep slope of more than 30^0 would reduce soil loss to a large extent and certain modification in croppoing plan might help in increasing higher return.

D.K. Mahandule *et al.* compare the changes in resource use structure and returns from crops before and after the implementation of watershed development programme in the drought-prone area of Western Maharashtra. They indicate that the watershed development activities are effective in reducing soil loss and increasing the irrigated area. Low value

crops have been replaced by high value crops and increases in the level of input use improved the level of income and employment. The study by Ashutosh Shrivastava *et al.* in Chambal River Valley indicates that several soil conservation practices, such as bench terracing, bunding and pasture development helped in reducing loss of top soil going to the rivers. However, bench terracing is found most effective compared to other soil conservation measures. Shift in cropping pattern is also noticed in favour of remunerative cash crops. The cropping intensity increased mainly because of increase in *rabi* cropping. The yields of most of the crops increased. The project was helpful in increasing wage rate and gainful employment.

Sibranjan Misra's study in West Bengal indicates increased irrigation leading to higher crop diversification and substitution of low value crops with more profitable crops due to watershed technology. The land productivity increased by more than seven times and the employment opportunities increased substantially. Afforestation programme improved the fodder availability. He suggests that to make the programme more effective technical aspects, land levelling, improvement of field channel and drainage and channel layout should be initiated and active participation of local institutions should be encouraged. In another study in West Bengal, M. G. Ghosh finds that there is a significant increase in the area under vegetables, mustard and potato due to increase in irrigation. The relative increase in the yield of important crops is higher in the command area than in the non-command area. Since these areas are dominated by marginal and small farmers, they are the major beneficiaries of this programme.

T. Alagumani's study in Avinashi taluk in Coimbatore, Tamil Nadu indicates that various soil conservation measures such as contour bunding, disc ploughing and sowing on the contour bunded area with seed drill, etc., are helpful in increasing the yield of most of the crops, except groundnut which declined by more than 50 per cent. The study by O. Timothy Randhir and M. Ravichandran shows that check dams and disc ploughing accounted for 30 to 32 per cent of the total cost of Rs. 1,667/ha. They noticed that after the introduction of watershed programme, there was change in the cropping pattern and two new crops such as cotton and cowpea were adopted by the farmers. There was substantial reduction in the number of gullies and increase in water level. But despite the awareness of soil degradation problems, only 69 per cent of the farmers maintained the watershed structure. They suggest that increased farmer participation and subsidies are important for the success of the project.

A study by G.N. Singh and Rajesh Kumar Singh indicates that the watershed project is helpful in increasing the double cropping which was earlier a rare practice. Existing fallow and uncultivable land was converted to fruits plantation and pastures. Improvement in groundwater table helped in installing a number of dug wells and shallow tubewells. This resulted in higher cropping intensity from 100 to 156 per cent. The area under pearlmillet, sorghum, wheat, mustard and lentil increased but that under pigeonpea and chickpea decreased. Some new crops such as soyabeans, vegetables and other pulses are introduced in this area. The productivity of many crops and fodder production also increased. The milk production increased substantially due to an increase in the availability of fodder and in the number of livestock, specially buffaloes. Regular employment of both men and women as well as their income increased considerably. About 90 per cent of the poor families escaped poverty during a period of five years.

The study by K. G. Kshirsagar and R.D. Ghodake draws lessons from the micro-watershed experiment on 3 to 25 ha conducted at ICRISAT Center and on the farmers' fields for several years. The results indicate higher potential for the watershed technology specially in assured rainfall areas with deep black soil. However, they suggest that provision of adequate credit in time and farmers' participation are the critical factors for the success of the project.

