CHAPTER IX

SUMMARY AND CONCLUSIONS

Dryland regions play quite a significant role in the Indian economy. Bulk of the country's coarse cereals output, oilseeds, pulses and cotton output, apart from that of other agricultural commodities is from the dry regions. A large proportion of India's poor also reside in the dry regions. The development and prosperity of the dry regions, thus, holds the key to the development and prosperity of the country as a whole. However, the development of dryland agriculture poses immense challenges because of a host of constraints specific to the dry regions. The development of these regions which are characterised by poor resource base and multi-dimensional problems needs an approach which not only aims at improving the natural resource base of the region but also rational use of these resources to support the economic growth without disturbing the ecological balance. Realising the above, the government emphasised the need for the development
Watershed Development Programmes (WDPs) have been initiated in the country to improve and sustain productivity and production potentials of the dry regions at higher levels through adoption of appropriate production and conservation technologies as also meet the community needs for food, fuel, fodder and timber. Unlike traditional approaches to development where the revenue or administrative boundary is adopted as the appropriate unit for development purposes under watershed development approach the watershed is adopted as the unit for development i.e. it considers the organic boundary as the suitable unit for development. A 'watershed' is an area having common drainage where the rainwater falling in an area coming within a ridge line can be harvested. It aims at improving the lands falling within the drainage irrespective of ownership, for soil and water conservation. This in turn will help to achieve better crop and range, land husbandry and restoration of lands. It is a holistic approach to development and endeavours to improve the economic and natural resource base of the dry regions.
Karnataka State where dryland agriculture is significant and which also has been in the forefront among states of India in implementing watershed development programme was selected for the conduct of the present study. In the state two parallel programmes i.e. District Watershed Development Programme (DWDP) and National Watershed Development Programme (NWDP) are in operation which are implemented respectively by the Dryland Development Board (DLDB) and the Department of Agriculture. DWDP covers all the 19 districts of the State. Considering its unique organisational features and other aspects we confined our study to DWDP.

The study attempted both a macro-level analysis of the financial and physical progress of DWDP in the state and the programme's impact on selected variables based on secondary data, and a micro-level analysis of farm survey data to study the programme's impact on cropping pattern and intensity, crop yields, costs and incomes, employment, non-arable development, soil and water conservation, etc. For an in-depth study Mittemari Watershed in Kolar district and a non-project area for comparative purposes was selected. Totally 193 farm households i.e. 138 from WPA and 55 from NPA were selected on systematic sampling basis with a random start for an in-depth study. Of the 138 sample households in WPA, 50 were selected from the upper reach
and 88 from the lower reach. This was to enable us to see whether costs and benefits have been shared equally or not by different groups of farmers in WPA. The reference year for the study was the agricultural year 1989-90. A 'Before and After' or a 'With and Without' watershed project approach common in project appraisal or impact studies has been followed in the study.

The major findings of the study are as follows:-

A) Macro-Level Analysis:

An analysis of the progress of District Watershed Development Programme in the state both in financial and physical terms consolidated from 1983-84 upto 1989-90 revealed that the agricultural sector i.e. arable land development received the highest priority both in terms of financial share and coverage of area than the forestry and horticultural sectors. The agricultural sector alone accounted for about 49 per cent of the total investments under DWDP; the share of forestry and horticultural sectors were respectively 41 and 10 per cent. However, taking the average figure for the entire period under review the per hectare investment for the forestry sector was the highest being
Rs 6270; the same for horticulture and agricultural sectors respectively were Rs 3696 and Rs 1088 per hectare.

The possible reasons for the relatively lower share of forestry and horticulture sector in total investment under DWDP are: Unlike the agricultural sector, the forest and horticultural sectors required relatively higher per hectare investment. Also the long gestation period between investment and returns from forestry and horticulture compared to agriculture, and the desire to get immediate benefits from DWDP without much time lag which was essential to get people's support and interest for DWDP necessitated priority to investment for the agricultural sector than the other two sectors. From 1988-89 onwards the share of forestry and horticulture sectors has been improving.

With regard to physical progress in terms of area treated, soil and water conservation received high priority. Across the three rainfall zones, the proportion of the area treated for soil and water conservation in the agricultural sector to total arable land was the highest in the low rainfall zone, its cumulative percentage being about 63.40 of arable land treated for SWC. For the state as a whole under DWDP about 59 per cent of arable land was brought under SWC
measures. In the case of forest sector the proportion of non-arable land brought under forest cover was 18.83 per cent and in the horticultural sector only about 3 per cent of the total watershed area has been planted with horticultural plants. Comparatively this poor progress in horticulture sector was mainly due to delay in implementation of this programme, lower targets, higher priority to arable land development, etc.

An analysis of the physical progress of individual activities in all the three sectors indicated variations across zones. SWC measures received high priority in the low rainfall zone whereas water harvesting structures became the principal activity in the high rainfall zone where the management of surplus water is the main problem. In the case of forestry sector block plantation on common lands and in the case of horticultural sector orchard-horti plantations on private lands reported good progress, in terms of coverage of area and achievements of targets.

The impact of WDP on adoption of dry farming technology such as improved cultivation practices and use of modern inputs is positive. For instance, for the state as a whole, 70 per cent of the total treated area in agricultural sector has adopted contour cultivation with keyline. The area covered by HYV/improved seeds
was about 79 per cent to the total area treated in the agricultural sector. Similarly, fertiliser use has increased.

Analysis of secondary data revealed that WDP had a positive impact on employment generation, crop yields, ground water table and area irrigated, and also led to higher returns from crop farming.

(B) Micro-Level Analysis:

Our analysis of primary data indicates that watershed development programme has brought about a noticeable change in the cropping pattern in the Mittemari Watershed. This has resulted in a shift from mono-cropping to mixed and inter cropping and also from local to cultivation of improved/HYVs of major dry crops as well as a shift towards cultivation of cash and high value crops. It has also led to greater crop diversification and commercialisation of agriculture. New crops like onion, maize and water-melon were cultivated in WPA. Among rainfed crops groundnut with redgram (inter-crop) claims the highest share in the total cropped area in both WPA and NPA for all size groups of holdings.
There are also conspicuous differences in the cropping pattern between the upper and lower reaches of WPA. There is greater crop diversification, especially among irrigated crops in the upper reach than in the lower reach. The proportion of irrigated area to total cropped area was also higher in the upper reach among all strata of holdings. In the upper reach, even the small and medium holdings with up to 4 hectares have taken to cultivation of cash and high value crops. A spurt in investment in borewells and development of water markets in WPA, especially in the upper reach explain these shifts in the cropping pattern in WPA, apart from other factors.

Improved moisture availability and adoption of modern technology are expected to improve cropping intensity. The cropping intensity as measured through the multiple cropping index was found to be higher for large holdings in WPA compared to in NPA; small and medium holdings, however, reported cropping intensities to be slightly lower in WPA than NPA. However, in the upper reach the cropping intensities were higher than in the lower reach and NPA among all strata of holdings. However, the traditional cropping intensity index indicates only the extent of multiple cropping and cannot capture the intensive use of land brought about
by increasing the plant population density through mixed and intercropping. As noted earlier, there has been a shift from monoculture to mixed/inter-cropping in WPA which indicates an improvement in cropping intensity in WPA as compared to in NPA. In all situations cropping intensities also varied directly with farm size.

The per hectare yields of crops cultivated in WPA and NPA varies across crops, seasons and holdings. Among dry crops ragi with its intercrop, pulses, recorded higher yield per hectare in WPA than NPA among all strata of farmers. Taking all the farms together the per hectare yield of ragi + pulses was 559 + 30 kgs in WPA as against 364 + 26 kgs in NPA. In the case of groundnut and redgram (intercrop) WPA reported higher per hectare yields than NPA for all holdings upto 4 hectares. In the case of redgram all size groups of holdings reported higher yields per hectare in WPA than in NPA.

In the case of irrigated crops, it is interesting that among the kharif crops per hectare yields were higher in NPA than WPA during the reference year. For instance in WPA as a whole the per hectare yield of kharif paddy was around 3157 kgs in WPA and over 4150 kgs in NPA. In contrast to this, the per hectare yields of rabi crops were higher in WPA than
NPA, among all strata of holdings, i.e., 3615 kgs and 3150 kgs for rabi paddy in WPA and NPA respectively. Taking the aggregate figures for paddy over the two seasons it is significant that small and medium holdings recorded higher per hectare yields in WPA than NPA.

As regards the relationship between size of holdings and productivity, there was no consistent or uniform relationship and it is found to vary across crops, seasons, and regions.