T. Selvin Jebaraj Norman *et al.* examine the impact of the watershed development project in Kerala. Their study showed that subsidy was an important component for the success of the watershed project. On an average, each beneficiary received Rs. 2,281 as subsidy,of which 78 per cent was for land development, 18 per cent for fertiliser and 4 per cent for seedling/seeds. About 25 per cent of the beneficiaries were benefited by the land development programme. However, agricultural wages and income increased marginally. The farmers expressed that the amount of subsidy provided to them was small and wanted that this should be continued for irrigation development. They also indicated cumbersome procedural formalities in getting subsidies at proper time. On the other hand, the programme implementing agency faced numerous difficulties in implementing the programme due to lack of trained manpower. It was indicated that other programmes, such as forestry, pasture development and dairying should have been given enough attention. However, the project was not very helpful in improving the income level of the farmers.

D.B. Yadav *et al.* have examined the effect of the comprehensive watershed development programme of Daate village, Kolhapur, Maharashtra. Their study indicates that the project helped in reducing soil loss and averted nutrient and organic matter loss significantly. There is decline in the run-off and increase in moisture storage and groundwater recharge. The project also helped in increasing cropping intensity and bringing more area under cultivation. Many new crops are introduced in the area. D.V. Jahagirdar's study in Maharashtra has indicated increase in cropping intensity due to higher increase in *rabi* cropped area mainly because of increase in irrigation. Crop yields in contour cultivation are consistently high and indicate declining trend in the yield differences over time. Contour cultivation is found helpful in improving yield specially in low rainfall years whereas during high rainfall years yield is quite low.

B.V. Singh and D.D. Gupta have examined the socio-economic impact of the watershed project in Bunga, Ambala district, Haryana. They indicate that increased availability of assured water supply for irrigation and introduction of new high value crops in the area improved the socio-economic status of the people in that area. This is clearly reflected by improvement in social amenities. Positive benefit-cost ratio suggested that the project was economically viable. M. G. Nema *et al.*, examining the impact of watershed development in Madhya Pradesh, indicate that the cropping intensity is higher in the command area than in the non-command area. The farmers in the command area adopted improved technology and used higher level of fertiliser. The yields of most of the crops are higher in the command area than in the non-command area. However, they indicate that still there are some constraints which need to be removed. Dibakar Naik and Binod Chandra Mohanty describe the features of the Dhobakia nala mini watershed (Orissa State) in relation to cropping pattern, land use and land holdings. Based on the status report, they suggest afforestation and rehabilitation of degraded forests by planting quick growing species plants and trees for fuel and fodder use. M. Kiran Sankar Reddy and M.R. Naidu have estimated the benefit-cost

ratios of beneficiary and non-beneficiary farms developed under Uppalur watershed area (Andhra Pradesh State), using different performance criteria, such as farm business income, family labour income and net income. The authors have found that the minor irrigation facilities created by the watershed programme improved the asset structure of the beneficiaries and provided increased employment opportunities, specially in crop production activities. In general, the benefit-cost ratios at all levels of profit are higher for the small and marginal beneficiary farmers, indicating the better impact of the watershed programmes on crop productivity.

B.K. Sikka *et al.* have examined the impact of the watershed development programme on crop productivity and labour utilisation in rainfed areas of Kalol sub-watershed in Himachal Pradesh. They have indicated the major constraints faced in the programme and suggested ways for efficient working of the programme. The study has revealed that the impact of the programme on labour utilisation was marginal while no impact was observed on seed rates and fertiliser consumption. There was marginal improvement in the productivity of important crops due to extension activities. The study indicated that the major constraints faced by the programme were inadequate staff, lack of infrastructure facilities and small funds for land and water management works. They suggest that more importance should be given for developing suitable varieties of oilseeds and pulses (less water consuming crops) to increase not only the income but also to enrich the soil quality. Another important suggestion relates to provision of timely credit to the beneficiaries to encourage the adoption of recommended package of practices. However, they have indicated that this programme would have been more beneficial when all the developmental works (engineering structures) of the watershed were completed.