The yield differentials between WPA and NPA is sharper when we analyse the value productivity of various crops and crop groups. WPA reported higher per hectare value productivity of groundnut for holdings up to 4 hectares. The per hectare value productivity of aggregated irrigated crops and total crops as a whole is distinctly higher in WPA than in NPA for most strata of farms. As mentioned earlier, a spurt in investment in borewells, greater crop diversity, increased area under irrigation, adoption of dry farming and conservation technologies and crop pattern differences explain the relatively higher value productivity of crops in Mittemari Watershed compared to NPA. There is no consistent or uniform relationship between farm size and value productivity of crops across crops, seasons and regions. However, it is interesting that the per
hectare value productivity of crops among small farmers in most cases were higher in WPA than NPA. This indicates that small farmers have also shared in the gains of growth due to watershed development activities.

To see whether the difference in mean value productivity of various crops/crop groups between WPA and NPA was statistically significant or not we conducted a difference of means test. The results indicated that although in a majority of cases the mean value productivity of most crops/crop groups was higher in WPA than NPA, these differences were not statistically significant. Non-adherence to recommended package of inputs, in situ moisture conservation and cultivation practices, apart from a dry spell of six weeks in WPA during the reference year which pulled down the crop yields may explain this to some extent. It is apparent that the kind of yield increases recorded in the green revolution belt has not occurred. However, considering that low or stagnant yields have been a chronic feature of the dry regions, any improvement in yields as seen in our watershed area is to be welcomed.

Apart from enhancing crop yields, reducing the variability of crop yields is also one of the objectives of the Watershed Development Programme. To examine the variability of crops yields cultivated in WPA compared
to NPA we used the coefficient of variation (CVs). The results indicate that the variability of yields of dry crops as a whole and of groundnut with redgram as an intercrop was slightly lower in WPA than NPA, especially among small farmers. However, for other crops especially irrigated crops variability of yields was higher in WPA than NPA for all size groups of holdings. The tendency for yield variability to rise with growth is not unusual and is well documented in the development economic literature. It is interesting that even small farmers of WPA reported variability in yields of irrigated crops to be higher than the same in NPA. This could be because irrigated crops being more profitable and less risky, even small farmers are willing to bear greater risks by investing on irrigated crops.

To study the input-output relationship and also assess the role and contribution of different inputs to yields of various crops in WPA and NPA we fitted per hectare production functions. Two functional forms one linear and the other log linear using ordinary least squares method were fitted. Separate production functions were fitted to each size groups of holdings and for major crops and crop groups common to both WPA and NPA.
The results of the per hectare production functions revealed that the contribution of human labour input and fertiliser to crop productivity was positive and in most cases statistically significant in WPA for most crops and crop groups. This is significant, because many production function studies of Indian agriculture have indicated the marginal productivity of human labour to be low or negative, implying their overuse in Indian agriculture. Watershed development programme with its emphasis on use of better crop production and conservation technologies which are labour intensive in nature has helped to promote more and better use of human labour. The fertiliser variable also is positive in a majority of cases for dry crops, which indicates the scope for increasing the productivity of dry crops through application of fertilisers.

An analysis of the costs and returns of major crops and crop groups cultivated in WPA and NPA indicates that watershed development programme has led to higher per hectare investment for cultivation of both dry as well as irrigated crops. The per hectare costs of cultivation in terms of different cost concepts for rainfed and irrigated crops in most cases were higher in WPA than the NPA. For instance, taking all the farms together the per hectare costs in terms of Cost 'C' for
total dry crops was Rs 3084 in WPA as against Rs 2670 in NPA. This was due to increased use of modern inputs and hired labour for crop cultivation in the watershed area. Watershed development programme has led to greater monetisation of inputs for dry as well as irrigated crops, among all strata of holdings. It is interesting that even a subsistence crop like ragi, and small farmers reported greater level of monetisation of inputs in WPA than the same in NPA.

Regarding the relationship between per hectare costs and farm size we came across varied situations among the crops. While in WPA the per hectare costs for dry crops varied inversely with holding size, in NPA it indicated a 'V' shaped relationship. In the case of irrigated crops the per hectare costs in WPA had a 'V' shaped relationship with an increase in size of holdings and in NPA an inverse relationship. For total crops the per hectare costs varied directly with holdings size in WPA; in NPA it varied inversely with holding size upto 4 hectares and then again rose among large holdings of above 4 hectares. While among small farms higher per hectare costs are due to capital indivisibilities and high overheads, among the large farmers per hectare costs are high due to their better access to resources and markets.
Within WPA in the case of rainfed crops the per hectare costs up to cost 'B' were higher in the lower reach than in the upper reach for small and medium holdings. In respect of irrigated crops the per hectare costs were higher in the upper reach. Thus, on the whole, watershed development programme has led to greater per hectare investment and monetisation of inputs for both dry and irrigated crops, among most strata of holdings.

Another important aspect which we examined was whether there was any economies of scale in crop production in WPA as compared to in NPA. It was observed that economies of scale seemed to favour small farmers in WPA with respect to ragi production; whereas in respect of groundnut and irrigated paddy, the advantage was in favour of large farmers. In NPA, for these three crops, the per unit cost of production in terms of both cost A3 and cost 'C' were relatively the lowest among large farmers. Overall our analysis shows that the per unit cost of production of ragi was relatively lower in WPA than in NPA in terms of both costs A3 and cost C. For other crops like groundnut and irrigated paddy NPA reported lower per unit costs of production than WPA. The higher per unit cost of production for groundnut and paddy in WPA was due to higher use of modern and market inputs.
Regarding profitability, our analysis reveals that in the case of rainfed or dry crops profits or surpluses were reported only over paid out costs. Profits over cost 'C' which includes all paid out costs and imputed costs of farm produced and owned inputs including family labour was negative for dry crops both in WPA and NPA among all size groups of holdings except for large holdings in NPA. In the case of irrigated crops, profits over cost 'C' are not only positive both in WPA and NPA but also they are much higher in WPA than NPA for most strata of holdings. However, what is most significant to note is that for total crops, while profits over cost C are positive in WPA for all strata of holdings, in NPA most strata of holdings reported negative returns. Taking all farms together, profits over cost C was Rs 752 per hectare in WPA as against Rs -73 in NPA. Although the profits over Cost C for small and medium holdings in WPA is not large, this finding is significant since most farm management studies in India using data for the 1950s, 60s and 70s had reported negative returns from crop farming when profits were calculated with reference to Cost C. In general, profits per hectare varied positively with farm size.

The upper and lower reaches reported surpluses over all paid out cost for rainfed crops; however in the case of ragi + pulses large holdings in the upper reach
reported profits over cost 'C'. In respect of irrigated crops both the upper and lower reaches recorded profits over all cost concepts. Profits over cost 'C' was relatively higher in the upper reach than in the lower reach. Overall, for crop farming as a whole the upper reach reported higher returns/profits among all strata of farms as compared to that in the lower reach due to the greater weightage of irrigated and high value crops in the upper reach.

To assess the returns per unit of investment we also calculated output-input (OI) ratios. For dry crops the OI ratios were below unity both in WPA and NPA. In contrast to this, for irrigated crops the OI ratios were not only greater than unity both in WPA and NPA but also much higher in WPA than in NPA. For total dry crops the OI ratios were higher in the lower reach of WPA for all strata of holdings upto 4 hectares; whereas in the upper reach large farms reported higher OI ratios. In the case of irrigated crops although these OI ratios were greater than unity for all size groups of holdings both in the upper and lower reaches they were much higher in the upper reach than in the lower reach. Taking all crops together farmers of WPA reported higher returns per rupee of investment as compared to the same in NPA. This indicates that
farmers in their investment and resource allocation decisions keep an overall perspective in view and hence try to offset losses from one crop or crops through profits from other crops. Hence their concern is to maximise returns from crop farming as a whole.

Watershed development programme has also augmented employment opportunities in crop production among all strata of holdings. The per hectare labour input for crop production both for dry and irrigated crops were higher in WPA than in NPA. Within WPA the upper reach reported higher per hectare labour input both for rainfed and irrigated crops. Watershed development programme has resulted in increased use of family and hired labour as well as that of both male and female labour, for most crops and crop groups under review among all strata of holdings.