Rajendra Singh and K.N. Thapaliyal have studied the national development projects in Bundelkhand region of Uttar Pradesh. They indicate that the watershed approach helped in raising the underground water table, increasing the cropped area and the intensity of cropping. There were shifts in the cropping pattern from cereals and oilseeds to pulses during *kharif* and from cereals and pulses to oilseeds during *rabi*. Input levels increased and the productivity of almost all crops increased, except pigeonpea and barley. They also show that there is a need to increase the number of ponds or percolation tanks to contain excess rain water for increasing groundwater recharge. However, they suggest that small and marginal farmers should be encouraged to adopt silvi-pastoral system or agro-horticultural systems while the landless labour should be allotted community land on long-term lease to take up these systems.

M.R. Alshi *et al.* examine the impact of land development activities is Gunj watershed development project in Akola, Maharashtra. Their study indicates that mainly two land development activities, namely, 'nalla' training (strengthening, widening and deepening of water stream passing through fields) and reclamation of ill-drained soils, are initiated in the watershed area. The reclamation of ill-drained land was more effective in improving the yield and crop income than nalla training. S.B. Undirwade *et al.*, examining the effect of watershed development programme on changes in the resource use pattern and net returns in respect of crop production in Gunj watershed in Akola, Maharashtra, indicate that increased use of plant nutrients (N+P+K) over time resulted in an increase in the yield of crops. The total cropped area increased mainly due to increase in the cropping intensity and additional area brought under cultivation. This also indicates that the project is helpful in

increasing the demand for bullock and human labour considerably.

A.A. Biradar and M.S. Kallur separately deal with the socio-economic and techno-economic issues of a watershed in Gulbarga, Karnataka in two papers. This macro-watershed with an area of 46,714 ha covering 56 villages is sub-divided into 16 sub-watersheds. They indicate that during the period of three years, soil erosion is reduced considerably and the increased groundwater recharge helped in improving soil moisture. All this helped in increasing the crop yield and income by 80 to 100 per cent. The increased cultivable area due to reduction in soil erosion and degradation helped in increasing double cropping and reduced salinity problem. R.V.V.S.G.K. Raju *et al.* have evaluated the economic impact of Chevella watershed project in Medak district of Andhra Pradesh. The study has provided detailed useful information for a longer period and indicated that the short-term or immediate benefits of the watershed programme were minimal. Wherever benefits were significant, it was due to subsidies granted to watershed farmers in the initial period. They indicate that the real benefit of the programme will be known only in the long run.

P. Lakshmi Narasamma *et al.* have analysed the economic impact of Mittemari watershed in Kolar district of Karnataka. The study indicates that the watershed technology is profitable but it has made no real impact on income, employment and standard of living. They feel that the real impact can be worked out only in the long run after considering all aspects of watershed development, particularly when soil and water management techniques and social/farm forestry are fully implemented.

Swarn Lata Arya *et al.* have measured the economic efficiency of watershed management system in Ambala district of Haryana and indicated that at the micro level the watershed helps in increasing cropping intensity and net return because of increased supplemental irrigation. Using decomposition technique they estimated the contribution of different technologies in the total change in crop production. The results indicate that water management accounted for 50 per cent increase in the net returns for wheat and 32 per cent increase for all crops taken together but irrigation and fertiliser inputs are identified as important factors in increasing net returns per ha. However, they did not indicate what was the effect of irrigation and fertiliser in the rainfed area. D.K. Singh has examined the effect of watershed on land use and cropping pattern in the catchment area of Matatila river valley project in Uttar Pradesh. The integrated watershed development programme helped in reducing silt load and in increasing the life of the reservoir. It conserves rain water and run-off in increasing sub-soil moisture and groundwater recharge. A number of programmes, such as farm forestry, horticulture and silvi-pastures were introduced in dryland areas. In addition, contour bunding, gully plugs, check dams, sub-mergence bundies and small tanks were constructed in the catchment area on community and individual basis. The results indicated that though the owned area of the beneficiaries reduced marginally because some land was allocated to various land development programmes such as bunds, channel and drains, etc., the net area sown and gross cropped area increased marginally. The cropping intensity increased and there was shift in the cropping pattern and high value remunerative crops increased and replaced the low value crops.