The average household income and per capita income of the sample farm households were higher in WPA than in NPA for all size groups of holdings. This difference in the average incomes between WPA and NPA was quite conspicuous among large farmers. We also tried to find out the impact of WDP on poverty levels in our study area. As per the estimates of Dandekar and Rath the poverty line for rural Karnataka during 1960-61 was Rs 172 per capita per annum. Using the Consumer
Price Index for Agricultural Labourers was inflated this figure to arrive at the poverty line of Rs 1302.04 per capita per annum for rural Karnataka in 1989-90, our reference year. It is interesting that in WPA while small farmers reported per capita income above the poverty line, in NPA it was below the poverty line. This shows that WDP has helped in reducing poverty. Interestingly in both WPA and NPA, medium farmers continued to be below the poverty line although the per capita income of medium farmers in WPA was higher than in NPA.

Watershed Development programme also seeks to diversify economic activities in the dryland region. It is interesting that small farmers in WPA, reported greater level of diversification of economic activities, than their counterparts in NPA. Watershed development programme also seeks to promote and improve animal husbandry activities in WPA. Our analysis indicates that small and medium farmers in WPA recorded higher returns from livestock enterprise compared to in NPA. A shift in favour of cross-breed livestock and reduction of goat population has also been noted.

With regard to adoption of dry farming technology our analysis indicates that though the impact of watershed development programme on adoption of dry
farming technology like recommended input package and improved cultivation practices is positive, the level of adoption varies across crops, holdings and regions. The farmers are also selective in adoption of these technologies. They generally prefer less risky inputs. For major dry crops like groundnut and ragi there was almost 100 per cent coverage of area under HYVs and also there was not much differences in this regard between WPA and NPA. However, in respect of redgram cultivated as an inter crop, there was a conspicuous difference between WPA and NPA. Use of HYVs for irrigated crops was widespread both in WPA and NPA among all strata of holdings. Regarding the fertiliser input, the proportion of adopters, area fertilised and intensity of application of fertilisers in most cases were higher in WPA, both for rainfed and irrigated crops. Among dry crops the per hectare fertiliser use was higher for groundnut than for ragi which is a subsistence crop. The irrigated crops reported higher level and intensity of use of modern inputs than rainfed crops both in WPA and NPA evidently, due to their greater profitability and lower risks. The rate of adoption of modern inputs for both rainfed and irrigated crops were generally higher among large farmers though small farmers in WPA reported the level and intensity of use of modern inputs to be higher than in NPA. Farmers of WPA in general
have not adopted the total package of inputs and practices at the recommended doses due to various constraints. The level of adoption of recommended in situ conservation methods is also partial. A majority of farmers of WPA fall within the group of 50 to 75 percent level of adopters of these practices. Individual practices like land leveling, deep ploughing, contour cultivation and dead furrows have been adopted by a majority of farmers. The level of adoption of these were, generally higher for large farmers, due to their better access to resources and knowledge. The constraints as perceived by farmers in adoption of these improved practices were: Non-availability of implements, lack of strong draught power, hindrance to inter cultivation, time consuming, lack of knowledge and proper training.

We analysed the economic viability of social forestry undertaken on common lands in our study area through social cost-benefit analysis. Sixty hectares of tankbed land in Mittemari Watershed has been afforested with Acacia Nilotica as a part of Watershed development programme. For estimating the benefits and costs cash flows were converted into real prices using the prices which were prevailing in the concerned villages during 1989-90. The cost considered were, the actual
establishment costs, recurring costs and opportunity grazing cost. To test the rigorousness of our results different sets of assumptions were used such as taking benefits at full value and benefits reduced by 50 per cent. We deducted two different levels of costs one excluding opportunity grazing cost and in another including it. This gives us 4 sets of possibilities. Three alternate discount rates, i.e. at 3, 5 and 8 per cents were used to estimate NPVs and BC ratios. The results established the economic viability of social forestry in terms of Net Present Value, BC ratios and internal rates of returns. Even at reduced benefits by 50 per cent including opportunity grazing cost the IRR was quite high, being 12.81 per cent. Unlike the experience of most watersheds under DWDP of Karnataka where arable land development received higher priority, in Mittemari investment on non-arable land development claimed higher share than arable land development. Both in terms of investment and area covered, among the individual structures strengthening of the existing bunds received high priority in arable land development.

To realise the benefits of the watershed development programme for a longer period on a sustainable basis, it is essential to maintain the soil and water conservation structures created. Generally this is the responsibility of the beneficiaries.
However, in Mittemari WPA the conditions of the soil and water conservation structures are not satisfactory. Many of the assets created are either damaged and/or in need of repairs. For instance, about 45 per cent of the SEBs are existing partially and require repairs. Among the structures gully checks and farm ponds were poorly maintained; most of them have broken or got damaged due to high velocity of surface runoffs during intense precipitation. With regard to moisture availability, water level in wells and tanks, availability of fuel, fodder, timber, etc., a majority of the sample farmers indicated that compared to the pre-project period there is not much difference after WDP. Thus, watershed development programme has not been able to realise fully its stated benefits in Mittemari watershed area in this regard.

Watershed development programme emphasises the effective participation of people in different stages of its development activities, starting from planning to implementation and maintenance of the SWC assets. In Mittemari Watershed although an informal committee called Village Resource Development Sangha was formulated, in due course, as reported by the Sangha members it was discontinued. As per the findings of this study people's participation in Mittemari Watershed was virtually nil in all stages.
Thus, overall our analysis indicates that watershed development programme has given encouraging results and offers a ray of hope to the disadvantaged dryland farmers of India. It has led to an improvement in crop yields, income and employment. Variability of aggregate dry crops is also marginally lower in UPA than in non-watershed area. It has improved the returns from crop farming. Although gains of this growth have accrued differentially, it is significant that small farmers have also shared in the benefits of this growth. It has also enabled small farmers to cross the poverty line. However, in other aspects, its achievements are less spectacular. Poor maintenance of SWC structures and lack of effective people's participation pose threats to the very sustainability of the developed watershed.

In discussing about the prospects and potential of watershed development programmes in promoting the development of dryland regions in the state and country as a whole, there are quite a number of issues that come to the fore. Firstly, the question of the replicability of these programme in other regions assumes importance. Here we may note that quite a number of studies reviewed in Chapter 1 have indicated positive benefits from watershed development programmes.
implemented in other parts of the country. This suggests that watershed development programmes have already been replicated in other dry zones of the country, and offer a viable option for the development of dryland regions in the country.

Secondly, the sustainability of the programme is another aspect which merits discussion. This is because presently the programme largely involves a top down approach rather than being planned and implemented through effective people's involvement. As noted earlier, wherever effective people's participation has been involved, benefits from watershed development programmes have been more spectacular as evident from the experiences of Sukhomajri in Haryana, Ralegaon Shindi in Maharashtra and Pidow in Gulbarga district, Karnataka. We have already noted the improper maintenance of soil and water conservation structures created as a result of watershed development programme in Mittenari. Effective people's participation and strengthening of the extension system can help to overcome some of these shortcomings. Village sanghas have been constituted under the DWDP recently for effective people's participation and their effectiveness and working needs to be seen.
Thirdly, the question arises as to how to reconcile social interests with individual interests. For instance, contour bunding undertaken as part of the soil and water conservation works under DWDP requires the co-operation of the people for its implementation and success as contour bunds cut across ownership boundaries. Effective people's participation in watershed development activities will help in better realisation of the goals and benefits of watershed development programme. Existence of externalities can distort the real costs and benefits of watershed development programmes. In Sukhomajri the landless who were deprived of their grazing lands as a result of watershed development activities were compensated by giving them equal rights to water which could be traded as well as fodder rights in the village forest.

Fourthly, with growing emphasis on decentralised planning, the role of decentralised democratic institutions in watershed development programme assumes great importance. In view of the diverse micro situations characteristic of watershed development programmes, fuller realisation of the benefits of the programme may be better served by giving more say to the local level institutions in implementing watershed development programmes.
Fifthly, as noted earlier, social forestry undertaken on common lands in the watershed have generally resulted in mono-species plantations. Mixed types of plantations i.e. plantations consisting of a mix of fuel, wood, fruit and fodder species would be more desirable from the viewpoint of the local community and ecology of the region as well as in obtaining higher returns.

Sixthly, increased production and commercialization of agriculture in watershed areas calls for building of appropriate marketing links and networks. This aspect has been relatively neglected in watershed development activities and merits more attention.

Lastly, in the context of New Economic Policies with its emphasis on reducing public expenditure and subsidies the question of continued government support for watershed development programmes assumes relevance. In this context either public investments have to be recovered from the beneficiaries or appropriate measures taken to raise and reinvest the surpluses generated in the watershed. If these aspects are addressed to it will be possible to realize the full benefits of watershed development programmes on a sustainable basis.