S.D. Suryawanshi *et al.* have examined the economic impact of Kolhewadi watershed in Ahmednagar, Maharashtra. Various land development activities such as contour bunding, land levelling, nalla bunding and maintenance and farm ponds were initiated in the project area considering the available resources in the region. The study indicates that soil and water

conservation activities are helpful in improving the irrigation potential while contour bunding helped in reducing the velocity of run-off water and soil erosion. Nalla bunding and old percolation tanks performed well in storing water and increasing recharge of well down-stream. The deep soils with 30-40 cm depth were diverted to *kharif* crops like pearlmillet, chickpea and sunflower. The *rabi* sorghum area was diverted to oilseeds and pulses. Some horticultural crops were introduced in the area and the yield of most of the crops increased significantly.

There are other studies which do not necessarily fit within the scope of the topic concerned. Some of these are by M. Narayana Reddy *et al.*, G.V.K. Rao *et al.* and S. Hafeez *et al.*

Issues for Discussion

Most of the papers indicate that watershed projects are helpful in increasing income and employment due to shift in crop-mixes in favour of superior high value crops and increased yield, improvement in soil moisture and reduction in soil erosion, increase in irrigation potential and water level. This clearly indicates that the watershed development is a good concept and must form the basis of planning soil conservation, land improvement and afforestation (Vaidyanathan, 1991).

The basic question arises that despite such a high profitability (ranging from 200 to 700 per cent) from watershed approach, why this technology has not been accepted by the farmers on a larger scale? Why has it not spread even to the neighbouring areas of the watershed programme? Is it because the adoption of watershed technology is highly influenced by subsidy component and government intervention? The evidences indicate that when the government/researchers' interventions and subsidy are withdrawn, most of the farmers have reverted back to traditional method. What are the major constraints to adoption and spread of this technology - lack of resources, lack of knowledge, lack of interest or the habit of increased dependence on subsidy or outside help? Have the farmers themselves taken any initiative on their own? Once the technology has helped in increasing the income level of the farmers, then why do the farmers still look for subsidy? How long subsidy or credit can be provided? Could farmers be able to manage the inputs from their own saving due to increased income? How the gains from this technology were distributed, *i.e.*, who benefited more from technology? If this technology has not been very effective as expected, then was it because of some organisational problem or lack of proper understanding of the problems of the people/area. In other words, was it due to poor participation of the people and if yes, then why the participation was low and how can it be improved?

In most cases it was observed that it was mainly improved seeds, increased use of fertiliser and increased access to irrigation, which were responsible for improvement in yield/income and change in the cropping patterns. Then the question arises which component of technology contributed most to the success of these projects? What was the direct contribution of individual component of technology in reducing the soil erosion and increasing the moisture retention capacity of the soil. What were the initial cost and operational cost of this technology? Who will share the initial cost and operational cost for maintaining those structures. Various components of watershed technology need to be examined thoroughly in a holistic way. A number of suggestions, such as the concept of cyclical credit, service area approach,

micro-watershed sanghas, *etc.*, have been made to make the watershed approach more effective but it is not clear how far these experiences from different watershed projects can be replicated. However, some of the major issues related to watershed concepts are outlined below:

1. Does the watershed concept differ in rainfed and irrigated areas? and do we need different approaches for these two areas?

2. How effectively can we increase the farmers' participation and integrate the activities of government and voluntary organisations?

3. How can we encourage farmers to adopt new technologies without providing subsidy for long period? How can adequate credit be provided well in time?

4. Which component of watershed technology is more effective in improving the income of the farmers and maintaining ecological balance for sustainable development?

5. How can we assure the maintenance of watershed structure in the long run? Who will share the cost for such investment?

6. Do we need a set of watershed technology suitable to different homogeneous agro-ecological environment?

7. Do we need a separate watershed agency with all the powers for effective co-ordination and implementation of watershed activities?

8. Do we really have adequate and appropriate technologies to meet site specific requirements of the people? and can we replicate the experiences of successful watershed projects?

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